Fixing Education

Yefim (Jeff) Zhuk

Described here technology and methods propose significant changes in the current approach to education, consulting and training. The rising costs of education, the mismatches between academic and industry practice, and the difficulty of finding that first job are each addressed by the proposed approach. If these problems are of interest to you, please read on and use the COMMENTS link to provide your opinion. The author highly appreciates your feedback.

"Fixing Education means fixing at least two major problems: education inequity and disconnect between Academia and Job Market"

Education inequity

Job market in the US is changing much faster than in most countries. Simpler jobs disappear while new and exciting opportunities appear on the horizon. Current school curriculum is far behind the industry demand and the distance is growing. For example, Information Technology is looking for Big Data, Semantic Technology and Cognitive Computing skills, but we still teach SQL and C++ programming. Investments in acceleration of technology are much greater than educational investments. Plus, it takes tremendous efforts to formalize new knowledge into "educational" materials. It is much easier to lose an existing job than to jump on a new fast moving wagon. The jumpers, who can catch up with the changes, are our educational elite.

There are many reasons for education inequity. Here is just one story.

When I was training a small team of DoD software architects and developers, one of the men stood out the most to me because he was always able to expand on any subject and had great questions. However, when he told me his story, I was surprised to learn that his elementary, middle and high schools considered him retarded, a "lost case". Just before college, he developed his own way of learning and later became a successful student in college and then a team-lead at work.

How many "lost cases" do we have in schools, colleges or in the workplace? How many students have trouble following along with the mainstream methods of education and vocational training? What is the percentage of students with learning differences or detrimental gaps in their education?

I was a corporate trainer, university and college instructor, taught in public and private schools, consulted and mentored business and technical teams. (See http://javaschool.com) Usually less than half of the group can sync with the basic flow of materials and can understand a bigger picture of the developmental process. Going above and beyond, the best mentors can recognize those who are ready for advanced material and those that need more time or special attention. The most effective teachers develop ways to approach individual learning differences, fill in the gaps in their knowledge, keep the students engaged, and minimize the "lost cases".

We can enormously increase these efforts by utilizing the latest technology. By focusing on ending education inequity we will also solve the related program of the growing economic inequity in our society. "We" does not necessary mean the government or only the government. Private companies would also see a great payoff from an investment in resolving education inequity by enlarging the pool of skilled workers available. Furthermore, publicity of a company's efforts in education would also serve to build up the company's public image. And from a moral point of view, what could be a better payoff than fixing society's problems?

Disconnect between Academia and Job Market

Here are just three of the major problems with mainstream education:

1. **Colleges and Universities** are enormously expensive, although considered to be the main channel for access to education.
   This is no longer true. There are many ways to learn, and spending four to six years in school is just one of them.

There are students who prefer a classroom, live instruction and dorm life. There are many others who are looking for the shortest path to a job. In all cases, learning is a lifelong process, and is not limited to the school years.

2. **The Academic Curriculum** is several years behind industry practice, even in the best of schools.
Academia is slow to change, partially due to the fact that accreditation takes years. Technology constantly accelerates, and each year the gap between industry practice and academic curriculum is growing.

3. **After graduation** from most schools, students have a significant loan to repay and a hard time finding their first career employment.
This is a direct consequence of the existing disconnect between academia and the job market.

Industry investments in technology are much greater than the investments in curricula, so it is not a surprise that affordable investments within the current approach to technical education cannot fix the problem.

Fixing the problem requires resolving two major disconnects:

- The disconnect between the job market and the education being provided by Academia.

- The disconnect between the "mainstream" approach and the capabilities of individual learners.

This second problem is well known to any teacher.

Usually less than half of the group can sync with the basic flow of material. The majority are behind, while a few individuals are bored and looking for the next step. Good mentors can recognize those who are ready for advanced material and those that need more time or special attention. Unfortunately, a teacher has to focus on the mainstream group. No extra resources are available to help the stragglers or to challenge top students to optimal achievement.

Changing the educational formula

What is the fix?

The first thing is to expand professional education beyond Academia
by establishing a direct link (the orange dashed line below) between
students and the job market.

The current curriculum in colleges and universities is far behind industry
practice.

For example, we still teach C and C++ to Information Technology students,
but industry is looking for artificial intelligence (AI) programming skills [1, 2,
and 3].

Academia, with its four-year colleges or six-year universities is no longer the
only channel to professional education.

Educational material can be delivered over the Internet to any place and to
almost any device. No one knows better what skills are needed today than
subject matter experts (SMEs), and some of them (actually many of them)
are willing to share.

Just imagine that a consulting company which is specialized in AI directly
shares its knowledge in Java and AI, and, after several months of study,
offers students consulting projects. With a well-focused curriculum, it is

feasible to prepare students for professional work in several months (see http://ituniversity.us [4]) instead of it taking several years.

This is not about Coding Schools, which miss a business side of the story. Subject Matter Expert is not just a code expert. SME knows business goals of a company, business practices and business processes, all these extremely important components that are often lost in translation.

