

# Supporting Diverse and Creative Collaboration in the Scratch Online Community

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## Design Environments for Creative Collaboration

*A young boy plays with a choose-your-adventure project and decides to leave a comment with suggestions for the creator. A young girl sees a simple maze game and decides to remix it to add new levels in the game. A young boy watches an animated music video and asks the creator if she wants to collaborate on a project. Two friends who met online decide to make a birthday card together for a mutual friend, then ask their network of friends to add a message to the project by remixing it; by the end of the day, hundreds of other young people have remixed the original project.*

These stories highlight the experiences of young people in a mass collaboration environment—namely, the Scratch online community (<http://scratch.mit.edu>). With the Scratch programming language, young people can create their own interactive media, such as animations, games, and stories, and share these projects in a dynamic online community with young people from all over the world. Since Scratch launched in 2007, more than eleven million projects have been shared and more than nine user accounts created. Scratch was designed with collaboration in mind. In particular, it enables creative collaboration—that is, coming together to design, build, and invent shared artifacts. Whether they involve just two people or hundreds of people, creative collaborations in Scratch are embedded and supported within an active and large online community.

These stories also represent the diversity of ways that young people are collaborating: providing feedback, sharing ideas, building on existing projects, and coordinating the creation of a single project. How they organize themselves can vary across time, membership, and level of coordination. In the process, they learn new

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things from one another. As they build on one another's projects, they can learn how the previous projects were made. As they work with others who have varying levels of ability, they can learn new skills and techniques. They may experience obstacles, such as conflict, misunderstandings, and mutual disappointment (for example, when a collaborative project does not turn out as planned). However, despite—and sometimes through the process of working through—these challenges, young people can learn valuable things about themselves as creators and collaborators.

Scratch provides a lens onto different styles of collaboration than have been traditionally studied by the educational research community. Whereas previous research has often focused on small-group structured collaborations in classroom settings, Scratch and other online environments have opened opportunities for collaborations that involve larger number of participants, working on projects driven by participants' interests, and where participants' roles and goals evolve fluidly over time.

In this chapter, we explore two questions:

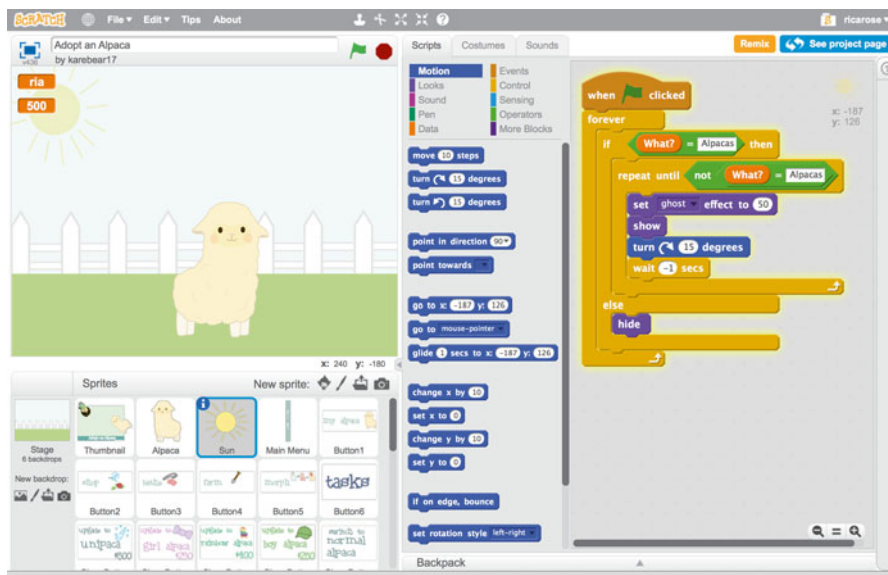
- What are the different ways that young people engage in creative collaboration?
- How can we design environments to encourage and support diverse and creative collaboration?

First, we will explore these questions in the context of the Scratch programming language and online community. We describe varied and emergent collaborative activities, driven by members of the Scratch community members, and we describe the ways in which they are learning as they engage in these activities. We then discuss our design strategies for encouraging and supporting diverse and creative collaboration and how we implemented these strategies across technical and social structures in the community.

## Scratch Online Community

Scratch is a programming language (Fig. 1) and online community (Fig. 2) where young people can create and share interactive media such as games, animations, and stories (Resnick et al., 2009). Scratch is designed and maintained by the MIT Scratch Team, which we are members of. Since Scratch launched in 2007, it has grown into a vibrant community with more than 15,000 projects shared every day, by young people all around the world, primarily between the ages of 8 and 16.

