

*Scratch: Open source software for
programming, creativity and collaboration*



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Introduction

Children are viewed as born to be highly creative and have a willingness to explore and experiment with their physical and conceptual environment. Creativity poses different meaning to different people however for many years in educational system creativity is always restricted to areas such as art, music, literature and arts. However with the integration of technology into both society and educational system, creativity and technology has become closely link.

The creativity process can provide children with opportunities for experimenting new ideas, different way of problem solving and new ways of thinking. Resnick views creative thinking as critical for success and satisfaction in today's society [5], this has contributed to many researches on so how technology help children to be highly creative.

This paper will particularly focus on Scratch, how it is used to introduce children to programming and at the same time encourage them to be creative. Scratch's support to the nature of open source software in providing collaboration and knowledge sharing are also discussed.

Open Source Software

Open source software implies a software program that can be accessed freely and whose source code is open and must allow distribution in source code as well as compiled form [2].

The distribution terms must be open in that the license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale [2].

Most OSS are developed publicly in a collaborative manner implying that the development processes are also open. With open source, the users are given the same opportunities to download programs, create, develop and share.

There are different open source software specifically created to support creativity, In the next section we will shortly discuss different tools used for creativity purposes before focusing solely on scratch.

Open source software for creativity

Below are number of tools which support cooperation and sharing, they are open source software that are used for creating new media art works and supporting creativity.

some are aimed to be used by children and other are targeting artists, designers, hobbyists, and anyone else interested in creating interactive objects or environments.

The list below are software listed on Art and Technology project site[1] :

Scratch

It is a programming language that helps people create their interactive stories, games, music and art then be able to share it online. Scratch will be discussed further in the next section.

Tux Paint

It was developed by a community of volunteers with aiming for children of ages 3 to 12. It has an easy to use interface with fun sound effects and a cartoon character that guides the children as they program with it. As stated in Tux Paint official site “If you are looking for a fun way to encourage creativity in your children, look no further than Tux Paint”.

Arduino

It is an open source prototyping platform with easy to use hardware and software and it is intended for artists, designers, hobbyists, and anyone else interested in creating interactive objects or environments. By receiving input from the sensors Arduino can sense the environment and affect the surrounding by controlling lights, motors, and other actuators.

Audacity

Audacity is used for recording and editing sounds and works with all operating systems that is Mac OS X, Microsoft Windows, GNU/Linux e.t.c. The layout which has a tape style offering rewind, fast forward, play, and record function makes it simple to use. This software is specifically for use for audio and video recording manipulations. Commercial alternatives to Audacity are Apple Logic Studio, Cubase, Pro Tools. These programs are very expensive. Another alternative is Garageband which is free with Mac OS X

Inkscape

It is for editing graphics using vectors which makes it easier for images to be scaled up more easily. Files are saved in Scalable Vector Graphics (SVG) file format, although it is possible to save in other formats as well. Due to the fact that it requires a lot of study and experimentation to be able to use it correctly it is not designed for children and teenagers.

GIMP

GNU Image Manipulation Program (GIMP) is used for photo retouching, image composition and image authoring. Its feature involves a large screen that allows one to not only preview your artwork but also do editing work while using the most of your screen. GIMP supports majority of picture file formats, such as jpeg, png, gif, xcf (GIMP file format) and also Photoshop format.

Scratch

It is a programming language that helps people create their interactive stories, games, music and art then be able to share it online. It was created by Lifelong Kindergarten Group, at MIT Media Lab and it is open intended especially for 8- to 16-year-olds but it is also used by people of all ages[4].

With scratch program children can create their artefacts and incorporate several media types like sounds in wav format, have pictures in the format .png and also enable one to record own sounds. Through the design in mind scratch was developed having core features to encourage children to use of the tool. These features are:

Building-block programming. It is based on a building-block metaphor, in which learners build scripts by snapping together graphical blocks much like pieces in a jigsaw puzzle. Commands and data types are represented by blocks of different shapes, with pieces fitting together in only syntactically-correct ways. Resnick et al adds what inspired the building-block approach which was drawn from previous research on Logo Blocks and Etoys. This had been proven to be very intuitive for beginning programmers. Its user interface and page-navigation system are inspired by Logo Microworlds[5].

Programmable manipulation of rich media. Traditional programming environments involved manipulation of numbers, strings, or simple graphics. In Scratch programs manipulate images, animations, movies, and sound.

Deep shareability. The object architecture of Scratch supports “deep shareability.” It allows sharing of projects online and one can export export objects at all levels, from individual animated characters to full projects, and exchange them with friends running Scratch on many types of devices—desktops, laptops, tablets, handhelds, and perhaps even mobile phones or embedded devices.

