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Chapter 1

Scratch and Community Services : Addressing Quality Education and Reduced Inequalities

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Abstract: *The integration of technology in education is important for students and teachers. One of the possibilities of integrating technology into education is by using Scratch. Since Scratch is a free web application, it can be accessed by anyone from anywhere and anytime. Moreover, it does not require users to learn any programming language as it applies a drag-and drop block system. It can also be used online and offline, offering 70 languages to choose from. With these features, Scratch can be introduced in community service programmes to address two Social Development Goals (SDG) namely SDG 4 (Quality Education) and SDG 10 (Reduced Inequalities), in reducing the digital divide among teachers and students. It is important to promote the application of Scratch to teachers who cannot access expensive and advanced technology, empowering them to develop quality learning materials for students. Additionally, students can use Scratch for developing multimedia projects related to their subjects, making their learning fun and engaging. By using Scratch, various skills can be enhanced among teachers and students such as critical thinking, creative thinking, computer programming and computational thinking. However, underprivileged teachers and students may not have been exposed to Scratch. Thus, it is essential to introduce Scratch to them through community service programmes organised by certain organisations such as universities. This opens the possibility for teachers and students to learn Scratch, and experts from universities to share their expertise with the community.*

Keywords: *Scratch, community service, Sustainable Development Goals, Quality Education, Reduced Inequalities*

1. INTRODUCTION

The rapid advancement of technology has provided many opportunities to integrate information and communication technologies in education. Conventional learning techniques have been rapidly replaced with modern learning media in making learning more engaging and interactive. Therefore, more meaningful learning can occur. This is because the use of interactive media such as quiz games can increase student engagement and enhance learning outcomes (Putra & Salsabila, 2021). In the educational environment, interactive learning materials with gamification and multimedia elements are becoming increasingly popular worldwide as additional tools in teaching and learning. Interactive learning materials can be developed by teachers while interactive multimedia projects can be assigned

to students related to subjects learnt so that learning can occur through-fun ways. As a result, various skills can be enhanced among teachers and students such as critical thinking, creative thinking, computer programming and computational thinking.

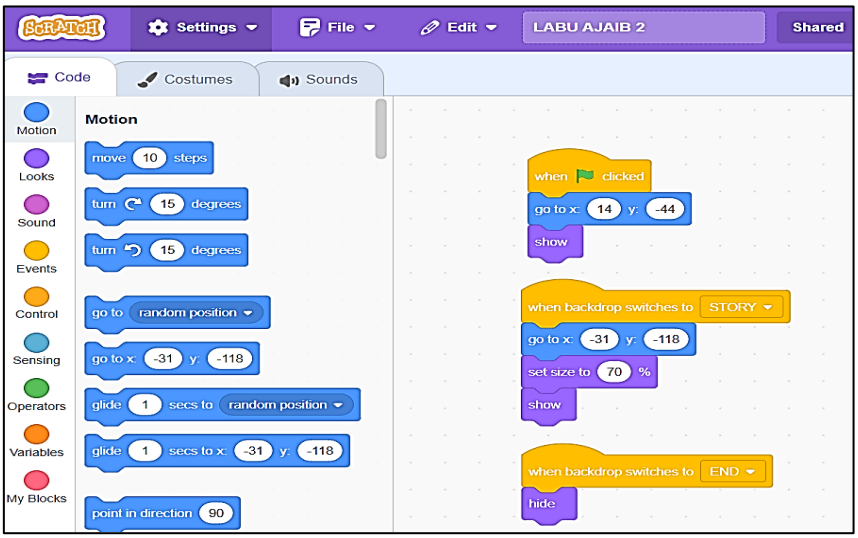
However, there are underprivileged teachers and students who encounter socioeconomic challenges such as low household incomes and limited access to essential services, resources, and infrastructure. Due to the challenges, they have unequal access to programmes for enhancing their information communication technology (ICT) skills. As a result, a bigger digital divide may be formed. Therefore, organisations such as universities can play their role opening the access to upgrade skills related to educational technologies to-underprivileged groups to ensure quality and equality in education.

In this context, the use of Scratch has emerged as a promising tool to enhance educational quality and accessibility. Scratch is designed to be user-friendly and visually appealing. Thus, it has the potential to engage a diverse audience in computer programming and computational thinking (Daily & Eugene, 2013) without learning programming language. Additionally, community-based services can play a vital role in complementing the efforts of formal education systems, providing supplementary learning opportunities and support structures particularly in upgrading ICT skills.

2. SCRATCH

Scratch can be accessed at https://scratch.mit.edu/. It is a block-based programming language developed by the Massachusetts Institute of Technology Media Lab (Pérez-Jorge & Martínez-Murciano, 2022). It is designed to be an introductory tool for teaching computational thinking and programming to children and young adults, with the goal of fostering creativity, problem-solving, and collaboration (Yuan & Bowen, 2018). Scratch can be used to create games, animations and interactive stories, by dragging visual programming blocks which represent various commands and functions. Although Scratch is designed for children from eight to sixteen years old, it is also suitable for adults.