In designing Scratch, we wanted everyone to be able to express and share their ideas. To support broad participation from many interests and backgrounds, we made it easy for young people to create and personalize their projects. They can upload images and music, create their own graphics, and record their own sounds. Scratch members have created a wide variety of projects that include animated music videos of popular music, holiday cards for their friends, quirky musical instruments, biology simulations, interactive newspapers, tutorials about Scratch, and adaptations of popular games.



**Fig. 1** Scratch programming interface. Young people can snap together graphical blocks that have different programming commands. They can stack these blocks and execute sequences of commands that control the attributes and actions of sprites, or objects, in their project



**Fig. 2** Home page of the Scratch website. On the home page, members can browse projects and see the latest activity in the community

The Scratch website provides opportunities for members to create and connect with other creators from around the world. Members can easily share their projects by clicking on a “Share” button and showcase their project on a dedicated project page, where other members can interact with their project and leave comments. Members can also immediately view and interact with a project’s code by clicking on the “See Inside” button in the project page. To explore projects in the Scratch community, members can start from the home page, which includes projects curated by the MIT Scratch Team, recent projects from people they follow, and projects that the rest of community is “loving.”

The Scratch website is also rich in collaborations. Members frequently build on top of each other’s ideas, images, sounds, and projects through remixing. Members can also gather and work together in a number of ways. The Scratch website includes a discussion forum, where members can ask questions, converse about Scratch-related topics, and find collaborators. Members can collect and curate projects into shared pages called *studios*. Studios have an area where anyone can write comments. Members can organize the studio by inviting others to become curators.

## Creative Collaboration in Scratch

As membership has grown in the Scratch community, young people have collaborated in ways beyond what we had originally anticipated. More and more young people have taken the initiative to connect, coordinate, and collaborate on projects and activities—from forming collaborative groups that developed sophisticated projects to crowdsourcing project ideas to the entire community (Aragon, Poon, Monroy-Hernández, & Aragon, 2009). In this section, we describe five stories of creative collaboration across the Scratch community to demonstrate the diverse ways Scratch members connect, coordinate, and work together. These stories are based on online activity in the Scratch website (using pseudonyms of Scratch usernames for anonymity).

### Remixing Projects and Ideas: Jumping Monkey<sup>1</sup>

Remixing is a common collaborative activity on the Scratch website—about a third of the projects shared in Scratch are remixes (Monroy-Hernandez, 2012). Remixing refers to taking an existing project and making changes to make your own version. All projects on the website are covered by Creative Commons ShareAlike license: When a member shares a project in Scratch, anyone can remix the original project and share it again on the website. Remixing allows members to build on top of other projects and change it in to add new features.

In the Scratch project “Jumping Monkey,” Jessy9, an elementary school student, created a simple game where the goal was to help a monkey eat bananas by using

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<sup>1</sup> This story of creative collaboration on Scratch was adapted from Andrés Monroy-Hernandez’s dissertation, *Designing for Remixing* (2012).

the arrow keys to move around the screen (Fig. 3a). Choaz, age 34, played the game and had a number of ideas for improving it. There were several simple black platforms in the game, and Choaz thought the game would be more interesting if the monkey could land on the platforms. So Choaz decided to remix the project and added a color detection technique he called “pink slippers.” Choaz painted pink shoes on the monkey and programmed the monkey to react whenever the pink shoes touched any of the black platforms. He also decided to create another remix that was a more developed game, which featured moving platforms and a different character (Fig. 3b). He made sure to credit Jessy9 in the project description for the inspiration: “I’d never have started this if it wasn’t for her jumping monkey.”

As other community members interacted with Choaz’s remixes, some of them shared their own remixes of his projects. A remix by MagicX, a middle school student, added obstacles to the game (Fig. 3c), and she created another project that was more sophisticated. Scratch member GummyBear, a college student, saw MagicX’s remix and asked if she could remix the project. MagicX responded by asking GummyBear to collaborate on a project, and together they developed a sophisticated game with music and professional-looking graphics (Fig. 3d). The project soon gained community-wide attention and had more than 10,000 views, far more than any of the “ancestor” projects in the remix tree.