This is a great opportunity to expand education beyond Academia and directly connect students to the job market!

A solution to the problem:

Creating educational materials is difficult. Subject matter experts will often miss the structure, format or sequence needed to convert their knowledge into high-quality educational materials.

I know this from personal experience.

I am an IT consultant and a corporate trainer, university and college instructor. I have taught part-time in public and private schools, and also consulted and mentored businesses and technical teams.

Many times I have had this funny feeling that concepts which looked absolutely straightforward and clear in my head appeared as spaghetti in class materials.

A lot of work has been done, and inventions [Patents 1-6] produced, while looking for better ways to consistently create and deliver knowledge in appropriate structures.

I will describe several components of this work, including the conversational approach and Semantic Technology. It is not an artificial intelligence (AI) framework, although this approach and system is also used to teach AI fundamentals.

For a long period, AI lived on the bottom of the lake of opportunities. Recent years turned the lake into an ocean and the underwater current brought AI back to the surface. Nothing else is growing so quickly, with increasing demands for new skills and talents.

Artificial intelligence can mean many things. I will focus on just one. Computer programs are becoming more helpful. They start working for us not just as stupid machines, but almost as partners. Partners usually talk to

each other and good ideas are polished and clarified in brainstorming conversations.

The conversational approach to knowledge acquisition combines the power of Big Data and Semantic Technologies with human intuition. This combination has proved to be extremely helpful in converting knowledge into well-structured, properly formatted data.

The Conversational Semantic Decision Support (CSDS) system, described in the book, "IT of the future" [1], helps SMEs to overcome this difficulty and produce course content.

How does it work?

The magic is done in several steps:

- First, a system would ask (prompt) a SME about specific educational goals and help in creating a conceptual graph based on the goals.
- Then, CSDS will automatically build a decision tree/script to help prompt the SMEs in providing related information.
- Then the decision tree is used by a system to converse with a SME while retrieving the information and building a proper structure of correctly formatted educational materials based on the conceptual graph.
- The system also generates test questions for each subject of the conceptual graph in a semi-automated process. The questions help to evaluate the student's progress as well as the student's perception of the materials from both quality and difficulty perspectives.

Helping SMEs to become instructors will not only increase educational channels beyond Academia. This will directly connect students with the job market and significantly improve employment opportunities, especially for young people looking for their first job.

Colleges and universities will survive. There are many students that need classrooms, friendly teamwork, and exciting social life outside of home. But new educational channels will compete with traditional schools and will impact school prices.

My personal 30-year experience of teaching in class and online, including challenging and exciting work with inner city students in Detroit, confirms: it is feasible during several months (not several years!) to develop a set of skills that opens the door to a profession.

Regardless of the course major, I always start with introduction to Critical Thinking and Skills to Learn. These two subjects must be included in any course of study.

The end of the coursework is not the end of education; quite the opposite! From this point, a person is getting a real job with real pay and has acquired a taste for continued learning.

The second major problem of current education is the disconnect between the "mainstream" approach and individual learning differences.

In the future, I envision robots performing as teaching assistants. They will introduce better evaluation instruments, which will look more like games than tests. These games/tests will help to precisely measure a student's engagement at each point of study. Robots will be especially successful with children. Not only due to enormous memory and quick thinking, and the ability to replicate custom copies while gaming simultaneously with multiple participants, but most importantly due to lack of emotional reactions. Robots can keep their cool in the situations that would drive a human teacher crazy. ("2040", [5])

Changing Formula of Education*
Valid alternative to enormously expensive schools

Conversational approach in education is crucial to finding individual differences and consistently engaging a student.

Combined with Semantic Technology a Conversational Semantic Decision Support (CSDS) also helps students by optimizing Individual Learning Process.

CSDS also helps SME transform knowledge into educational quality materials.

Expanding Education beyond Academia Teaching skills that industry needs today Directly connecting with Job Market

Expand Education beyond Academia & Help SME teaching

Educational Goals

Individual Skills and Preferences

Learning Materials

Real-time Optimized Conceptual Graph

Conversational Semantic Decision Support:
-- Helping SME transform knowledge
----- Building initial Conceptual Graph based on Educational Goals
----- Helping SME transform knowledge into Learning Materials
-- Optimizing Individual Learning Process
----- Evaluate Student Performance & Optimize Individual Graph
----- Semi-automatic QnAs arrange for Test-Driven Learning (TDL)

Teaching with regard to each student's individual ability is the hardest part of being a teacher. One would like to do exactly that, but trying to focus on

stragglers can result in the failure to complete the coursework for the majority of students.

Can technology help here?

While preparing the course, the Conversational Semantic Decision Support (CSDS) system focuses on building a conceptual graph of the course.

A conceptual graph usually includes dependent subjects, which can be found in publicly available sources. The system can help by collecting a variety of materials for each of such subjects, effectively creating a set of choices which can be used during the learning process.

