Design Proposal
Afterschool Online Scratch Club for 4th grade students
Lexington Public Schools, MA for Fall 2020.

Part 1: Introduction

Lexington Public Schools (LPS) is a K-12 district with six elementary schools. In March 2020, all schools were closed due to the pandemic. Schools will reopen in September, with students learning remotely or in hybrid cohorts of in person and remote. Many after school clubs such as the 4th Grade Science Club are cancelled. This affects over 500 students in LPS (see Appendix 1). In addition, social interactions such as playdates with friends will be limited due to infection concerns.

This Design proposal is an online, afterschool club for 4th graders using MIT's Scratch. It will be run once a week in Fall, using the Zoom platform for group work and with the help of Lexington High School (LHS) student mentors. The primary purpose is to provide a safe, fun and creative outlet to 4th graders, and to introduce them to Scratch. It will also allow students to interact with their peers. The club will benefit the learners socially and create a community of practice[1]. Exposure to programming basics will help the students as they learn about robotics in the LPS curriculum[2]. In addition, working with Scratch dovetails with the Department of Elementary and Secondary Education's (DESE) standards based curriculum which emphasizes performing tasks as opposed to only memorizing facts[3]. The hope is that through this club, learners will be inspired because "*when students from all backgrounds engage in interest-driven learning online…they can produce remarkable works of art, programming, engineering…*" according to Professors Mehta and Reich[4].

Part 2: Learner & Context Analysis

Common characteristics for LPS 4th graders are: aged 9 to 10 years; majority use English with only 8.8% English Language Learners (ELL); predominantly white, 40% of Asian origin and 15% of African American and other races[5]; all possess school provided devices with access to the internet, and can be considered computer literate, due to the emphasis on computer usage within LPS[6]. Most students would have some experience with afterschool activities as the schools and town are geared towards this with LexTended Day, Hayden Center, Town Recreation Department[7] and many child-centered commercial enterprises such as Einstein's Workshop[8]. One may wonder how the needs of this seemingly heterogeneous[9], very large learner group may be met with one proposal. Therefore, the club is leveraging Scratch which is designed for its accessibility to many types of learners[10]. In addition, given the online and social nature of the club, only four learner personas are most important. Depending on prior technology exposure and personality type learners would fall under one of the four quadrants. See table.

Table 1: Learner Personas

Personality Type	Introvert	Extrovert
Comfort with Technology		
Tech Novice	**1. Tech novice-introvert** (Shy, new to Scratch)	**2. Tech novice-extrovert** (Outgoing, new to Scratch)
Tech Expert	**3. Tech expert-introvert** (Shy, very knowledgeable about Scratch, computers)	**4. Tech expert-extrovert** (Outgoing, very knowledgeable about Scratch, computers)

The information pertinent to personas can be gathered during the sign-up process and from teachers. The information will help categorize the students for possible scaffolding needs, peer groupings and mentor assignment. For example: the teachers may decide to give students choice (friends) or pursue either homogenous (keeping shy and tech savvy children together) or heterogeneous grouping (mix of all four quadrants) for small group work, discussions etc.

As per the limited survey results (Appendix 2), 4th graders like to be in activities with peers whether its playing sports or board games. They don't like chores or 'just sitting at home', therefore the online club may be well suited to this group. At this age parents and caregivers influence children's decisions substantially. They tend to encourage activities wherein children can mingle with peers, hence participation may be viewed favorably. In addition, interaction with LHS students may be an additional motivator as the students have a reputation for being athletically, academically and artistically driven[11]. At the very least the club would serve as an electronic babysitter and at the best it could serve as an engaging, learning enriched playdate with peers and older role models. The club may also serve as a precursor to some of the computational skills to be introduced in 4th grade and beyond as required by the curriculum[12]. Some obstacles to learning may be some difficulty with comprehension for ELL students; parental desire to restrict number of hours in front of a screen; fatigue on Friday at the end of a week of school learning; family commitments; and the optional nature of the club reducing motivation[13].

Note: 14% of the LPS student population is special needs. Their inclusion is desired. However, that is worthy of its own proposal.

Part 3: Goals and Outcomes

Goal: At the end of this experience learners would have an introduction to the Scratch platform through play and have some familiarity with the basics of programming.

Learning outcomes: Learners will be able to create a Scratch program and describe it to an audience of their peers and high school mentors, sharing at least two features and at least one area of improvement in an online small group discussion.

Goal: At the end of this experience learners will be able to reflect on their learning and identify enjoyable experiences with Scratch and in the club.