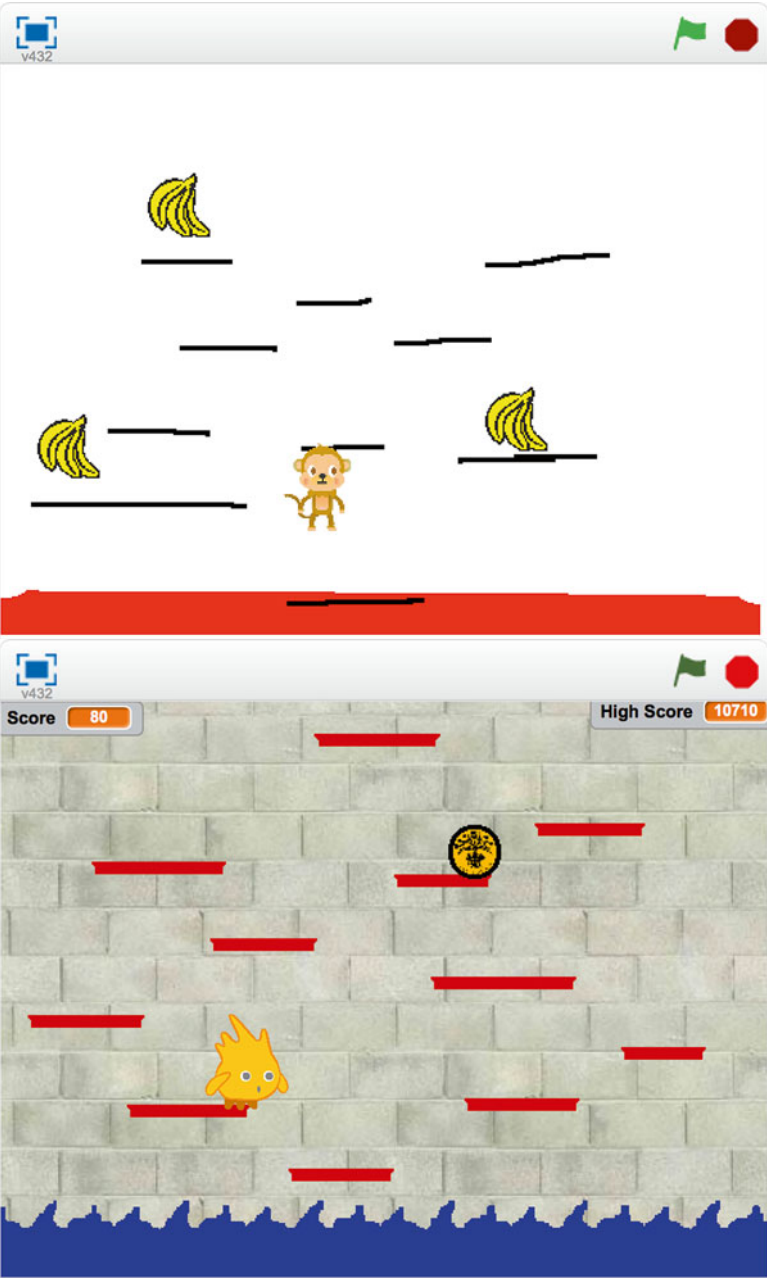
## Organizing Contests in the Community: The Creativity Challenge

Scratch members often create contests and challenges for their friends and other community members (Nickerson & Monroy-Hernández, 2011). Each contest can instigate the creation of many projects. For example, “coloring contests” challenge members to color in a line drawing in interesting ways, and the original creator chooses a winner. Other examples include projects that challenge members to add a character to a project, such as a dancer to a dance party or a character running away from a rolling boulder.

MrBreakfast, a middle school student, liked the spirit of these contests and challenges, but he wanted to do something different. Rather than having people work on the same project such as coloring the same character, he wanted people to come up with different ideas. He built a simple project to explain his challenge, which he called The Creativity Challenge, and he asked Scratch members to create something using a simple line drawing of what looked like a caterpillar, but they were not allowed to draw a caterpillar. He gave other rules, such as no copying and making sure to follow the Scratch community guidelines<sup>2</sup>. To help people get started, he created an example: a giraffe wearing a colorful scarf on a sunny day. He shared the project and gave the community 2 weeks to share their projects.

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<sup>2</sup>Scratch community guidelines: [http://scratch.mit.edu/community\\_guidelines](http://scratch.mit.edu/community_guidelines).