Figure 1 Scratch interface showing the visual programming blocks



Scratch allows members to exchange ideas, resources, and projects (Simó & Hernández, 2015) in the Scratch website. Additionally, the community contributes to improving motivation and performance among students, as they can share their creations, seek feedback, and learn from one another (Wen et al., 2023). The community is essential for democratizing programming skills and empowering underprivileged groups, such as women and minorities, who have traditionally faced barriers in accessing and thriving in technology (Wen et al., 2023).

Scratch projects published on the Scratch website are accessible and the blocks used can be viewed by all users. This promotes open-source learning and fosters a collaborative environment where users can learn from each other's projects and even remix them to create new applications (Fang et al., 2023; Iskrenović-Momčilović, 2020; Wen et al., 2023). Therefore, Scratch can be an effective tool for teaching computational thinking and programming concepts, while also building a supportive community that can address inequalities in education related to technology.

The educational potential of Scratch has been widely recognized with numerous studies demonstrating its ability to enhance learning motivation, computational thinking skills, and mathematical understanding. Fang et al. (2023) revealed that Scratch had the ability to develop students' computational and mathematical thinking skills. Wen et al. (2023) indicated that Scratch could be effective in improving students' programming knowledge and achievement, as well as their attitudes towards programming. Additionally, Scratch can enhance critical thinking skills, creative thinking skills and problem-solving abilities (Iskrenović-Momčilović, 2020; Wen et al., 2023; Fang et al., 2023)

Scratch should be both inclusive and accessible, particularly for underprivileged populations (Fang et al., 2023; Montiel & Zermeño, 2021; Wen et al., 2023). Thus, ensuring equal access to Scratch-based learning opportunities is essential for promoting inclusive and equitable quality education. This may align with the goals outlined in the United Nations Sustainable Development Goals. One of the ways to make it reachable is by organising workshops through community service.

3. COMMUNITY SERVICE FOR EDUCATION

Community service is defined as volunteer work performed by individuals or groups to benefit their community or society. In education, community service can take various forms, such as tutoring programmes, mentoring programmes and after-school enrichment activities. Other than that, educational outreach initiatives can also be organised in the forms of workshops, webinars, teacher training, and technical support for integrating technology in education.

Community-based educational services can play a crucial role in addressing the challenges formal education systems faced, particularly in underprivileged communities. In the case of digital divide, organisations can provide supplementary learning opportunities, access to technology and digital resources, and support structures that may not be readily available in traditional school settings.

In the context of university, expertise from the institution can develop community-based education programmes, such as Scratch workshops and coding clubs, to promote computational thinking and digital skills among underserved youth (Balouktsis, 2016; Fang et al., 2023). These community-based initiatives not only benefit the participants but also provide valuable learning experiences for the university community, which comprises lecturers, staff, and students. Participants can develop their teaching, leadership, and community engagement skills.

4. INTEGRATING SCRATCH IN COMMUNITY SERVICES

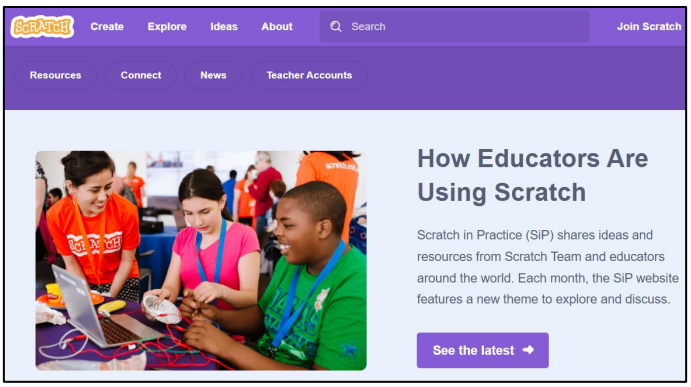
The integration of Scratch into community-based educational services can be a powerful approach. Among the SDGs that can be addressed are SDG 4: Quality Education and SDG 10: Reduced Inequalities. The following are how Scratch can be integrated into educational community services by universities.

Universities can organise various face-to-face educational programs for underprivileged students in their vicinity through face-to-face programmes. First, after-school programmes can be conducted to provide access to Scratch and teach digital skills and computational thinking to youth in low-income

areas (Jannah et al., 2021). Second, coding clubs can be hosted at community centers, libraries, selected schools or other accessible venues that bring Scratch-based learning to diverse participants. Finally, university lecturers can collaborate with schools to conduct workshops at schools, utilising the school computer laboratory with the facilitation from schoolteachers.

Universities can also reach broader participants by conducting programmes virtually. Programmes such as workshops and after-school programmes can be conducted through online platforms. Workshops can be conducted on video conference platforms such as Google Meet, Zoom and Webex. At the same time, after-school programmes can be conducted on learning management systems such as Microsoft Teams and Google Classroom. The platforms allow communication among participants, file sharing, and assignment management. Other than that, Scratch itself offers a teacher account where teachers can monitor the progress of their students' projects. Due to the nature of online programmes that eliminate geography boundaries, the programme participants can go beyond the university vicinity. When community service programmes are conducted online, the participants can be from the local country and other countries.