To optimize the learning process, the system gives hints to the teacher to adjust both the style and type of suggested content based on tests/evaluations of individual differences in student's learning style and pace. Some students benefit from Test-Driven Learning, some need more samples and more SME's time.

The system is not (and should not be) completely automatic, but provides significant help to a SME working with students.

The system is not a dream or just a set of good ideas, but is more like a "work in progress" [4].

For example, Internet Technology University, http://ITUniversity.us, provides a platform for SMEs to post educational materials and teach students online. It is up to a SME to offer a price tag or free access.

By expanding the learning process beyond Academia, we establish a new paradigm, where companies can better fulfil their needs and students have a much better outcome from the learning process – the job!

Who will benefit from these changes?

1. First of all, those searching for their first job can follow job market trends.

Here are some statistics on starting salaries:
For humanities and social sciences, the first job's average salary is $35k-$40k.
Information Technology is more generous. IT is awarding the first job with $60k-$70k salaries.

Let's trust the free market. (This is especially easy for someone who lived at least several years in a government-regulated country.)

To get a job in a high-demand field, it is more important to have the skills to do the job than it is to have a degree! Here I am admittedly on thin ice. We traditionally think that a degree means an education.

This is not true! We never stop learning... after we have a good start, but that starting point should not be as hard and expensive as it is today.

2. The same mechanism which helps a SME express her/his knowledge can help in unlocking and capturing "tribal knowledge" to benefit corporations.

Corporate knowledge or "know how" can be split into three categories:

- Structured data – in relational databases

- Unstructured data – text documents: regulations, business policies and instructions in folders and web sites

- And the biggest portion of information, which is used daily in business routine, but has never been captured. It is so-called "Tribal Knowledge" [1].

My conservative estimate of the percentages of structured, unstructured and "tribal" knowledge is 10%, 20% and 70%.
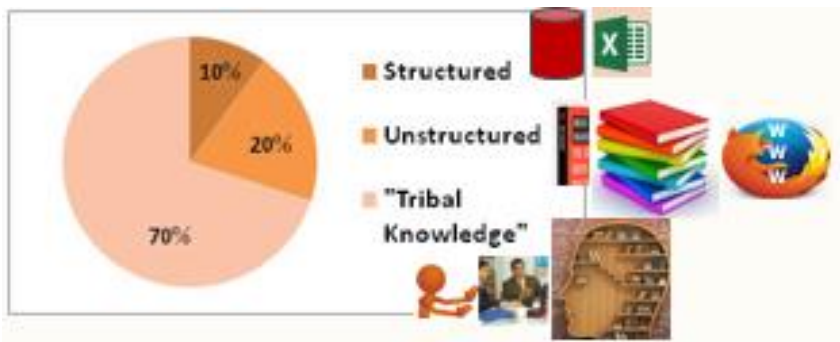
By retiring "baby boomers" or replacing "experienced and expensive" with "young and cheap" workers, corporations actively lose huge portions of tribal knowledge. Not only retirees, but other people leave the company for various reasons, expanding the void in corporate knowledge.

Sooner or later the business feels the pain, especially companies dealing with long-life products surrounded by an enormous volume of related rules and regulations.

The "experienced and expensive" would love to share their knowledge, but capturing tribal knowledge is tricky, and formalizing this information is even more difficult.

The Conversational Semantic Decision Support (CSDS) system helps to make this challenging task feasible. CSDS will transform the concept of a Corporate Knowledge Warehouse (CKW) into a working system.

What is a Corporate Knowledge Warehouse?

The CKW is a collection of electronic materials which describe enterprise processes, not only for people but also for a machine. Formalized as the integrated ontology of connected knowledge domains, CKW can be converted into specific formats for specific purposes.

For example, they can be converted into business rules and scenarios to drive business applications, as described in the Knowledge-driven architecture patent [1].

They can also be converted into educational and training materials for specific audiences. CSDS will prompt a SME for an initial structure and will help to build a conceptual graph. Then walking over the graph, it will help to create branches, while asking for examples and user stories and creating tests for each branch.

People will still be involved in the processes, but they will not need to repeat boring work, which can be done by the system. The system would engage a SME in conversations, asking to confirm a decision, fill in the knowledge gap in unexpected situations. Becoming part of daily routine, these conversations will effectively grow CKW, improving automation and productivity.

Enabling a SME as a great mentor and a wonderful teacher not only makes her or him a more valuable employee, but also a happier person.

Accelerating learning processes and keeping pace with changes in technology will address the imbalance between demand and supply.
Job stability does not lie in limiting global collaborative engineering, but in improving the ability to innovate, to learn quickly and change directions -- even run ahead of the game.

Developing personal and social mechanisms for quick adaptation to changes is a very natural and rewarding alternative to regulatory barriers. Technology is on our side today as a friend and a partner helping us to succeed.

We will reduce the necessity for brokerage between a student and a profession.
This is done in other industries. Smart applications such as Uber remove the necessity for brokers - receptionists at taxi stations. Smart applications directly connect consumers and producers.