**Fig. 3** “Jumping Monkey” project and remixes. Original game by Jessy9 (a) and remixes by Choaz (b), MagicX (c), and GummyBear (d)

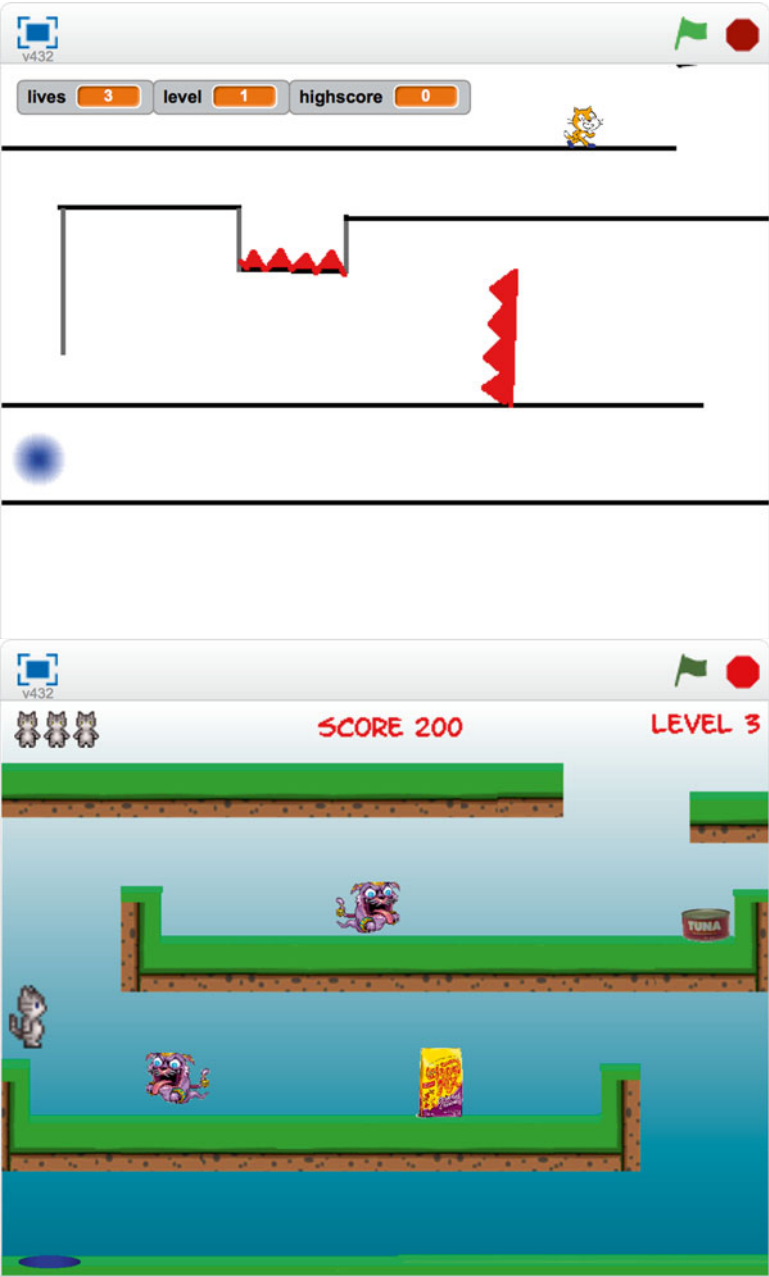
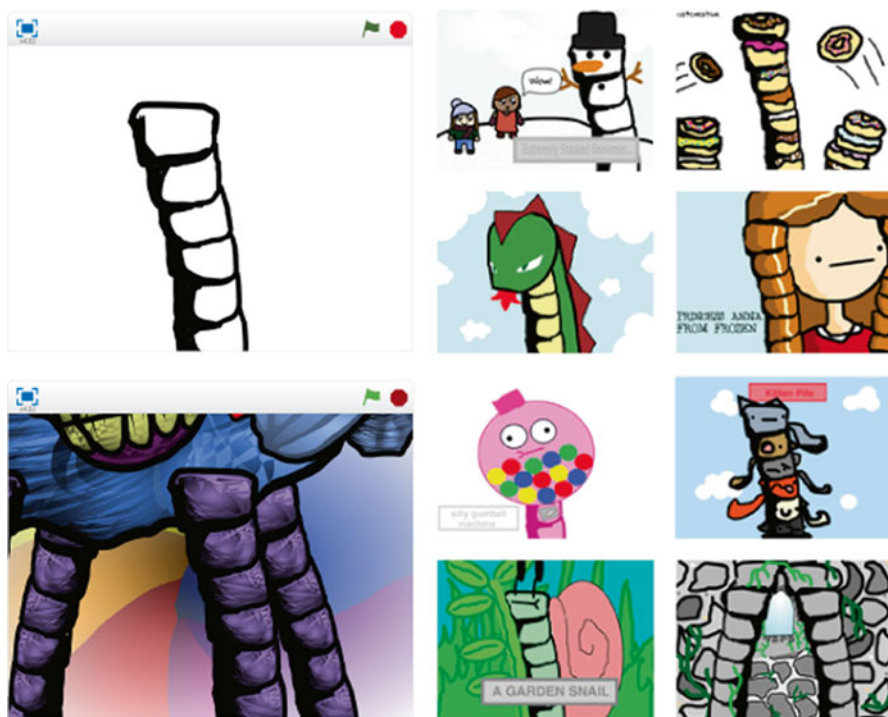


