

# Making and Maker-Spaces: The Secret Sauce of Future-Proof Learning

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**Abstract**— We propose that hands-on, experiential education is the most important ingredient for innovation, and that we need to start from very early years. In a few years, when the specifics of what is typically taught in the school classrooms will inevitably become redundant, it is the creativity resulting from a hands-on approach to learning that will remain relevant in times to come.

In this contribution, we demonstrate several examples of future-proof and timeless approaches to teaching, which are simple and inexpensive. We build on the idea that learning also happens in the *muscle*, and this principle manifests itself in all our demonstrations and activities designed to supplement and enhance the knowledge intended to be imparted in the curriculum.

Based on experiences gathered over several workshops conducted with students and teachers alike, the anecdotal evidence in favor of the efficacy of these methods is overwhelming. These methods lead to greater engagement in real-time and to higher retention rates, even of non-trivial and counter-intuitive concepts. There is a great need to foster creativity and innovation in young minds. We firmly believe that experiential STEM education is the key to driving innovation in India.

**Keywords**— *Education, STEM, Hands-on Learning, Teacher Training, Creativity in Education, Tinkering*

## I. INTRODUCTION

“If you don’t let anybody build a box around you, then you will never have to think outside of the box.”

- Richard Branson

We all learn best when we make, explore, pull things apart, and put them back together. Our current competitive and fast-paced system, however, seldom provides space for such learning. We are so focused on covering the curriculum in the schools that we forget to enliven the classrooms.

### A. The Problem

The present system of school education is well-acknowledged as being plagued by several issues, including, but not limited to: growing disinterest in the classroom, distraction by modern technology, increasing concern about the relevance of the material taught and the danger that it becomes quickly dated, and so on.

There is a great need to restructure our schools in this era of information overload. Having less information about something is no longer a problem. We are generating 2.5 quintillion bytes of data per day and all of it is just some

clicks away. We need to think really hard what we teach and how we teach [3]. Computers are already on the verge of making teachers redundant in their current state. Our teachers need to quickly re-engineer their style to remain relevant in the upcoming future.

The issue with most changes to education that are implemented in our systems presently is that they are short-sighted to the point where they treat the symptoms rather than addressing the heart of the issue at hand. For example, banning the use of mobile phones on school premises may keep students from texting during lectures, but it will not change the fact that they are disinterested in the lecture itself.

More of the same thing is sometimes not useful, and we feel it is doing more bad than good in education. Children spend countless hours in tuition classes replicating exactly what they do in their schools. This time can be invested to ignite the passion and nurture the inherent creativity of children.

### B. Our Background and Contributions

The Center for Creative Learning (CCL) was established in 2017 at Indian Institute of Technology, Gandhinagar. The goal of the center is to create and foster makers in India who can take innovation to next level and realize the dream of “Make in India”.

In this contribution, we demonstrate several examples of future-proof and timeless approaches to teaching, which are simple and inexpensive, cutting across themes in science, mathematics, engineering, and allied disciplines.

### C. Related Work

As the field of education is relevant to everybody, there have been numerous attempts towards its betterment. But most solutions are either out of the reach of people or not suitable for Indian context.

LittleBits and Osmo provides great kits for children to first assemble themselves and then code. Osmo even goes to bridge the gap between digital and real world. We feel they are great tools but pricing makes it unaffordable for Indian markets.

Hour of Code is a free platform but is limited only to the software. It is an entirely virtual platform with no physical dimension, so while useful in serving the intended purpose, it has limited scope.