Integration with the physical world. Building on our previous research on LEGO/Logo and programmable bricks inputs from physical sensors (such as switches, sliders, distance sensors, motion detectors, and sound sensors) can be used to control the behaviour of Scratch creations.

Support for multiple languages. The program is used worldwide where there is a multitude of languages and therefore to support collaboration and sharing in scratch was developed to be a multi-language, multi-cultural environment.

Licenses

Scratch project and support materials are available under the creative commons “attribution-share alike” licence [3]. This license allow to share, distribute and transmit the work as well as remix to adapt the work. Conditions are specified by the sentence “Attribution-share alike, where attribution means user must attribute the work in the manner specified by the author or licensor [3]. Share Alike apply that if user alter, transform or build upon the work, it can only be distributed under the same or similar licences that the original author.

Scratch's Roles

Information on the sections below will be based on literature study and data collected during workshops organised for children at Remida Center, Trondheim. This workshop is organised in collaboration between between NTNU, meta.morf (Biennial of Art and Technology), ReMida Center Trondheim and Culture Mesén (KM). In this collaboration Meta.Morf organised 3 workshops for school children. The workshop consist of 3 main phases.

1. Children create artefacts using recyclable materials available at Remida center. Each group create 2 different artefacts. Based on this artefacts children then create a story lines which they will later implement in scratch
2. Organisers take pictures of all the artefacts created, children then use these pictures in scratch programme to create their story lines. Arduino light and touch sensors are also available to support interactivity.
3. Once children completed their artwork, they display them to the audiences. Each group is provided with a room to show installation of their work.

Programming Skills

Coding in scratch is much easier than traditional programming language, here children just snap the block together to create interactive stories[4], after brief tutorial, children are seen throughout workshop to manoeuvre around easily on scratch software, they start to experiment with sounds, backgrounds and picture to fit their storyline.

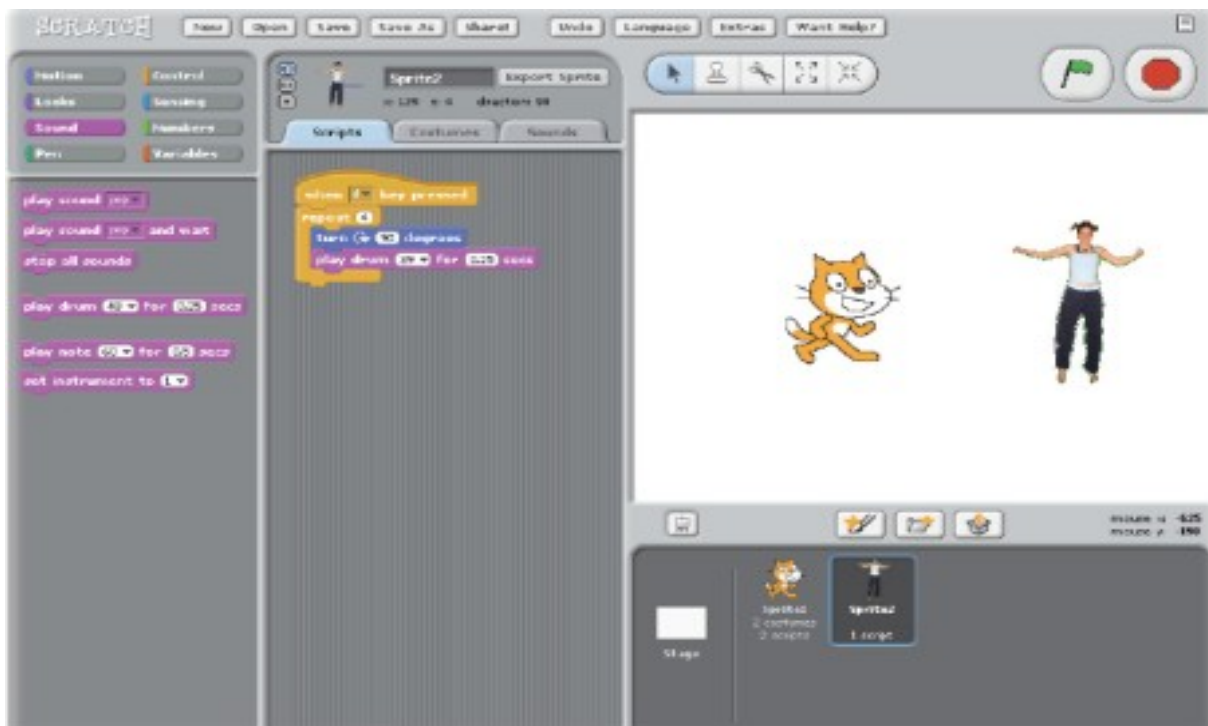


Figure 1: Scratch interface

Scratch code is grouped in sprites and use code fragment called “block “and snapping them together to create a programme [figure 1]. This provide a nature of easy programming that does not limit children to learn, mistakes are easily corrected and few experiments with scratch allow them to create something concrete. Most of the children had no previous experience with scratch, however after working with scratch for 2 hours, children are not afraid to experiment with different effects. They are even ahead of the tutor and are able to manipulate the program and so many times starting off with a function even before the tutorial start.