Fig. 3 (continued)





**Fig. 4** Original project by MrBreakfast (*top left*), winning project (*bottom left*), and other remixes by Scratch members

By the time the contest ended, MrBreakfast's project inspired more than 200 remixes (Fig. 4). Members created projects beyond his expectations. Many were whimsical, inspiring, and funny. Some interpreted the line drawing as piles of different things, such as piles of cute puppies, a tower of sugary donuts, and scoops of ice cream. Others incorporated the line drawing into different elements of things and people, such the braids of a young princess, a stone archway into a secret garden, and the stand of a silly gumball machine. Others made fantastical and fictional characters such as fire-breathing dragons, a marshmallow creature wearing a hat, and the lost ruins of the city made of eggplant.

He announced the winner as well as the other "honorable mentions" in a new project. With each announced winner, he gave positive feedback, highlighting the features that excited him about each of their projects. The winning project amazed him. The project creator made a beautiful and fanciful image of an elephant, with the line drawing incorporated into its legs (Fig. 4). The project was also interactive and allowed people to move around the project to see the other parts of the elephant. It was beyond anything he had expected. "The vector art blew my mind, and a tremendous amount of effort was obviously put into it," he wrote in his project announcement. Even after the challenge was over, many Scratch members continued to build on top of his original drawing to create more projects. In the meantime, Scratch members asked MrBreakfast to develop another creativity challenge.



## Creating Supportive Spaces for Communities of Interest: Anime School

“This is like an anime school, where ALL anime fans, students and more gather to explore, create, discuss and help fellow members of the Anime World! Please join!” Nancy2020, a middle school student, said in a Scratch studio she called “Anime School” (Fig. 5). She wanted to create a space where people could share ideas, learn from one another, and interact with others interested in talking about all things anime. Additionally, she wanted to find Scratch members who could help create and collect helpful tutorial projects about anime. She recruited people throughout the Scratch website, posting in the discussion forums and asking people to “apply” and explain why they wanted to help.

Within a few days, she got enthusiastic responses from dozens of Scratch members. Many expressed how much they also loved anime and wanted to share their love of anime with others. Some members described how tutorials created by other members had helped them in the past and now they wanted to return the favor to the community. As one Scratch member wrote: “I want this role to help both myself and my friends to learn to draw and improve on my/their anime skills. The tutorials help me find new ideas and methods of guidelines, shading, and textures, and they all help me find my own style.”

