



Rethinking Education

Jing Yu, John Galinato, Wen Yu, Cindy Lin and Rodrigo Kai

EasyChair preprints are intended for rapid dissemination of research results and are integrated with the rest of EasyChair.

October 18, 2024

Rethinking Education

Jing Yu
Advisor
Build-It-Yourself
Boston, MA
yj251005@gmail.com

John Galinato
Director
Build-It-Yourself
Boston, MA
john@build-it-yourself.com

Wen Yu
Co-Founder
Pi-Art
Boston, MA
wymoca@bu.edu

Cindy Lin
Intern
Build-It-Yourself
Toronto, Canada
cindylinn071030@gmail.com

Rodrigo Kai
Intern
Build-It-Yourself
Xalapa, Mexico
rodrigokby@gmail.com

Abstract— According to Mitchel Resnick in Lifelong Kindergarten, “To thrive in today’s fast-changing world, people of all ages must learn to think and act creatively”. To echo his study, this paper today proposes a vision to develop a metaverse classroom of the future that teaches students creativity and technical skills efficiently and effectively. The Build-It-Yourself strategy is to develop an online, global laboratory environment with interactive, dynamic content delivered by a network of art and engineering young talents from high level professional communities. “The best way ...is by focusing more on imagining, creating, playing, sharing, and reflecting, just as children do in traditional kindergartens” The Build-It-Yourself program reflects the research conducted by Professor Mitchel Resnick’s Lifelong Kindergarten group at the MIT Media Lab.

Keywords—education, creativity, builders, STEAM, e-learning, metaverse,

I. INTRODUCTION

Many people would agree that investment in education is a key to ‘happiness.’ But the problem is that traditional education is unaffordable to many and it is not addressing tomorrow’s needs.

Over the past 50 years, the cost of education has risen 24 times. Tuition at Cornell University was \$2,500 in 1970 and \$59,000 in 2020. This is more than 3 times the rate of inflation. If the cost of a cup of coffee had risen as much as the cost of education, your Dunkin Donuts early morning fix would set you back more than \$10! Dunkin Donuts, Starbucks, and all the rest would surely go out of business.

Will schools and universities go out of business if we don’t figure out how to control the cost of education?

Some might argue that it’s okay if the cost of education goes up so long as the quality of education rises proportionately. If

you measure the quality of education by what society is willing to pay for a college graduate, which Forbes does when it ranks colleges, then the quality of education has barely kept up with the inflation rate. The average Cornell engineering graduate salary in 1970 was \$12,000. In 2020, the average Cornell engineering graduate salary was \$94,000.

With Generative AI in the picture, it seems more urgent than ever for educators to rethink and redefine education by making learning:

1. accessible;
2. more relevant to what tomorrow’s needs.

II. A NEW WAY TO LEARN

Build-It-Yourself (BIY) introduces a transformative approach to learning, moving away from traditional rote memorization and lectures to an interactive, project-based, and game-like experience. This new way of learning integrates creativity, technology, and real-world problem-solving, which BIY had been practicing and constantly evolving for 2 decades.

Transform learning into a game-like experience where challenges and achievements drive student engagement. This approach increases motivation, encourages exploration, and fosters critical thinking.

Students encounter challenges that require them to use problem-solving skills to advance.

Learning modules are designed as interactive games, providing a narrative and quest-like experience, and most importantly, learning becomes a fun, life-long passion. Build-It-Yourself projects and associated storylines are written in a poke-fun-at-the-world style.

As echoed by other education providers, DuoLingo, Astra Nova (Elon Musk’s school), and ‘Got Game’ by John Beck

advocate gamifying the learning process to improve engagement.

III. PROJECT-BASED LEARNING

Students learn by working on meaningful projects that reflect real-world challenges, promoting collaboration, critical thinking, and creativity.

Projects are cross-disciplinary, blending science, technology, engineering, art, and mathematics (A-STEM).

Encourage students to explore, create, and present their findings.

Build-It-Yourself members exercise 5 problem-solving skills and multiple presentation skills in every project. Lab books inspired by Leonardo DaVinci and Charles Darwin document the engineering process:

1. Define the problem and mission
2. Research
3. Break a solution into simple parts
4. Collaborate with teammates
5. Document

IV. A-STEM

At BIY, we transit from STEAM (Science, Technology, Engineering, Arts, and Mathematics) to A-STEM, where Art (history, philosophy, psychology, music, poetry, and painting) is at the forefront, driving creativity in technology. Art is not an afterthought but the driving force that fosters innovation and creativity.

Students learn to use technology as a tool to bring artistic visions to life.

Build-It-Yourself projects start with a storyline about an important social issue. History, philosophy, psychology, politics, and economics are discussed before the building begins. At Build-It-Yourself roughly equal time is allocated to building and presenting a project. Artistic design is just as important as mechanical design. "If your project does not look cool, it may not get the attention it deserves." At the end of a Build-It-Yourself project, builders must create a video presentation that includes music and graphic design.