Learning outcomes: (a) At least once per week: learners will give age appropriate positive feedback to peers in a small group discussion. The feedback may be related to the design of a peer's Scratch program, or a social interaction which was noteworthy (a joke or problem solving help given, for example). **(b)** Over the duration of the club: Learners will be able to articulate and give at least one concrete example of what they have learned in Scratch from the first to the last session. They will be able to share at least one fun Scratch feature or enjoyable experience working with Scratch.

During the pandemic, young students are missing the fun interactions and comradery of playdates and peer interactions as a number of afterschool clubs and activities have been cancelled. The hope is that having an online afterschool program that emphasizes fun and positive interactions will fulfill these Social Emotional Learning[14] needs while introducing young learners to a vibrant online platform for computing.

The goals and outcomes are selected to reflect the deliberate informal nature of the club. The club will be loosely organized in terms of weekly learning modules with emphasis on experimentation and fun and not on weekly end deliverables. The design of the club is for it to be a worthwhile substitute for the non-evaluative in-person activities, clubs and playdates that the students cannot participate in due to Covid 19. By introducing student choice, multiple opportunities for small group discussions, and removing the pressure to perform to set standards, hopefully the students will find it an enjoyable learning and social experience. Experimenting with Scratch along with positive reinforcement should help build a growth mindset[15] and reinforce a belief that any setbacks encountered just require deliberate practice to solve[16]. Scratch can be a gateway to further explorations in programming and learning in other domains[17]. The hope is that learners become more active producers of technology solutions as opposed to just passive consumers in future years. The immediate goal is for kids to have fun while playing with Scratch and make friends!

Part 4: Assessment Approach

Due to the informal nature of the club, the organizers will make use of a mix of nonobvious formative, feedback and summative assessments[18] (Appendix 3). Participation will be a key formative assessment throughout. As the end goal is fun, all assessments have to be equally fun, not perceived as assessments, and definitely not onerous. The four learner personas have to be considered during mentor assignment to ensure a harmonious match, and also when organizing the group discussions to ensure that all can participate equally, such that the discussion does not get too technical or too simplified, too one sided or just noise, for learners to lose confidence or interest.

The formative assessments will be done by the assigned mentor (LHS student) through observation or conversations with learner, hence they have to be simple, easy to understand, administer and record. Opportunities for self and peer assessment by learners will be incorporated into the periodic discussions through simple prompts which encourage reflection, collaboration and problem solving, as well as highlighting Scratch skills learned within the group[19]. The mentor will also collect any written reflections by learner and keep track of learner's progress with Scratch skills using a simple checklist. This approach leverages the advantages of Cooperative Learning where learners are taking on roles, sharing responsibility and helping each other[20].

The club will run one session a week for 6 to 8 weeks. At the end of each session, the mentor will communicate positive feedback verbally to the learner and through a short email to the parent. For the two learner personas which we have identified as 'introvert', the assessments may be more observational and there can be less emphasis on sharing and reflecting in a small group setting, until the student is ready to do so. If the student wants to do a written reflection instead then that can be substituted. At all points student choice is to be enquired and honored.

Summative assessments will be in the form of a Scratch program that the learner designates as the one they would like to share in a slightly larger online group setting. The summative assessment will again be a simple checklist which the mentor maintains. Participation in the last session and the group discussion will be considered as having met the required criteria. Encouragement will be given to the learner to reflect on the journey from the first week to the last, whether they would likely use Scratch again and share thoughts during the discussion. The mentor will again provide verbal positive feedback to the learner and written feedback to the parents or caregivers. There is no negative consequence of an outcome not being met, nor will the formative and summative assessments be recorded per student beyond the purpose of improving the club for the next session or next year.

The attempt is to make the experience fun and memorable so that children will want to investigate Scratch capabilities further and maintain the friendships formed even after the club has ended. The club is not trying to develop master Scratch programmers.

Part 5: Key Instructional Design Decisions 563

Fundamentally, the key instruction design decision is to put learners in front of the 'toy' (Scratch), provide some friends (peers) and trusted older companions (mentors) and to say – Go Play! All other details flow from this rationale (Appendix 4).

After an initial session which is weighted towards building social connections between peers and mentor-mentees, all other sessions will follow the rough format of some independent work, interspersed with quick small group discussions in designated collaborative teams. This format harnesses the benefits of Peer and Group Learning. If positive peer relationships can be established, then along with emotional support they can motivate learning[20]. Research has shown that Group Learning too has many benefits – *"...in comprehension, retention, and problem-solving. Interacting with others helps learners construct and refine their conceptual understanding, identifying gaps and new connections for deep, active processing*[21]*".* It is important to create a supportive, engaging environment across all four learner personas with appropriate group discussions. The initial and last sessions will also have 1-minute written assignments where the learners individually reflect on their learning using Scratch.