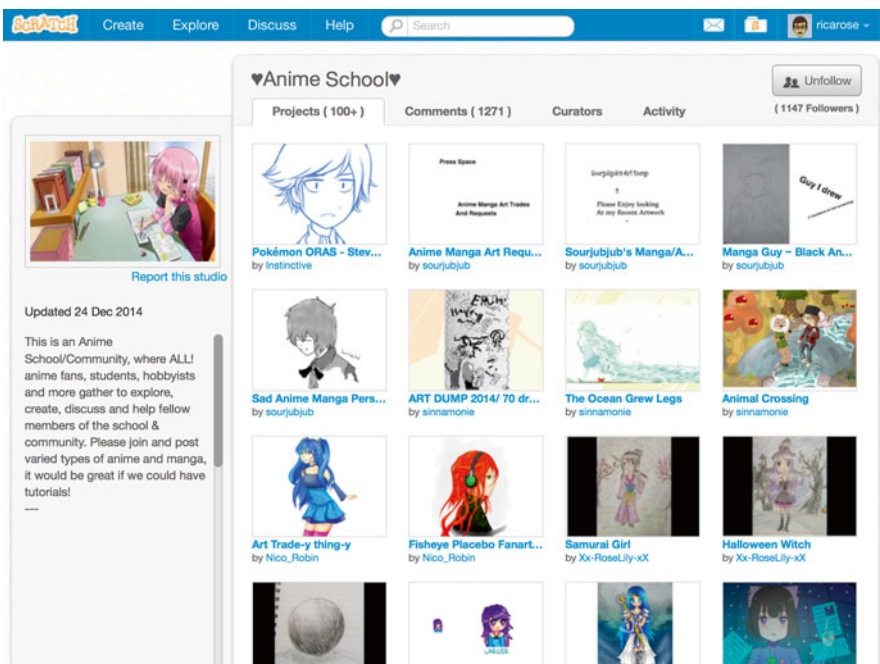


Fig. 5 Anime School studio page

Another Scratch member commented, “There are a whole bunch of people on Scratch with AMAZING anime potential, and they just need a little guidance or tips!” For people who were ready with tutorials to share, she added their projects to the studio and gave them role of “teacher.”

Together they created a few tutorials, but their biggest task was searching the Scratch website to find anime-related tutorials created by other members. They found tutorials that included projects such as how to draw eyes, bodies, and hair in an anime style, how to use Scratch programming to animate their anime characters, and how to use other illustration tools like CorelDRAW. Many Scratch members who came to the studio found this wide and large collection of more than 100 projects. Within the tutorial projects themselves, Scratch members were enthusiastically thanking the creators in the project comments.

After several months, their studio was featured on the home page of Scratch by the MIT Scratch Team, which gave the studio more visibility across the community. And as the studio gained visibility, so did the tutorial projects that were a part of the Anime School, as Scratch members made suggestions of other projects to add. The comments and questions in the studio also increased as more people also wanted to join and help with the Anime School. To help manage the increasing activity within the studio, Nancy2020 promoted some of the most helpful members as “Managers.” As Nancy2020 became busy outside of Scratch, these managers took the lead in running the school. The Anime School continues to grow with more than 300 projects, which include tutorials, art, animations, and other anime-related projects, and more than two dozen managers and curators who maintain the school.

## **Imagining New Worlds Together: Jellies RPG**

Role-playing games (RPGs) are a popular activity in the Scratch community. In RPGs, Scratch members create projects about their characters and collect these projects in studios. Within the studios, they use the comments to role-play the actions and dialogue of their characters. Scratch members transformed studios, which the MIT Scratch Team had designed as pages for members to curate projects, into social spaces to role-play characters in worlds they create. ComfyCabin, a middle school student, decided to start his own RPG using creatures he called “jellies.” Two things inspired jellies: the wiggling movement of Jello and the epic stories of comic book superheroes. Jellies moved and bounced liked Jello. They were also an alien species from a planet that got destroyed by The Dark Jellie. The few who managed to escape crash landed in different parts of the Earth. The “Jellie RPG” began after they arrived on Earth.

ComfyCabin announced this RPG and backstory in a project, and he opened the RPG to anyone interested in playing along in the story. Like many RPGs in Scratch, some members role-played in the studio comments. Comment-by-comment, Scratchers would describe what their character did and said in response to their interactions with other members’ characters. Some Scratchers, including

ComfyCabin, also created short animations to make their adventures come alive. They took turns and built on top of each other's story line. For example, two Scratchers, MooshyJello and Gree, took turns making simple animations about their two jellies and their adventures together as they encountered other jellies in different parts of the Earth. These short animations and their stories converged in a final series with their characters combining their powers to defeat The Dark Jelly.

Meanwhile, the idea of jellies spread throughout the Scratch community, beyond the original studio and their short animations. Some Scratch members put together a magazine called "Jellies' Weekly," creating journalistic stories about different jelly characters. Others created animated music videos featuring different jelly characters. Others started spin-off stories of the jellies on Earth. And even as ComfyCabin moved on to other interests, many continued the role-playing game studio while others started their own. After a group of Scratch members completed a storyline about the The Dark Jelly's defeat, another Scratch member started a sequel RPG and rallied other members interested in continuing the saga.