V. BUILD-IT-BLOCKS

Build-It-Blocks (BIB) is a comprehensive database of fundamental art, engineering, and programming modules designed for kids who love to create and build. It serves as a resourceful toolkit that inspires creativity and innovation, much like libraries and catalogs used by professionals in various fields.

1. reinforces an important problem-solving technique; Break a solution into simple parts.
2. enables builders to create unique, complex solutions quickly.
3. reduces the need to train teachers to be fluent in multiple disciplines.

VI. AI SKILLS

Other than the conventional STEAM education, a new education could not bypass the teaching of AI. Teaching AI

skills prepares students for the future digital world, equipping them with essential knowledge for emerging industries.

Aside from discussion on foundational AI concepts such as machine learning, natural language processing, prompt engineering, and ethical considerations, we also offered opportunities for kids to apply generative AI tools to their A-STEM projects.

In the workshop we conducted at the MIT Media Lab, students explored various generative AI tools across text, music, and image domains to create their own projects. The experience highlighted several key insights:

1. Some AI tools can complement the role of a teacher by providing personalized learning experiences and a wide variety of professional suggestions tailored to individual student needs.
2. Students need to understand and experiment with a combination of AI tools before integrating them into their projects. This experimentation is crucial for effectively leveraging the capabilities of generative AI.
3. Current AI tools are most effective when used in collaboration with teachers. This partnership allows for guidance and context that enhances the learning experience.
4. Aesthetic Competency and Creativity: Ultimately, the effectiveness of AI tools in creative projects depends on the student's own aesthetic sense and creativity. While AI can generate content, the human touch in evaluating and refining these outputs is essential for achieving artistic goals.

VII. GROWTH PATH

Learning should not be limited to the school years. We must inspire and cultivate a life-long passion for learning.

Thanks to BIY, students acquire both technical and life skills.

Technology has led to an accelerated globalization. It is now easier to realize the value that people from around the world with many different ideas and interests can add to ourselves and to our organizations. The issues we have today affect more people than ever before, and it has been demonstrated that international collaboration does work (e.g. the ozone layer). It has become natural and commonplace to collaborate to reach better solutions.

VIII. INVENTION UNIVERSE

Invention Universe is a computer game-like environment where builders can share their projects and ideas. It is the string that pulls all modules in the system together like pearls and toward a metaverse that is beyond a classroom or any form of physical location.

Invention Universe encourages builders, mentors (art and engineering students from well-known universities), and parents to collaborate. Invention Universe enables a growth path from 8 to 80. Every member of Build-It-Yourself owns a planet. Each member can customize his or her planet with home-made graphics. Every member can post his or her portfolio of projects to his or her laboratory.

IX. CONCLUSIONS

This program has benefited over 4,000 children, with parents' total payments amounting to more than \$1.4 million. Notably, over 75% of participants are repeat customers. Through hands-on practice, a technology teaching system both widely accessible and relevant to future needs has been successfully established. We believe that continued practice and experimental exploration will add value along this promising path.

REFERENCES

- [1] "Comparing STEM vs. STEAM: Why the arts make a difference," *UCF Online*, 10-Apr-2020. [Online]. Available: <http://www.ucf.edu/online/engineering/news/comparing-stem-vs-steam-why-the-arts-make-a-difference/>. [Accessed: 12-Feb-2022].
- [2] "Why should every child learn Artificial Intelligence?". *SKOOL OF CODE*, 05-Jul-2022. [Online]. Available: <http://skoolofcode.us/blog/why-should-every-child-learn-artificial-intelligence/>. [Accessed: 12-Sep-2024].
- [3] "What is PBL?," *PBLWorks*. [Online]. Available: <http://www.pblworks.org/what-is-pbl>. [Accessed: 12-Sep-2024].
- [4] "Build-It-Yourself toys, robots, puppets, contraptions, computer programs," *Build-it-yourself.com*. [Online]. Available: <http://build-it-yourself.com/>. [Accessed: 12-Sep-2024].
- [5] Mitchel Resnick, *Lifelong Kindergarten*, The MIT Press, 2018.
- [6] Admin. "Top Reasons Why Every Kid Should Learn AI." *SKOOL OF CODE*, 31 July 2022.[Online]. Available: skoolofcode.us/blog/why-should-every-child-learn-artificial-intelligence/.
- [7] J. Maeda, "Emphasizes the importance of integrating art with technology for creative innovation",2013. *STEM + Art=STEAM*. [Online]Available: www.pblworks.org/what-is-pbl#:~:text=Project%20Based%20Learning%20is%20a,question%2C%20problem%2C%20or%20challenge. [Accessed 12 Sept. 2024].
- [8] "It-Yourself Toys, Robots, Puppets, Contraptions, Computer Programs." *Build, build-it-yourself.com*. [Accessed 12 Sept. 2024].
- [9] <https://www.youtube.com/watch?v=rMPLKatao3U>
- [10] Cornell engineering salary: Available: <https://visit.engineering.cornell.edu/project/electrical-and-computer-engineering/#:~:text=Starting%20salaries%20of%20B.S.,High%20salary%3A%20%24131%2C000>