Creativity Skills

Creative achievement is always preceded by a stimulus [6], initiation should be provided to gear up the creativity process. In the beginning of the workshop, artists shows previous work in scratch to children, this has become inspiration for them, gives them idea of what scratch programming has to offer, children were referring to the example to make their own artwork. This is especially useful for children who are confused of the starting point to encourage them in representing their knowledge and ideas after seeing what kind of artwork they are able to achieve with scratch.

Once they get used to scratch software and realising different features they can achieve, children become more involved and trying to think of what stories they want to tell and share them within their group. They put their imagination to reality on the design process.

Scratch give them room for personal expression, children can use their own picture and edit background and personalise artwork based on their interest, in this workshop children use picture from their own artwork, by personalising what they do children are seen to be more involved in creativity process.

Scratch also offers different way to think about problems and way to solve them. Children collaborate on the process actively and constantly modifying one another project and giving each other chances to try out the program. Since each group are working with different stories, they tackle the process in different way, some establish the stories before starting the programming, some stories changes during the process to accommodate their possibility to program them all.

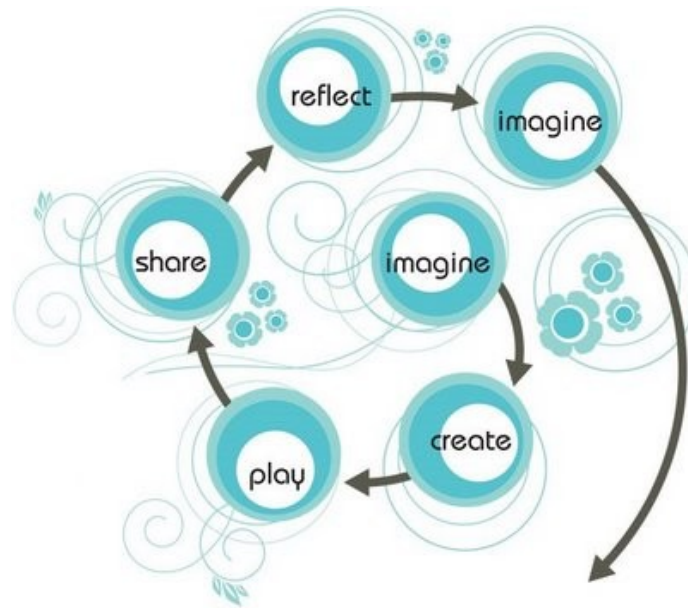


Figure 2: Creative learning spiral

This experience also reflect creative learning spiral (Figure 2), In this In this process, learners *imagine* what they want to do, *create* a project based on their ideas, *experiment* with their creations, *share* their ideas and creations with others, *reflect* on their experiences all of which leads them to *imagine* new ideas and new projects[6]. Children actively engaged in all parts of creative thinking process, they share ideas, create their stories, experiment different things in scratch and collaborate effectively in a group.

Scratch for Collaboration and knowledge sharing

Collaboration

Scratch was developed with learning and education in mind[4],we see that during creation they are learning how to think interactively, reason and work collaboratively. Collaboration is achieved by the fact that once the scratch project has been shared online several people can have access to it and be able to work on it and remix to get better artwork. Alternatively the scratchers on the scratch community can be able to give input or ideas when one asks [4]. The scratch program is open source so anyone can download the project so long as they have the scratch installed on their computer and work on the project.

At the time of writing there is 1,415,675 projects available online with millions of sprites and scripts[3] from all over the world so there is a multitude of languages and therefore to support collaboration and sharing in scratch was developed to be a multi-language, multi-cultural

environment.

Knowledge Sharing

In the Scratch online community, some members offered creative service to other community members.

For example 12 year-old community member rather than making a full project, she enjoyed making individual characters. She then encourage other community members to use her characters in their projects[6]. This has brought positive response from several community members.

Scratch community also consist of educators who are interested in encouraging not only children to programme but have also used scratch to introduce programming class in university.

Conclusion

The use of Scratch has encouraged children to be more creative at the same time learning the basic programming skills, this programme also support Open source nature to offer collaboration and knowledge sharing.

It should be noted that this conclusion are made solely from literature available and researcher assumption from the workshop observation. Further investigation with the children who attend the workshop are needed to gather first hand information in regards to knowledge they acquired from Scratch workshop.

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