## **Coordinating a Multi-animator Project (MAP): Dr. Who**

OhHai, a middle school student, is a big Dr. Who fan. On Scratch, she met other "Whovians," a name that Dr. Who fans call themselves. During one summer, OhHai decided to "let her inner Whovian out" in the community through an animated music video featuring a Dr. Who song. However, instead of doing it on her own, she decided to invite her Scratch friends and anyone else in the community. Together, they would create a "multi-animator project" (MAP). In a MAP, creators animate different segments of a story or a song. OhHai offered to put all the projects together. She created a base project with the song split up into 17 segments, each covering 10 s of the song. She shared this project and invited anyone to sign up.

About a dozen animators signed up with some offering to animate more than one segment. Some reinterpreted different Dr. Who scenes with cats as characters, since many of them, including OhHai were also cat lovers. While many of the animators submitted their segments in a few days, OhHai took a few more months to share the completed MAP. In the project description, OhHai proudly wrote in the number of sprites and coding scripts that the project contained: 78 sprites and more than 350 scripts. She also wrote that even though she put it together, the animators deserved much of the credit for their animated segments. Soon after she posted it, her project appeared on What the Community is Loving row in the home page, which gave it even more visibility in the community.

The project also became a place for other Scratch members to ask OhHai questions about learning how to put a MAP together. Initially, she helped these members by individually replying to their questions. However, after getting the same questions, she created a tutorial project in Scratch, where she shared techniques, such as ways to organize scripts and sprites from different animators, ways to import different assets, and how to split up audio into different segments. People incorporated her advice and shared links to MAPs that they created. Others also shared more suggestions to add

to her tutorial, which she then incorporated in her tutorial project. OhHai was excited to see the different kinds of MAPs emerging around the community and was glad to help others create their own. In the meantime, she also began her next MAP, featuring another Dr. Who song, and coordinated another group of animators to contribute to the larger animation.

## Learning Through Creative Collaboration

In these stories, we see the rich and diverse ways that Scratch members are engaging in creative collaboration. The forms that they took varied across many dimensions, such as scale, level of coordination, time, and membership. Some collaborative activities included a small group of individuals remixing projects, while others involved hundreds of young people remixing and adapting a project. Some activities had a consistent set of members contributing, while membership in other activities continually shifted. For some of these activities, a central leader was involved, like Nancy2020 in the Anime School recruiting members and assigning roles and tasks to participants. Other activities were more distributed, with Scratch members like MrBreakfast and ComfyCabin developing the initial concept, then giving creative freedom to participants. Some collaborations occurred over a period of time, such as the MAP, while some are ongoing and continue to develop and evolve over time, like the Anime School.

These stories also highlight the different ways that Scratch members are learning across these collaborative activities. In each case, Scratch members are engaging in *design*—making artifacts such as remixing a game to add more obstacles or creating a musical animation. Scratch is inspired by constructionist learning philosophy, which argues that people learn most effectively when they are designing and building personally meaningful artifacts (Kafai & Resnick, 1996; Papert, 1980). The construction of physical and digital artifacts play an important role in constructing knowledge. Papert wrote about the importance of “objects to think with”—as young people build artifacts, they are also building new ideas and thinking about their own thinking.

They are also learning through their shared *interests*, such as an interest in a popular TV show, anime art, or role-playing adventures. When young people design and build projects inspired by their own interests, they are willing to work longer and harder on the projects, and they persist through challenges and difficulties. Within online and networked settings, interests can also be a catalyst for learners to connect and develop “affinity spaces” around their shared interests (Gee, 2004), such as the way the Anime School on Scratch developed to support interests in anime. These interest-driven spaces can also support young people from “hanging out” to “geeking out” or engaging more deeply in their learning (Ito et al., 2009).

And finally, these shared activities are being supported by a *community* of other creators (Brennan & Resnick, 2012). Within the Scratch online community, members learn through peripheral as well as proactive participation (Lave & Wenger,

1991). For example, some members learned from observing OhHai's collaborative process in arranging the MAP project, while others participated directly by contributing animated segments for the overall project. In the community, members have access to many projects that they can remix, that they can learn from, and that can inspire new ideas. They can also leverage the community and crowdsource for ideas, projects, or elements in a new project. And finally, Scratch members serve many important roles in helping each other learn, acting as guides, critical friends, and collaborators.