Professional education will become less dependent on brokers, such as Academia and job agencies. Smart applications with CSDS will streamline professional education, directly connecting students and jobs.

These methods might also be used in regular schools!

The difference between high school and college could be less dramatic if middle and high schools included advanced subjects taught directly by SMEs from local companies.

This connection might also bring some social benefits for both parties.

3. **Educational publishers will finally be in a position to offer templates** (conversational scripts) helping authors, first of all the SMEs, to share their unique knowledge.

4. **Consulting agencies, which often have the best SMEs** in a specific knowledge domain, will become invaluable knowledge resources. The system/platform helps SMEs sharing their unique knowledge in multiple ways, including Teaching-by-samples, Test-driven-study, and more. Some of these ways, such as Test-driven-study can be used for screening potential candidates.

There is an opportunity to grow a Knowledge Tree into a Global Knowledge Marketplace by collecting the "tribal knowledge" of individuals, their experience, stories, scientific and emotional context.

Frequently Asked questions from reader's comments and email messages:

Why it is different from Google and Wikipedia?

- The audience is different: not only people but also computer programs
- There is a conversational component, which accelerates data search and comes up as a partner in a brainstorming session.

Even with the help of a program, CSDS, sharing expertise is a time consuming effort. What incentives can be provided to motivate this work?

- Knowledge investment can be measured, for example by the usage. As any investment it can be awarded, for example, by a proper share of the marketplace. This might become a very valuable enterprise.

Do you really think that a computer program can replace a good teacher?

- The shortage of teachers and instructors in the U.S. is estimated in many thousands. The program will help many more people share their knowledge in sciences and IT.
- Yes, it is difficult to achieve quality and efficiency. These two are conflicting criteria. The program will help a teacher/SME to be more efficient, first of all taking care of multiple supporting activities (besides teaching) required today. Then, the program would improve quality by optimizing learning path based on individual student learning differences.

What is the process to offer and teach a new course?

Start with this link: http://ITUniversity.us. Anyone can JOIN and use the platform to develop and post educational materials and after a quick review offer a price tag or free access. Someone can choose teaching existing curriculum. PayPal will work for you providing payments for your classes. The main rule at ITU – no upfront payments. Students pay only after the class, if satisfied and happy and want to gain access to the next study section. And another rule for an instructor: find time for individual meetings with every student and optimize the individual pace of study.

This is a work in progress, and any help and feedback is highly appreciated.

Can this approach be expanded beyond the IT field?

Former students, SMEs, Consultants, Publishers, What do you think?

Would you join the project if investment is provided?

References:

- 1. http://ITofTheFuture.com – the book online on Cognitive Computing and Semantic Cloud Architecture, describes CSDS and Business Analytics Sandbox for Enterprise (BASE), Yefim (Jeff) Zhuk
- 2. Integration-Ready Architecture and Design, by Cambridge University Press, Yefim (Jeff) Zhuk
- 3. http://www.dataversity.net/software-semantic-evolution-and-the-next-step-part-1/ - Software Semantic Evolution: SOA and Microservices and the Next Step
- 4. http://ituniversity.us – Internet Technology University
- 5. http://itofthefuture.com/book/message.pdf - The message from 2040

Patents 1-6:

- Knowledge-Driven Architecture | US Patent | Yefim Zhuk | Driving applications with business scenarios
- Adaptive Mobile Robot System | US Patent | Yefim Zhuk | Integrating software and knowledge engineering with robotic technologies
- Collaborative security and decision making in service-oriented environment | US and 15 European countries, Patent| Yefim Zhuk/Boeing | Turning a beautiful idea of collaborative decision into a system
- Conversational Service Knowledge Map | US Patent Pending | Yefim Zhuk | Allows developers and subject matter experts (SME) describe, find, negotiate, assemble and execute software services
- Rules Collector System and Method | US Patent | Yefim Zhuk/Boeing | Formalizing expert knowledge into rules, which can be used for solving the next problem in the expert-computer brainstorming
- Distributed Active Knowledge and Process | US Patent | Yefim Zhuk/Yahoo | Collaborative data/services

Misty Davidson

ESL Intructor at Common Ground International

Excellent points. I am totally a non-techie, but if I were young today, it would be different. We desperately need a workforce with specific technological skills. Vocational education is not for "dummies" who can't do anything else. It is for bright young people who are interested in their own future and wish to make a contribution. Learning is a lifetime process, and technological advances will require constant continuing education. There are many ways to learn, but, unfortunately, in the USA, only college seems to get any respect. Maybe that's why the USA has such a shortage of qualified workers, whereas other countries are embracing multiple ways of learning and education that prepares their young people for the real world. We have a lot to learn from places such as Germany and South Korea.

 Jeff (Yefim) Zhuk

Enterprise Architecture, Integrated Software and Knowledge Engineering

>the USA has such a shortage of qualified workers

>a lot to learn from places such as Germany and South Korea

Misty, you are correct. The USA is very innovative in technology but still conservative in education and training. With the technology described here and very modest investment we can do much better. With the current approach to education, it takes several years to understand and satisfy market demand. And we always end up with oversupply. The new approach is more precise and faster in following the job market changes.