To meet the goals, the club utilizes instructional activities such as Hands-On Learning and Peer Teaching/Collaboration[22] which echo constructionist theory. In Seymour Papert's words *"…..we learn better still if we combine our doing with talking and thinking about what we have done*." [23]. The learner is learning by doing, while also sharing insights, successes and collaboratively problem solving. The Zoom platform allows multiple simultaneous screen sharing. Learners can view each other's projects. Unfortunately, there are some limitations of being completely online, as the same Scratch project cannot be simultaneously modified by two users [24].

A teacher will help coordinate the club at each elementary school and will collect feedback from high school mentors and act as a facilitator when needed. Given that the club is trying to meet the needs of four different learner personas, assignment of mentors needs to be done carefully. For example: even though the instructional activities may be the same, Scratch lends itself to exploration at different levels of complexity[25], therefore, tech-savvy learners may need to be carefully grouped with mentors and peers such that all feel supported and not overwhelmed by a peer's quick pace of progress.

The mentor's guided instruction and facilitation role[26] will employ effective questioning[19] during group discussions to make the learner remember and reflect, in a nonobvious, informal manner. It will support the peer teaching/collaboration, and prepare the learner to share their ideas with an audience. It can also help strengthen the learners' initial declarative knowledge of the intricacies of Scratch by repeated recall. Depending on the mentor's skill with questioning prompts and frequency, the knowledge may become procedural knowledge,[27] on some Scratch skills such accessing certain block types or change a variable's value etc.[28]. Given that the mentors are young students themselves, without training in such matters, this instruction style may have variable success across groups.

Peer and group dynamics will have to be monitored by the teacher and mentors to reinforce positive group dynamics and curb any negativity or excessive criticism. The benefits of peer and group learning hang in that balance.

Part 6: Reflections

Having successfully started and run many STEM clubs within LPS, this design proposal came intuitively. In the past I noticed students discover self-confidence, a joy in learning, and friendships. During the pandemic, the need is even greater. Therefore, I conceived a proposal with immediate practical application very quickly. Making quick decisions, is a function of my previous education and experience in design, and management. One recognizes an issue and acts fast to solve it. It is harder to discuss theoretical concepts which require a slower cadence, reflection, and an ability to think in the abstract. The Module 6 assignment forced me to slow my pace and question my ideas. Going through the outline and final write-up helped me find research backed theories for my intuitive assumptions. The design proposal is a stronger vision for that.

As a consumer of remote learning during HPL, I have many questions about my design proposal that I hope to resolve prior to September. Some of these are: after months of remote learning and social isolation would students want to do an online club? Lexington tends to have achievement oriented driven students. Would a club emphasizing fun succeed? How does one create an atmosphere of fun, or make learning fun? HPL hasn't mentioned any relevant theories. Ultimately all learning should be joyous, so how do we add jokes and good humor to all pedagogy? In the coming months I intend to do further reading on this topic to find any research backed theories (Appendix 5).

During my tenure at LPS, I have seen initiatives implemented without adequate emphasis on backward design that give me concern. Experienced educators believe they know what is best for a type of student and build a curriculum to meet those non-authenticated needs. (The irony! This is identical to my attitude mentioned above). There is a reluctance to engage with quantitative data and over reliance on qualitative data. As a result, an initiative gets implemented, and with poor assessment, it does not get questioned or improved. In Module 6 the assessment

section never addresses evaluating the initiative itself. By taking my design proposal forward I intend to spend time on evaluating its progress, operational issues, and teasing out lessons for the next iteration. A pilot project in one elementary school may be the best start.

As can be inferred from above, HPL has dovetailed very neatly into my personal goals for joining HGSE. I wanted to study courses which I could leverage immediately in my ongoing role at LPS (that attitude again!) Therefore, I am gratified that as the culminating assignment I have something tangible to take back to my community. In addition, through HPL, I have discovered that along with Eames' design philosophy, Professor Papert's Constructionism theory has always influenced my views and ideas about education, even though I did not know their origin. It is highly likely that they will be my 'intellectual home' in the field of education and endeavors to come.

Part 7: References

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(11) Wikipedia. (n.d.) *Lexington High School (Massachusetts)* Wikimedia Foundation Inc. Available at <https://en.wikipedia.org/wiki/Lexington_High_School_(Massachusetts)>

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(17) ScratchEd Unit 5: Going Deeper (Module 5) Available at <https://canvas.harvard.edu/courses/73180/pages/unit-5-going-deeper-module-5?module_item_id=658526>

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(26) Harvard Graduate School of Education, (n.d.). Unit 6.4.2 *Instructional Stance Direct vs. Guided instruction*. How People Learn. Available at: < https://canvas.harvard.edu/courses/73180/pages/unit-6-dot-4-2-instructional-stance?module_item_id=658620>

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Part 8: Appendix

Appendix 1:

Dr. Kavanaugh (Director of Planning and Assessment, Lexington Public Schools) for enrollment in 4th grade in the 6 elementary schools in Lexington, MA, 2019.