Figure 2 Teacher Account on Scratch



In the context of teachers, training and support for teachers in under-resourced schools are crucial. Therefore, professional development workshops should be conducted to specifically equip them with the skills and confidence to integrate Scratch into their classrooms. Mentorship programmes that pair experienced Scratch lecturers from universities with teachers can be organised to provide ongoing support and guidance.

It is hoped that community service on Scratch for students and teachers can help them work together to create interactive projects. Thus, they may develop critical 21st-century skills such as problem-solving, communication, and teamwork. The skills are valuable for academic and career success and contribute to personal growth and social cohesion.

5. SDG4: Quality Education

The purpose of SDG 4: Quality Education is to make sure that quality education is inclusive and equitable. Additionally, it is also to foster opportunities for lifelong learning for all individuals. This reflects the crucial role of education in driving economic growth, improving health outcomes, reducing inequalities, and ultimately, fostering sustainable development (Shaeffer, 2019).

Some key targets of SDG4 are as follows (United Nations Development Programme, n.d.):

a. To ensure that all girls and boys complete free, equitable and quality primary and secondary education by 2030.

b. To ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university.

c. To substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.

d. To eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.

The emphasis on quality education reflects the recognition that simply providing access to education is not adequate. Education must be of adequate quality to impart the knowledge, skills and competencies required for individuals to thrive and contribute to sustainable development. The aspect of quality education emphasized in this article by using Scratch that may enhance not only ICT skills but also other skills including critical thinking, creative thinking, problem-solving and computational thinking.

SDG4 on quality education is a critical component of the broader Sustainable Development Goals, as education is a key enabler for achieving many other development targets related to poverty, health, gender equality, and economic growth (Nazir et al., 2023; Al-Kuwari et al., 2021; Sari et al., 2020).

6. SDG 10: REDUCED INEQUALITIES

The purpose of SDG 10 is to reduce inequality within and among countries. In education, reducing inequalities can take many forms, such as inequality in income, economy and opportunity. Inequalities commonly occur in the underprivileged communities. The goal of SDG 10 recognizes that inequality is a significant barrier to sustainable development, as it undermines the realization of human rights.

Some key targets of SDG 10 are as follows (United Nations Development Programme, n.d.):

a. Progressively achieve and sustain income growth of the bottom 40% of the population at a rate higher than the national average.

b. Empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status.

c. Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard.

d. Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality.

The inequality emphasized in this article is the opportunity to access education such as access to enhancement of ICT skills as addressed in this article. Addressing inequality is critical for achieving a just and equitable society, where all people have the chance to reach their full potential. By reducing inequalities, SDG 10 supports the broader vision of the 2030 Agenda for Sustainable Development, which aims to "leave no one behind".

7. HOW SCRATCH CAN ADDRESS QUALITY EDUCATION AND REDUCED INEQUALITIES

The integration of the Scratch programming platform and community-based educational services can be a powerful approach to addressing the goals of quality education and reduced inequalities (Boeren, 2019).

First, by providing access to Scratch-based learning opportunities within community settings, the initiatives can help to democratize digital skills and computational thinking. Many underprivileged communities, particularly those with limited resources or access to technology, often encounter

challenges in developing the digital competencies required for success in the 21st century. Bringing Scratch-based activities to community centers, after-school programmes, and other accessible venues can help to bridge the digital divide and ensure more equitable access to quality educational experiences (Bhandari, 2024).

Second, the hands-on, project-based nature of Scratch can foster the development of critical 21st century skills such as problem-solving, communication, and teamwork. The competencies are not only valuable for academic and career success but also contribute to individual empowerment and social mobility. By empowering participants, especially those from underprivileged groups in creating their own digital projects using Scratch, inequalities can be reduced, and a more inclusive and equitable educational landscape can be promoted.

Finally, the Scratch community itself serves as a valuable resource for participants. It provides opportunities for collaboration, peer-to-peer learning, and the sharing of ideas and creative works. The sense of community and belonging can be particularly impactful for students who may feel isolated or marginalized in traditional educational settings.

Overall, the integration of Scratch and community-based educational services represents a promising approach to addressing the multifaceted challenges of quality education and reduced inequalities. Hence, universities should facilitate the underprivileged communities in their vicinity to introduce Scratch through community services.

8. CONCLUSION

The integration of Scratch and community-based educational services offers a compelling approach to address the critical goals of quality education and reduced inequalities. By democratizing access to digital skills and computational thinking, the initiatives can help to bridge the digital divide and ensure more equitable opportunities for underprivileged populations. Furthermore, the hands-on, project-based nature of Scratch can foster the development of essential 21st-century competencies, empower participants and promote social mobility. The Scratch community itself also serves as a valuable resource, providing opportunities for collaboration, peer-to-peer learning, and the sharing of ideas and creative works. Overall, this interdisciplinary approach holds significant promise for fostering a more inclusive and equitable educational landscape, where all individuals are given the chance to develop their knowledge, skills, and confidence to thrive in the digital age and contribute to sustainable development.

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