Think of Uber in transportation and Amazon in consumption. Streamlining connections between demand and supply never was easy. But when it is done, it looks very logical. I am sure we will have better connections between education and employment.

Sunil Cherian

Entrepreneur and CEO at Mentor Global

Jeff, this is interesting. We should look at ways to make this accessible. This is a core issue that will democratize learning.

Emily Langley

Knowledge manager, librarian, tutor and information management

Right on!

- **Radu Tomescu**

Sunil...this is all about wealth/income distribution.Since the 90s we have witnessed,in the US , (arguably) the largest-ever transfer of both wealth an income from the lower and middle-classes to the upper echelon. Yes, Internet is the Great Equalizer, thus opposition from certain quarters to net neutrality, and suggestions of tiered bandwidth..If we restrict poorest people to lowest bandwidth, they can't learn to much, can they? It's like in feudal China: the writing system is so complex that only richest people can afford to allow their children the time to learn it.

Jeff (Yefim) Zhuk

Enterprise Architecture, Integrated Software and Knowledge Engineering

Sunil, Thank you for thinking of "the ways to make it accessible". Let us think together. Soon after posting the article I received a call from a friend of mine, an expert in childhood education. I've got invaluable hints on the best collaborative methods with children and what the system must take into account to be successful. For example, the "logical thinking" is only developing at the age 12-14, not before. I did not know that. How to make the system accessible to people who would like to help and share, to educational experts, to content providers, to content organizers and system behavior coordinators? This is a challenging task. A good example is Wikipedia, which continue growing and mostly with valuable information. Although in our case, the system should transform information into system behavior. I just noticed that as a technical person, I tend to focus on the technical pieces, although the other sides of the story may be also important.

- **Jeff Dierckman**

Director Enterprise Architecture

I like the idea of applying the Conversational approach to education. A big challenge I see with the traditional Semantic approach though is the manual effort to model the knowledge domain. That would seem especially daunting in building a system that can converse on a variety of different domains. I'm wondering if some of the approaches taken by IBM Watson (which is now available outside use - at a price of course) could be used to help automate some of that by "reading" existing materials?

Lawrence Katz

Attorney at Self

Fascinating and well-written piece about a subject we should all be thinking about: Creating models to make knowledge, especially in the area of technology, more accessible. I see a couple of ironies here that, if they can be overcome, might lead to some breakthroughs. First: Tribal knowledge, which might be called wisdom, has a natural life span. Baby boomers like me have acquired a body of experiential knowledge that transcends expertise in a given field. This knowledge takes years to acquire, cannot be quantified, and is applied on a case-by-case basis. Like the generations before us, we will soon die and take this body of knowledge with us to the grave. The next generation traditionally starts from scratch. Second: Until very recently, information was expensive and education was cheap. Now, information is cheap and education is expensive. It seems as if Mr. Zhuk may have found a solution to both problems. .

- **Jeff (Yefim) Zhuk**

Enterprise Architecture, Integrated Software and Knowledge Engineering

Lawrence, Thank you for good words. I continue receiving messages, mostly in my email, related to this publication. Some of the messages include very interesting thoughts that I'd like to share with you.

From email: "In general, there are tons of people with good educations who have trouble finding work, and I think the reason is there just aren't enough jobs, not enough demand for what these people could do. "

Jeff – This is right, and the main reason is that education is far behind the "hot jobs". When finally we start teaching these subjects, they are old and cold. This disconnect between Academia and Job Market must

be fixed too. I hope that CSDS will help us here and will connect students to job markets.

From email:

"You certainly captured the key aspects of the problem, and I think you have some compelling ideas. I think that using technology to bridge differential learning gaps is absolutely imperative. My son is now five. He has had access to an iPad since he was two years old. My wife and I have adopted the practice of loading it with a variety of educational tools, games and information resources and then just leaving him alone. It has been amazing to watch how effectively he extracts knowledge organically using these tools… … I think the most challenging part of this lies on the other end of the spectrum from the consumers (students). You have students, you have a delivery mechanism that is responsive and adaptive, but you need to keep the material current and of suitable quality. For some subjects (history, for example) this is less of a problem. But for other topics, such as technology, it becomes more problematic. I think Wikipedia has given us at least one example of how "tribal knowledge" could be crowd sourced. In fact, the entire Internet is a living, breathing example of raw information. The difficulty is separating the signal from the noise"

Jeff - I admire your ability to balance control and freedom with your son, which helps him to find the best ways in the learning process. Our children are amazing, what was difficult for us is so easy for them. - Making the live, not static system and separating the signal from the noise is difficult. The plan is to expand my current ranking system, open it to everyone, still giving more weight to the score from the content editors and content owners. Good content will come up and bad should drown.

More sharing from email messages:

From email: "Check the Wolfram Alpha project for a possible correlation…" - "Have you investigated / and / or approached Kahn Academy with your thoughts? It seems to me that they may have the need for the system you envision."