School	4th grade
Bowman	90
Bridge	77
Estabrook	90
Fiske	60
Harrington	99
Hastings	126

Appendix 2: Responses to Learner Profile Survey sent to 4th Graders parents

Questions	Participant A	Participant B	Participant C
Grade level Fall 2020:	Rising 5th grader	Rising 4th grader	Rising 4th grader
Gender?	Male	Girl	Girl
Age?	10.5	9 years	9 years
What do you like to do best in school?	Science	Reading, math and science are my favorite subjects and gym is fun	Math
What do you like to do after school work is done?	Play Sports	I like to go swimming.	Play with my friends/go in the pool
What do you not like to do after school?	Run errands	I don't like just sitting at home	Play in the playroom
What is your favorite book?	Wonder	My favorites books are by the author Roald Dahl and I love biographies.	The land of Stories
What is your favorite game?	Monopoly	My favorite game is scrabble.	Life
What is your favorite movie?	Star Wars	My favorite movie is The Grinch.	Jumanji
What is your favorite sport?	Hockey	My favorite sport is swimming.	Soccer
Do you have any elder brothers and sisters?	No	No, I only have a younger sister.	No
Do you know what Scratch is?	Yes	No answer	Kinda
Would you be interested in playing with Scratch?	Yes, and has done Penguin coding in 1st and 2nd grade	No Answer	yes
State, Town	MA, Lexington	Pennsylvania	Pennsylvania

Appendix 3: Examples of Formative and Summative Assessments for online afterschool scratch club

For 4th graders – laughter and smiles will be a key metric of the club's success

Timeline	Formative	Summative
Pre Club (week 0)	Participation 1-minute reflection writing assignments	
Begin club (week 1 & 2)	Entrance Post Its (like entrance tickets but easier) Happiest mistakes made Largest number of distinct incomplete programs. Idea for a fun Scratch final program Presenting to sub group (2 or more 4th graders with their high school mentors). Giving and receiving feedback	
Mid-point	Participation	

(week 3 & 4)	1-minute reflection writing assignments	
	Continued work on individual final project interspersed with in-class surprise mini-group discussions	
	Low-stakes group work (problem solving each other's issues or desired features through Scratch)	
End club	Participation	Final projects
(week 5 & 6)	1-minute reflection writing assignments	Final presentations
		Final feedback sessions

Appendix 4: Instruction Activities List for online Scratch Club For LPS 4th graders

Timeline	Activity	Rationale
Pre-Club (week 0)	4th graders and LHS mentors group introductions and ice breakers.	Get to know each other and build a comfort level with small group of peers and assigned mentor.
	Setup of Scratch accounts with school email id (independently or assisted)	Reflect on current knowledge of Scratch and objectives for joining the club.
	1-minute reflection writing assignments - (what do I know about Scratch, what do I think I want to do with it).	
Begin club (week 1 & 2)	Happiest mistakes made	Value of experimentation, explore the breadth of possibilities with Scratch platform, sharing experiences and the learning journey with peers and mentors.
	Largest number of distinct incomplete programs.	
	Idea for a Scratch final program	
	Presenting to sub group (2+ 4th graders with high school mentors). Giving and receiving feedback (pair-share exercises)	
Mid-point (week 3 & 4)	Continued work on individual final project interspersed with in-class mini-group discussions	Deliberate practice with Scratch.
	Low-stakes group work (problem solving each other's issues or finding desired functionality in Scratch)	
End club (week 5 & 6)	1-minute reflection writing assignments	SEL skills of being "able to listen to feedback, understand differing perspectives, and identify the feelings and reactions of others" (HGSE,(n.d.) Mod 5.3.4, SEL integrated with other domains .How People Learn)
	One project for sharing	
	Project sharing presentation or talk	
	Feedback on project	

Appendix 5: Further reading

1. Enjoyment in learning
   https://www.researchgate.net/publication/323897499_THE_EFFECT_OF_ENJOYMENT_ON_LEARNING

2. Washington Post
   https://www.washingtonpost.com/news/answer-sheet/wp/2018/05/29/are-american-kids-happy-in-school-new-data-tells-a-surprising-story/

3. What Counts When it Comes to School Enjoyment and Aspiration in the Middle Grades
   https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5663305/#R3

4. American Psychology Association https://www.apa.org/monitor/2015/06/grabbing-students

5. The lasting importance of early relationships
   https://canvas.harvard.edu/courses/73180/pages/unit-4-dot-1-1-the-lasting-importance-of-early-relationships?module_item_id=658