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Invited Short Article

Reflections on 50 Years of Experience in Educational Technology

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I came to the world of educational technology in the 1980s from a position as a computer science professor at a regional state university in Alabama where I had been practicing as an educational technologist without awareness that I was doing so. In the intervening years, I have come to realize the complexities and challenge of educational technology and instructional design, thanks to mentors such as Robert Gagné, David Merrill, Robert Tennyson, and many others too numerous to name. Those learning experiences were largely unplanned and happened more or less by coincidence as I left teaching computer science to become the senior scientist for instructional systems at the Air Force Human Recourses Laboratory (a.k.a. Armstrong Laboratory) in San Antonio, Texas. I have also had the pleasure of being a tenured professor at the University of Bergen, Syracuse University, Florida State University, the University of Georgia, and the University of North Texas, where I have tried to apply the lessons learned along the way. Regretfully, what I see now happening in the broad domain of educational technology is a return to the beliefs I had when I entered this field so many years ago. Those unaware of the complexities and challenges and untrained in educational technology and learning science but adept with one or more technologies believe they can apply their technology knowledge to solve any educational problem that arises. If these remarks have any benefit, it is to help those technophiles understand that the emphasis and focus in educational technology and learning science should be placed initially and primarily on the learner and not on a particular technology nor the content to be learned. Technologies come and go, and those with keep knowledge in a content domain have already indicated what can be learned in that domain. As a result of my focus on the individual learner in this paper, this will not be a typical academic research paper. Rather it will be a plea to consider what really matters – not one's own prominence or advancement but helping others develop their own thoughts and understanding. Onward through the fog (a slogan borrowed from Oat Willie's in Austin, Texas).

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Introduction

When I agreed to write a personal retrospective on my years as an educational scientist, many thoughts came to mind. An early one was that I needed a mantra to guide my thoughts. I am borrowing this one from T. S. Eliot's *The Love Song of J. Alfred Prufrock*: "I grow old ... I grow old ... I shall wear the bottoms of my trousers rolled" (see <https://www.poetryfoundation.org/poetrymagazine/poems/44212/the-love-song-of-j-alfred-prufrock>). Another quotation from that poem I recall after all these years is this one: "I should have been a pair of ragged claws scuttling across the floors of silent seas." These reminders are meant to emphasize two things about existence on this planet: (a) a fundamental characteristic of nearly everything is change; technologies change; technologies change what one can do and will do and eventually will want to avoid doing; and (b) we are living in the darkness at the bottom of the ocean or perhaps in the darkness of Plato's cave (see <https://classics.mit.edu/Plato/republic.8.vii.html> for the text of that wonderfully elusive piece of reasoning).

While those reminders of things I read many years ago, there are also the words of Bob Dylan's *A Hard Rain's A-Gonna Fall* that come to mind: "I'll know my song well before I start singin'" (see <https://www.bobdylan.com/songs/hard-rains-gonna-fall/>). You should realize by this point in this brief essay that this will not be a typical research article in educational research. Rather it is an account of what has taken me more than 50 years to learn – namely, to borrow again from Bob Dylan, this time from *The Ballad of Frankie Lee and Judas Priest*: "When you see your neighbor carryin' somethin', help him with his load" (see <https://www.bobdylan.com/songs/ballad-frankie-lee-and-judas-priest/>).

Somewhat late in life I have come to realize that my job as a teacher is to help others learn ... not to tell them what to learn or what to say or what to think, but rather, help them learn and in some cases learn how to learn. My father used to say that his job as a Rabbi was to help people learn ... "to be the voice that encourages, the ear that listens, the eye that reflects, the hand that guides, the face that does not turn away" (no date ... just a memory from which I cannot escape). I have changed that mantra into my own: the job of a teacher is to get students to have questions ... not to ask question nor to have answers ... to get students to admit to not knowing while wanting to understand, to want to seek answers, to consider alternative answers, to reflect on one's assumptions, to question assumptions and consider still more possible answers, and basically to keep having questions. This concludes my preliminary remarks which should show that this will not be a typical academic paper with references and carefully considered argumentation leading up to a compelling conclusion. Should you decide to keep reading, please thank the many amazing teachers from whom I have learned what little I know.

Discussion

In the spirit of full disclosure, I should note that I have no formal training in instructional design, educational technology, learning, or any closely related area. My undergraduate degree is from the United States Air Force Academy in International Affairs and my doctoral degree is in philosophy from the University of Texas in Austin. I do not have a master's degree. I taught computer science for a number of years at Jacksonville State University and developed an interest in expert systems and artificial intelligence while there. I was fascinated with expert system technology and thought an expert system could be designed to do most things that trained people do. I spent a summer at the Air Force Research Laboratory in San Antonio to indicate how an expert system could be developed to do instructional design for technical



training. I came to realize how challenging that task was and wrote a report for the Air Force saying they needed to find people who knew a lot more than I did.

The Air Force asked for recommendations and I knew enough by then to recommend such folks as Robert Gagné, Henry Halff, Eileen Kintsch, David Merrill, Martha Polson, Charles Reigeluth, and Robert Tennyson (Spector, Polson, & Muraida, 1983). I had become somewhat familiar with the views of these scholars while reading in the extensive library of the Human Resources Library. The Air Force then asked me to write a project proposal and a job description for someone to lead such a group. The Air Force offered the lead job to me, much to my surprise. That is a short summary of how I got involved in this challenging domain, but I had yet to learn many important lessons.