From email: "Your article was very intriguing--the underlying message I walked away with is that computer semantics can better enable best practices in teaching with regard to meeting individual learning differences (even those caused by social inequities). However, I must reiterate my earlier point which is that some programs which focus on equity, alone-which implies all folks get a basic opportunity does not go as far as social justice, which helps to ensure those opportunities are meaningful and are indeed, equal."

Jeff - A similar and a bit different note I found in the recent article "Idiot's Guide to Inequity" by Nicholas Kristof in N.Y. Times: http://www.nytimes.com/2014/07/24/opinion/nicholas-kristof-idiots-guide-to-inequality-piketty-capital.html "Unfortunately, equal opportunity is now a mirage…. As an escalator of mobility, the American education system is broken…"

- **Jeff** - I believe there are cases, when the right approach can change the game. I'd like to say thanks to people who offered their help. I plan to contact you later. I am currently teaching Java Technology for a group in Detroit. It is a group of 32 women with almost no knowledge of IT.

The amazing fact is that in 3-4 months most of them will become Java programmers/consultants. This social project "StepITupAmerica" by UST-Global (a consulting company) with its educational arm, Mentor-Global, brought attention of Joe Biden, who visited us last week (https://www.facebook.com/StepITUpAmerica).

Teaching these students is challenging work, but we will prove that this can be done; most of the credit should go to our very focused and motivated students. And we can greatly scale up the educational process by using the methods described in this article.

- **Stuart Ambler**

Data Science Software Engineer

Misc comment, on logical thinking developing at age 12-14, I suspect that varies greatly with the person, some at much younger ages, some perhaps never
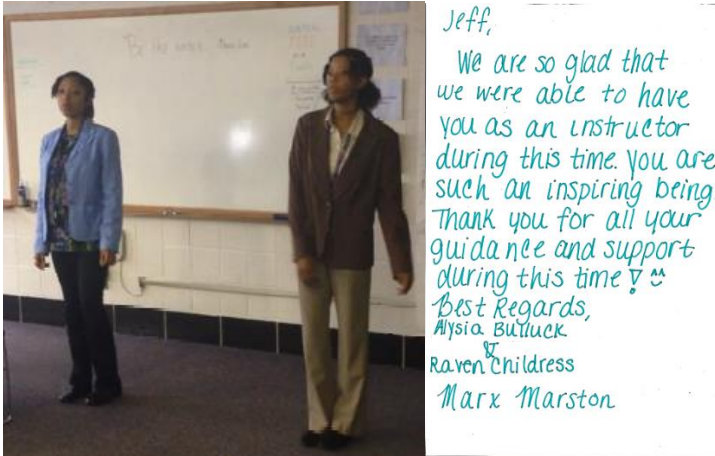
- **Jenae Conley**

Associate Software Developer at UST Global

Jeff was our trainer for the UST Global Step IT up America, he is intelligent and Very patient. We appreciate him for teaching us and guiding us. Anyone that will have him as a trainer will be lucky to have him.

Alisa & Raven

Associate Software Developer at UST Global

- I think Jeff is great. I appreciate his hands on approach as opposed to heavy lecturing.
- Excellent teaching format!!! Breaks EVERYTHING down to the best of our understanding.
- Awesome teacher! Jeff definitely has a gift to make JAVA seem simple. There is a difference between a teacher and an instructor. Jeff has a gift to teach! He definitely imparted knowledge and understanding…

Jeff (Yefim) Zhuk

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Thanks, Jenae. Our intense Java training sure took a lot of hard work, but we didn't cut any corners. We learned and practiced how to set priorities, to evaluate our current position, and to aim for achievable goals. We built a solid foundation of critical thinking by developing and optimizing the most valuable skill, the skill to learn. Software developers continue learning every day.

Since many of our students did not have this background, gaining this skill was sometimes very difficult and took a lot of determination. We also cultivated teamwork and Agile development (Agile is an iterative development style that adds flexibility to the process.)

It was very rewarding for me to see the students lifting their confidence level from "I will never understand" to "Yes, I can!!!" Many

of them started with little or no knowledge of Information Technology. Four months later they successfully passed a pretty complex 6-hour Java/J2EE test.

- **Alex Gorodinski**

Founder/Consultant at Open Mind Consulting, LLC

Excellent! This is one the best article about a real solution Education problems not only in professional area, but in the field of a personal development of students.

Jeff (Yefim) Zhuk

Enterprise Architecture, Integrated Software and Knowledge Engineering

Many of the former students are IT consultants now. This transformation has changed their lives. They do not have much experience but today they have a foot in the door. Information Technology is still a growing industry (one of a few). IT is trying to catch up with the growing ocean of data and increasing demands on information processing. Four-to-six months of intensive training proved to be a valid alternative to four-to-six years of college education (maybe not for everyone, but for many students.)

