

# Introduction

Cyclic amnesia best characterizes the history of technology in education. Over the last 100 years or so, we have gone through many cycles of hope and then disappointment: from film to radio, from radio to TV, from TV to computers, and from computers to the Internet. Every cycle started with amazing euphoria and then ended with disappointing outcomes. But somehow, we managed to forget the failures. We did not even stop to reflect what went wrong because new technology emerged, with more power and thus more hope. The new technology seemed so compelling that we could not afford time to reflect. We must act quickly to realize the potential of the new technology. Otherwise, we'd be missing out on its educational benefits. As a result, we have been repeating the same mistakes. I have suffered from amnesia as well, but would like to change that. Hence this book.

I have been very disappointed with the effects of technology on education. Despite the powerful potential of technology and massive investment in technology for educational purposes, the impact on education has been extremely limited. Technology has not solved many significant educational problems on a large scale. The *deus ex machina* in education has never appeared. This is a depressing realization after 30 years of attempts to improve learning through technology.

In 1985, I tried to use the Apple II to teach English vocabulary when I was in college in China. I had imagined that computerized programs would help everyone master the English language a lot faster. My program did not go very far. Other than me, nobody else used it. Although I learned a lot of English words through programming, the benefits did not come from using the software. Instead they came from programming.

## 2 NEVER SEND A HUMAN TO DO A MACHINE'S JOB

I was an amateur, but there were numerous professionals and businesses designing software and technology systems for language learning at the time. A field called computer-assisted language learning (CALL) evolved, with professional organizations, professional journals, and conferences. Schools purchased computers and built language labs. But today students all over the world still struggle to learn languages, and most of them learn from human teachers.

Ten years later, in 1995, I began using the Internet to teach foreign languages at the college level. With the powerful capacity to connect teachers and students from all over the world and easy access to original language and cultural resources, the Information Highway, as it was popularly known then, was going to deliver a revolution in language learning.

“Motivation” thus became my answer to a question posed to me by Professor Patrick Dickson of Michigan State University. He chaired the search committee that hired me as an assistant professor in educational technology. Patrick asked this question during my job interview in 1995: “In 10 years, what would be the reason if most people in the world are not bilingual given the potentials of the Internet for language learning?”

Today, most people in the world remain monolingual, and motivation may be only part of the reason. By and large, students of foreign languages continue to learn the same old way: a human teacher, textbooks, and exercise sheets. Very few students actually make use of the native speakers available online or the vast amount of newspapers, books, TV shows, and YouTube videos to learn the target language. As a result, 2 years of high school Spanish still does not give many students the capacity to function in the language.

Another 10 years passed. In 2005, I was designing an online computer game to teach Chinese to kids all over the world. Computer games have been found to be addictive, so they should be more engaging to children. Online social games have been extremely popular among young people. With increased bandwidth, enhanced graphics, and virtually ubiquitous access to computers, a massively multiplayer online role-playing game (MMORPG) would drastically improve the effectiveness of learning language. So I thought. The game was developed and piloted. There were many users. However, the fact remains that after a decade, Chinese language is still learned virtually the same way it was done in the 1960s or perhaps 1800s: human teachers and textbooks.

In 2015, efforts to develop and deploy technological solutions for language learning continue. But I am much less enthusiastic about its revolutionary outcomes as I was 10, 20, or 30 years ago, when the technology was much less powerful.

I have been repeatedly disappointed by my own efforts to bring about more effective education through technology. My personal disappointing journey is, unfortunately, not an isolated case. In fact, the failure of technology to deliver its grand promise to transform education is not even isolated to the field of language learning. It is repeated in all fields of education: math, social studies, science, and other subjects. There have been high hopes and diligent efforts in all areas. There have been exemplary pockets of success. But by and large, technology has not done much to improve education on a large scale. In the big picture, students' academic performance has remained flat over the last several decades, as measured by the National Assessment of Educational Progress and other historical assessments. The achievement gap has persisted.

This is not because we were mistaken about the power of modern information and communication technology. There is no doubt that computers are much more powerful than paper or even people in handling certain types of information and carrying out certain tasks. More important, technology keeps getting more powerful and less expensive. Over the past 30 years, digital technology has become increasingly sophisticated and omnipresent. It has transformed virtually all aspects of our lives. It has displaced workers in traditional professions. It has made entire lines of jobs disappear. It has created new mega companies and millions of new jobs. It has changed how we live, entertain, travel, work, and socialize. But it has not fundamentally transformed education, despite the emergence of online schools, massively open online courses (MOOCs), and introduction of technological devices into classrooms.

It is not due to lack of effort, either. Enormous amounts of money have been spent to equip schools. In 1995 the dream plan for a revolution was to have a student-to-computer ratio of 5:1. That was realized. Then we wanted 1:1, student to laptop, and that has become a reality in many schools. Virtually all schools and classrooms are connected today—a tremendous journey and investment to move from nothing to dial-up connection, to ISDN, to cable, to fiber optic, and to wireless. Computer labs have become a necessary feature of all schools.

There have also been tremendous efforts to prepare teachers and school leaders. Technology proficiency standards have been created and added for teacher certification or recertification. Professional development programs have been offered to in-service teachers. Educational technology courses have been added to teacher education programs for preservice teachers. Graduate degree programs have been developed and provided to technology leaders in schools. Professional organizations, publications, and conferences in educational technology have multiplied over the past 30 years.