These collaborative experiences demonstrate the ways that Scratch members learn by designing, motivated by their interests and supported by a community of other creators. However, not all members engage in collaborative activities (see chapter "Coding by Choice: A Transitional Analysis of Social Participation Patterns and Programming Contributions in the Online Scratch Community" by Fields, Kafai, & Giang, 2016) and not all these activities are productive or promote learning in Scratch (Brennan, 2011). Some members leave negative comments or unconstructive feedback in projects, which can be especially discouraging to newcomers. Additionally, while studios are helpful in curating projects and gathering people, some members create "Add Everything" studios with the intention of collecting as many projects as possible regardless of how they are related. Finally, while the remixing platform has made it easy for members to build on one another's projects, the remixing features have also made it easy for members to copy projects, without changing the original work.

## **Designing for Diverse and Creative Collaboration**

These experiences of different forms of creative collaboration make use of the technical and social structures we designed in the Scratch website—structures that we continually and iteratively revise, based on emergent activity in the community. In reflecting on these stories, the following lessons emerged.

### ***Design Tools and Environments That Are Simple and Easy to Appropriate***

Scratch members continually surprise our team in the ways they use the website and its tools beyond what we had imagined. For example, studios are often appropriated beyond the original intention as spaces for collecting and curating projects. Scratch members have used the studio features to engage in role-playing, to coordinate collaboration teams (which they often call "collabs"), and to create meeting places for subcommunities of interest. When designing studios, we aimed to keep them easy and simple, with only a few features beyond curating projects (for example, an area for exchanging comments). We also provided ways for members to personalize their studios by editing

the name, description, and icon of the studio. The simplicity of studios led to generativity, enabling community members to adapt studios for their own purposes.

### ***Highlight Diversity and Amplify Examples***

We use different spaces and features on the website to showcase interesting and diverse examples of collaboration in the community. Highlighting different kinds of projects and activities through the highly visible home page or community-wide events can also be a source of inspiration for Scratch members. When we featured the Anime School among the featured studios, members appreciated the access to tutorials about anime, and soon many asked if they could also help. In the last few years, we have also explicitly created a variety of “Collab Camps,” or collaborative challenges where we ask members to work together and create projects based on a creative constraint (Roque, Kafai, & Fields, 2012). These events have raised awareness of collaborative activities, which may not have been obvious to some Scratchers as an activity they could engage in.

### ***Create a Social Environment That Supports Diverse Projects and Activities***

Our commitment to supporting a variety of interests, backgrounds, and ways of creating and connecting in Scratch is embedded into our technical and social design, but it is also articulated in our policies. We created a set of community guidelines<sup>3</sup> that include being respectful of others and promoting constructive critique. The guidelines are presented in clear and friendly language. We use the guidelines to maintain a welcoming and respectful environment for members. For example, while we are open to the diverse and varied expressions of Scratch projects, we block projects that seem inappropriate for a community that includes children as young as 8 years. In addition to our efforts, members on the site actively promote the guidelines with others and report comments or projects that go against the guidelines.

### **Next Steps**

The diversity of collaboration in the Scratch community enables multiple entry points into and trajectories through creative collaboration experiences for young people. In Scratch, participation can be as simple as sharing a project—which can then be viewed and remixed by other members of the community. Working with

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<sup>3</sup> Scratch community guidelines: [http://scratch.mit.edu/community\\_guidelines](http://scratch.mit.edu/community_guidelines).

others can be as brief and easy as remixing a simple drawing or as prolonged and complex as merging two dozen animations into one large project. These multiple ways of collaborating provide avenues for both newcomers and old-timers to learn from one another and deepen their engagement.

Collaborating online, especially engaging in more sophisticated activities like collaboratively building projects, requires both technical and social savvy. The emergent activities show us both the learning opportunities and the challenges that Scratch members face when trying to engage in these activities. For example, newcomers are juggling both learning how to use Scratch and how to collaborate. Some members have trouble finding collaborators to work with or coordinating one another's efforts. The text-based medium of the comment areas can make explaining a sequence of Scratch blocks hard to describe.

These challenges as well as these collaborative activities from the community continue to inspire us as we revise and design new features in Scratch. For example, in 2013 we redesigned the website to make the Scratch programming editor available online. This change enabled members to see inside others' projects to see how they are created and more easily remix and learn from others' projects. We also redesigned the studio structure to better support collaboration, allowing members to add and manage multiple curators. In addition, we added a "back-pack" feature in the editor for members to reuse scripts and media across Scratch projects. We are exploring designs to allow Scratch members more to readily provide help for each other, inspired by the ways that Scratch members already support one another (Fernando, 2014). As we plan and design support structures in Scratch, we aim to provide new entry points for young people to design together, to pursue and connect over their interests, and to support one another through community.

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