Is this process and approach scalable? I believe it is. The key requirements for scalability are: - Improve educational content, remove information gaps, and provide multiple content levels to match multiple levels of skills - Develop a reliable feedback mechanism, which will provide conversational support to verify student knowledge and student understanding at each point of study - Provide

motivational support by taking into account individual preferences How much of this process can be delegated to a computer? Not everything and not all at once, but I am confident that a good teacher would find the assistance of such a computer program extremely beneficial. And then a computer program will learn more from a good teacher and can help even more…

- **Rebecca Ramo**

Special Education/Drama Teacher. Writer. Singer

It seems like most of the world is on the same page in terms of desiring a high quality education for all students, regardless of the circumstances to which they are born. However, the diversity comes in terms of the approach. I would welcome any kind of technological tools in my classroom with open arms. In fact, many teachers, even in the lowest funded schools around, have Promethean Boards or SmartBoards in their classrooms.

However, sometimes technology, at least in America's public schools, is a cover-up, a band-aid to disguise huge generational, socio-economic, and cultural (which may or may not refer to ethnicity) problems that cannot be solved with any kind of teacher intervention.

Using fun, "engaging" technology in the classroom will not reinforce language at home for children whose parents do not know English. It will not convince them of the value of education or the need to show up to school. Many of my students are really nice kids in the classroom, but they miss school because their parents either physically can't or "don't feel like" taking them to school.

Also, the corrupt wave of Common Core education, as is the societal pattern, is to go after unions. Teachers are under massive attack and are being tasked with ensuring that students pass standardized tests on grade level.

I often receive middle school students who read and do math at a second grade level. Even if they experience two years worth of growth in one year--a huge success, my "job performance" is at risk when the kids then do not pass the 7th grade standardized test which they are forced by law to take.

[Jeff (Yefim) Zhuk](#)

Enterprise Architecture, Integrated Software and Knowledge Engineering

[Rebecca](#), you are right. Each student needs individual attention. Technology cannot replace a teacher, but can save teacher's time and expand teaching power. For example, teachers are pressed to provide more paperwork. (A good idea of measuring the results is poisoned by its implementation.) Here is a great place for computerized conversational tests that would measure individual student's level and suggest the next step of study or a proper repetition material. Formatted as a friendly game this program saves teacher's time and still works under teacher's control.

- **[Rebecca Ramo](#)**

Special Education/Drama Teacher. Writer. Singer

When teachers "fail" to make students perform on grade level, even though they received the students when they were far below grade level, the blame is put on teachers for not having enough "rigor" and "technology" in their lesson plans. Absolutely no responsibility is put on parents, students, administrators, or the general society to help our children. Doctors, no matter how advanced their technology is, do not get rated "ineffective" if they are unable to cure a patient in the severe stages of an illness. They are not accused of not using the correct technology and being micromanaged down to every minute of their procedure by people who have never been doctors. Again, I welcome any and every technological source that benefits children. Please, we

will take it all. But first, we as teachers, would like less than 35 students in the classroom, supplies like pencils and paper for our students that we do not have to buy, since more often than not kids do not have them, time to teach our children at their level, instead of wasting everyone's time to prepare them for a test that is years above their grade level.

 Парафесь Сергей

Sergey Parafes, professor of the Moscow Aviation Institute (MAI), Aerospace Engineering Institute

начальник отдела в ЗАО "ИнСис-интеграция"

Director of the In Sys Integration department, ZAO

Jeff! The subject of the article, in my opinion, is very interesting and timely, especially into our ever-expanding world of knowledge. How to deliver this knowledge to specific student effectively? How to select the material that the students understand it? What feedback should we provide to better engage the students in the learning process? These and other similar questions, perhaps, any teacher asked many times. I agree with your statement that traditionally the most effective method of knowledge transfer from teacher to student is a straight talk "one on one". And I agree that this is very expensive. Yes you are right when you say, "We do not have enough teachers, especially good teachers to converse one-o-one with the students." I think it's a fair statement for any country.

Sergey Parafes, professor of the Moscow Aviation Institute (MAI), Aerospace Engineering School

 Jeff (Yefim) Zhuk

Enterprise Architecture, Integrated Software and Knowledge Engineering

Sergey, thank you for the response! As far as I know MAI in Russia is a similar level school as MIT or CalTech in the U.S. Do you have a course on Knowledge Engineering? Any usage of this subject and semantic technologies in education?

- **Парафесь Сергей**
- **Sergey Parafes, professor of the Moscow Aviation Institute (MAI), Aerospace Engineering Institute**
- **начальник отдела в ЗАО "ИнСис-интеграция"**
- **Director of the In Sys Integration department, ZAO**

Jeff, you invited academic world and corporate training to use is a combination of conversational approach with semantic technologies to solve this problem. I think it is a good idea. I have some experience in using similar technologies; in particular I'm quite familiar with the technologies of the ontological engineering. I would be interested to get acquainted with the proposed technology in teaching and collaborate on knowledge transfer details.

From: Neiel Baronberg

Jeff,

I love where this articles is going.
Formal - academic - basic education will become obsolete in the future. Much of the basics in medical school can be addressed I the first two years with online interactive material saving enormous expenses.