The project was called the Advanced Instructional Design Project and two systems were built and tested. One was designed by Gagné and called the Guided Approach to Instructional Design Advising, or GAIDA, although I had wanted it to be called Gagné's Approach to Instructional Design Advising. GAIDA was eventually expanded to include more than a half dozen annotated lessons and used in Air Force technical training for instructors for a number of years. The other system was called the Advanced Instructional Design Advisor or AIDA; it was designed by Merrill. It was also tested and shown to be effective in automating instructional design for aircraft technicians, but the graphics were automatically drawn from existing line art for aircraft subsystems. While AIDA could generate effective instruction in a matter of minutes without the help of a designer, it was not embraced by the Air Force as the line art used in the lessons was deemed too simplistic even though the lessons were shown to produce desired outcomes. For a summary of these efforts see the following website: <https://members.aect.org/edtech/26.pdf>.

The point of those examples shows the kind of people who influenced my early education in the area of instructional design and educational technology. When the Department of Defense decided to eliminate the military research units, I decided to take a position at the University of Bergen where I had met folks involved in continuous process simulations. While there, Merrill came for a visit and we showed him several learning environments we had constructed using system dynamics as the underlying formalism. I recall Merrill being somewhat impressed and asking just one question: How do you know students are learning anything. I was once again embarrassed by my lack of knowledge. We had no idea as the targeted domains were generally ill-defined and subject to multiple acceptable solutions. I realized I had yet again fallen prey to the lure of a technology and overlooked what really mattered – namely, the learning.

With that realization around the year 1999, my academic interests took on a new focus on evaluating the progress of learning and development of expertise in complex problem-solving domains. As it happened, A German colleague I knew, Norbert Seel (2012), had a similar interest and methodology to explore that area. While I was exploring expert-novice differences, Seel was exploring how novice solutions developed and improved over time.

I mention such researchers as they are people who helped me develop and from whom I believe others can learn a great deal. While I had not intended to include references in this retrospective piece, I will include a few to help those who have persisted this far into these remarks. After all, I remember Gagné saying on multiple occasions that our job as designers and teachers is to help others learn.

To wrap up this retrospective look at my last 50 or so years, I want to mention my current

interest. Most of my career was focused on helping adults in the workplace and college students learn, especially complex and challenging tasks and procedures. It occurred to me that we should be teaching children learn to cope with complexity. This lesson was brought home to me by Dejian Liu, the leader of Netdragon (see <http://ir.nd.com.cn/en/staff/liu-dejian>). I met with him on multiple occasions in Fuzhou, China and also in Denton, Texas. I proposed a project concerning teaching complex problem solving to young persons (Ma et al, 2020). Dr. Liu asked me how young when I first made the proposal. I said around 13 as that is when the scores of American school children in mathematics began to fall behind many others. His reply was simple and direct: “Even younger.” Netdragon later established a Memorandum of Agreement with UNT and funded an ongoing project aimed at helping young children develop complex problem-solving skills (Ma et al, 2020). While I cannot yet claim any notable progress, I do feel that I have at long last found something to which I might make a contribution, however minor.

Concluding Remarks

As promised, these recollections do not fit the expectations of an academic publication. Hopefully, such recollections might help others make more legitimate contributions to improving lifelong learning and understanding in and appreciation for the complexities and challenges of living on this planet.

I want to close with a few remarks I stumbled across in my unplanned lournays in the domain of instructional design and educational technology. The first is a reminder of the need to be humble and avoid exaggerating what one knows. This reminder comes from Oets Kolk Bouwsma, one of my favorite philosophy teachers (see https://en.wikipedia.org/wiki/Oets_Kolk_Bouwsma). He once wrote in an unpublished journal that it would be a remarkable coincidence if the limits of his imagination happened to coincide with reality. In other words, we generally know less than we might be inclined to believe that we know.

The second reminder comes from David Merrill, who said on occasion that people learn what they do. That means that careful attention should be given to what we ask our students to do. He added that just doing was seldom sufficient. Gagné added that people need timely and informative feedback. My informal review of learning years ago suggested: (a) that those who have done well in the past will generally continue to do well in the future; (b) people generally learn what from they do; (c) that practice with timely and informative feedback tends to improve performance and understanding; and (d) that learning often begins with a failure. That learning is failure driven is a theme one can find in the works of Roger Schank (see <https://www.engines4ed.org/hyperbook/nodes/curious-outline.html>).

A final reminder of these lessons is in the form of the universal underlying principle of all stuff (UUPS, pronounced ‘oops’), namely something has already gone wrong. The first corollary to UUPS is that mistakes rarely occur in isolation. The second corollary is that there are rarely sufficient resources to do what one believes should be done. The third corollary is that others often have better ideas. I close with a plea to teach UUPS and its corollaries to children throughout their learning experiences. It may be too late for old codgers like me.

Peace.



References

- Gagné, R. M. (1985). *The conditions of learning and theory of instruction* (4th ed.). New York: Holt, Rinehart & Winston.
- Ma, S., Bhagat, K. K., Spector, J. M., Lin, L., Liu, D., Leng, J., Tiruneh, D., Mancini, J. (2020). Developing critical thinking: A review of past efforts as a framework for a new approach for childhood learning. In J. M. Spector, B. B. Locker, and M. C. Childress (Eds.). *Learning, Design and Technology*” An international compendium of theory, research, practice and policy. New York: Springer. <https://link.springer.com/referencework/10.1007%2F978-3-319-17727-4>.
- Seel, N. M. (Ed.) (2012). *Encyclopedia of the sciences of learning*. New York: Springer.
- Spector, J. M., Polson, M. C., & Muraida, D. J. (Eds.) (1993). *Automating instructional design: Concepts and issues*. Englewood Cliffs, NJ: Educational Technology.