Once upon a time in AI

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Available online 7 November 2006

Once upon a time (in the 70's and 80's at least) there was a field called *AI and Education*. It was about creating intelligent tutoring systems. I wasn't impressed. It wasn't that I didn't care about education—I did—very much so. It just seemed to me that tutoring wasn't the issue in education and if AI had something to contribute to education it would be in the form of a new way of looking at intelligence and learning and not tricks to help people learn to solve physics problems (which always seemed irrelevant to most students—for good reason). So I stuck to working on learning.

In order to work on learning, I soon realized, one has to have some reason to learn—or to put this another way, you have to be trying to do something and want to learn how to do it better (especially when you have not gotten what you wanted.) For kids this meant getting through courses you knew didn't matter and then forgetting what you had learned. This meant for AI, and I was still immersed in AI at this time, that the computer needed to have (at least) real goals that it actually needed to accomplish; an ability to understand when it had achieved those goals; an ability to explain why it had not achieved them; and an experiential data base of prior attempts to achieve similar (or the same) goals. Learning had to mean getting better at what you had just tried to do each time you tried.

This was not only very hard to do, it also required, if you were not interested in micro-worlds, a collection of real world experiences from real experts that could be understood as needed by the computer as it was pursuing real goals. I termed this *case-based reasoning* and began a pursuit of criterial cases in given domains of knowledge. I was concerned with story telling at this time, seeing it then, as I do now, as the real way that humans store and share their experiences, so I looked for criterial stories—those that define the key issues in a domain. I worried about how a computer would recognize one story as being like another and how it would know to bring up a given story to help it through a new problem at just the right time. This meant I worried about memory organization.

I began to get more concerned with education as my kids went on in school. My move from Yale to Northwestern (in 1989) was prompted by my desire to build intellectually challenging learning environments that help kids get smarter, based on the principles of how people learn that I had been attempting to uncover in my quest to help make computers get smarter. I thought I could kill two birds with one stone. By hooking up with Andersen Consulting I thought we could gather cases from real world business problems and use them both as teaching devices in business (I called this case-based teaching) and in getting AI pushed forward with some case based reasoning systems that were of real world utility because they had a deep case base.

While we were quite successful in building simulations that helped people learn by doing (an idea as old as Plato at least), and learn from (simulated) experience, the idea of gathering cases to go to the next phase in my AI work didn't pan out. Businesses didn't really understand why they should care about cleverly organized and re-organizing

case bases, and they didn't want to tell their failure stories, so my AI work stopped. But the education work pushed on.

While we (my team of hundreds over the years) have built some very exciting programs that teach people in what I consider a reasonable way we have made no dent on the schools at all really (except of course our Master's degree programs at CMU West which, as of this writing at least, are entirely learn by doing and can be done entirely on line).

So I have set as my task for the next decade the creation of a totally new kind of high school: one that would offer only one curriculum per year (from a choice of many). Students would "live" in a virtual environment that they selected whose aim would be to teach them real world skills in a domain that interests them. Right now we are designing a Virtual Science and Technology High School that has the first year entirely devoted to scientific reasoning, the second to health sciences, the third to new technologies, the fourth to either engineering or entrepreneurship. The idea is teach reasoning, human relations, communication, problem solving, writing, and mathematics when needed in a realistic context that can lead to employable skills or further study. The curriculum in place in high schools today was designed in 1892—time for a new one. After these there are about fifty other curricula I would like to build.

We call these curricula—*story centered curricula*—because they elaborate a year long story in which students are working in some fictional world and have projects and deliverables and deadlines. They work in teams with other students and Socratic mentors helping them think out what they should do next.

Overthrowing the school system by providing an alternative to it is an audacious goal but one no more crazy than wanting to build an intelligent machine. As for intelligent machines I am still greatly interested in this issue, and as luck would have it have finally found (through my business contacts) a business and an industry that has a serious need for AI and an interest in funding work of exactly the sort that I was doing 25 years ago when I got detoured into kid's learning as a side issue of computer learning. So, I am back doing AI now too, but quietly because the business I am working with is not interested in publicity right now. Suffice it so say that Knowledge Management is, these days, an important field in the business world that claims to understand that if there is too much knowledge there is no knowledge at all, but fails to realize that AI is needed to create knowledgeable systems that get smarter. If the domain of knowledge is small enough, and goal-directed, AI can help.

I believe that we learned a great deal about cognition in the early years of AI and then AI went off on a wrong course. AI started to worry about efficient algorithms, mathematical proofs, science, and statistics. It should have been worrying about the mind. (When the best chess program works in a "non-cognitive modeling way" is it AI? Does it tell us something about how to build intelligences?) What we learned when we still looked at AI as modeling human cognition has not been forgotten however. There is still hope for making both people and machines smarter.