Efforts to develop educational technology products and services have been undertaken by education practitioners, researchers, and businesses. Governments have provided funds in support of innovations in educational technology as well. Numerous innovative products have been developed. The educational technology market in the U.S. preK–12 sector has grown to nearly \$10 billion, which can buy a lot of products and services.

Why hasn't technology transformed education as much as it has transformed other sectors? And more important, what can be done to realize its transformative power in education? In this book, my coauthors and I attempt to point out the reasons and suggest a new approach to using technology to better prepare our children for the future.

We took a retrospective review of past efforts to use technology in education, and we discovered that they have not been transformative largely because of five mistaken approaches. First, we have applied a misconstrued relationship between teachers and technology. Traditionally, technology has been viewed as something to either replace the teacher or aid the teacher, which directed efforts to develop products and services to replace the human teacher entirely or tools for teachers to use. A more productive relationship may be in the middle. That is, technology can replace certain functions of the human teacher, but not entirely. In the meantime, teachers do not need to control technology as simply a teaching tool to enhance instruction. Instead they should relinquish some of their teaching responsibilities to technology and shift their energy to do things that technology cannot do. This calls for a reconceptualization of the relationship as a partnership between teachers and technology.

The second mistaken approach is the way technology is treated in schools in relation to students. The traditional approach has been to use technology to help students “consume” information more

effectively. It has been used mainly as a way to help students learn better the existing curriculum, while a much more productive way is to help students use technology as a tool for creating and making authentic products. This calls for a transformation in how we view student learning.

The third mistaken approach is the result of our erroneous expectations and definition of educational outcomes. With the increasing pressure on schools to improve student academic achievement, often measured by standardized tests, investment in technology has historically been justified as an effective way to raise academic results or test scores. Thus technology has often been limited in traditional instructional practices instead of viewed as a transformative tool to create better education for all students.

The fourth set of mistakes is derived from the wrong assumption that technology is there only to improve existing curriculum and instruction while neglecting the fact that technology has created a new world, which demands new skills and knowledge. In other words, traditional approaches to educational technology have not typically viewed digital competence or the ability to live in the digital age as legitimate educational outcomes. Consequently, not much attention has been given to transforming schools into environments that cultivate digital competence.

The final mistake is the approach to professional development of educators. Too often professional development efforts have been driven by technological products instead of the needs of students and educational change. Technology changes fast. New products and services come out all the time at nonstop speed. To help teachers make use of technology, many professional development programs have been developed in schools. These programs often have a focus on teaching teachers how to use the newest technological tools instead of focusing on what students need and how technology as a whole can affect education.

The first five chapters of the book are devoted to each of the mistakes we have made. We illustrate these mistakes with stories and examples, research-based evidence, and provocative questions. But our purpose in writing this book is not limited to exposing the mistakes. Rather, it is to suggest a new way of thinking about technology in education, which we do in Chapter 6.

A new way to think about technology and education is “never send a human to do a machine’s job,” advice from Agent Smith in the

film *The Matrix*. In education, we need to redefine the relationship between humans and machines based on thoughtful analyses of what humans do best and what should be relegated to technology. There is no reason to have human teachers do things that machines do better or more effectively. There is no reason to have human teachers perform routine, mechanical, and boring tasks when technology can do. After all, the reason to have technology is to extend, expand, and/or replace certain human functions.

The redefinition of relationship can only happen when we begin to reimagine what education should be like. Thus in Chapter 6 we outline a series of possible changes that should and can happen to achieve better educational outcomes, not necessarily in order to simply use technology more. Technology has made it both a necessity and a possibility to realize some of the long-standing proposals for child-centered education and learning by doing. Personalized education that grants students autonomy and respects their uniqueness has become a necessity for cultivating the abilities required for living in a society when machines are rapidly taking jobs away from humans. Technology has made it possible to enable personalized learning and to have students take more control of their own learning. Moreover, technology has also made it possible for students to engage in authentic learning by tackling real-world problems on a global scale.

In summary, technology has been traditionally conceived as a tool to enhance and improve existing practices within the existing educational setup, but it has become a tool to enable a grand education transformation that has been imagined by many pioneering thinkers such as John Dewey. The transformation is not about technology, but about more meaningful education for all children. Perhaps finally we can escape the cyclic amnesia we have suffered in using technology to improve education.

This book is a review of what happened in the past. It is intended to challenge traditional thinking, practices, and policies. More important, it is intended to stimulate new thinking about the future of education and technology. Thus, while we criticize past-oriented practices and policies, we also provide numerous examples of emerging future-oriented practices and programs that reflect new ways of thinking. It is our hope that this book can help school leaders, policymakers, teachers, and parents reimagine education in the digital age.

The book is a collaborative project. The coauthors have been working together on issues discussed in this book for about a decade. During the process of writing, Gaoming Zhang took the lead to develop the proposal and helped coordinate the effort. While each chapter has a lead author (Chapters 1 and 3 by Gaoming Zhang, Chapters 2 and 4 by Jing Lei, Chapter 5 by Wei Qiu, and Chapter 6 by Yong Zhao), all authors reviewed and contributed to all the chapters. I am grateful for the work of the entire team.

—Yong Zhao

April 2015

Copyright Corwin 2016