But this only applies to "vocational" skills. In medicine human interaction is obviously imperative to asses a problem but I can see where in IT that would be less important. The best process for more second level education after the basic language is learned, I believe does require human interaction and response.

The Torah learning approach with one on one or very small interactive seminars where you learn from peers is most effective. This would be very different from big lecture

halls. I have always favored the development of vocational training schools at least he beginning of high school but society and parents have usually demanded the often useless "college" degree.

Still for "complete" education some grounding in humanities makes some sense to me and would decry a society of computer experts who have become robotic and artificially intelligent. I congratulate you on clearly seeing a deficiency and proposing a new direction forward. You are on to something very important and some might say revolutionary.

I congratulate you on clearly seeing a deficiency and proposing a new direction forward. You are on to something very important and some might say revolutionary.

Good luck, Neiel

Jeff (Yefim) Zhuk

Neiel, thank you so much, your words are very encouraging … and I feel more pressure to live up to expectations.

> Still for "complete" education some grounding in humanities makes some sense to me

Yes, this makes sense to me too, and our all life (not just college years) is dedicated to learning these values.

From: Leo Gorodinski,

Hi Yefim!

Hope all is well.

Your article looks good, and I'm sympathetic to your vision. Some comments:

- In broad strokes, I rely on the "smart, kind and gets things done" framework when interviewing. In addition to the gap between industry and academia, I've found it particularly difficult to assess the "gets things done" component during the interview process. The academic environment does little to prepare the student for work in the real world. Students with advanced degrees from highly acclaimed schools often have a difficult time integrating into a project-centric, highly collaborative work environment. Industry typically calls for greater degree of autonomy, innovation and soft skills than what is being delivered by academia. Involving SMEs in the education process should certainly help this. I also believe

my early exposure to real industry projects helped me a great deal, certainly far more than my university degree.

- Regarding "education never stops" - I believe this cannot be stressed enough. Technology changes rapidly, and even without change, there's so much technology out there, one never knows which part will be of use. As you say, these days, increasing volumes of data has created a need for statistical methods of AI (ie data science, machine learning) which are often overshadowed by focus on data structures. In addition, we've to triage among increasing numbers of channels of information - one has to be able to interpret information contained in documents at work, tribal knowledge, in addition to the more traditional text books or academic papers.

- CSDS - I've been a fan of this model since you first told me about the concept. Interestingly, the user-experience research wing of our organization is exploring similar methods. In addition, a former colleague of mine left Jet to form a startup where he wishes to introduce a more conversational user experience to placing orders for food using an app. We're still a few years away from brining this concept into our AI models more broadly. Indeed one challenge we've to overcome is scalability - at this point, having a model personalized for each user is prohibitive. However, we're working on an interesting project that will allow us to run computations much more quickly on clusters of GPUs. I'd like to hear more about what you've done with CSDS.

Evgeniya Polyak

Marketing manager (Megaplan)

I'm a student at ITU, online school. What makes a real difference at this school (besides a very good content online) is individual one-to-one online meetings with the instructor, his support and guidance. It is an excellent way to study. You can choose your pace of study and your best approach to go through the process. And this is a correct point that to get a job in computer science and engineering you can focus just on new skills, your social network is not as important as for some other professions. My plan is to start as a consultant (I already have an offer) and then join also as an instructor, helping more people to learn the skills that almost guarantee a great job.

 Jeff (Yefim) Zhuk

Thank you, Evgeniya, for the words of support and your intention to join ITU as an instructor. I hope to see you some day as an expert, capable to share with the students and to participate in further development of the ITU's platform. By enabling a consultant/expert to share the expertise, we try to break

the old misconception "those who know, they do, those who don't they – teach". ITU tries to integrate these activities: teaching, consulting and AI product development.

Thomas K. Keenan

IT System Administrator, freelancing for knowledge

I followed your article over from the Microsoft -LinkedIn announcement of Dec. 8th. With similar backgrounds in our track-records, your idea complements the Berufsausbildung in the F.R.G., albeit on an advanced level. Your idea spells out much more opportunities for young adults. Very good article and in-depth information.

Jeff (Yefim) Zhuk

Thomas, thank you for your support and references. My impression is that LinkedIn did a move in this direction and I hope that even more can be done under Microsoft umbrella. No one is providing direct connections between students and job market yet. We just started this work by developing a platform and methods to empower a SME as a teacher. This is work in progress and although it is not a trivial project, this can be done.

Farzana Kosgi

Agile Developer at Comerica Bank

Great Article!

Jeff (Yefim) Zhuk

Thank you, Farzana! I am glad you liked the article. I am always happy to see my former students online. (Say hello to your team!) Someday you will be ready to share your expertise and maybe will use the methods described here in the process.

Josh Howard

Pedagogy - Collaboration - Technology

Hi Jeff,

That's a compelling article and I think you pin down several common cultural challenges we face in the US with our education system. For the last two years I worked at a school called the Career Education Center Early College of Denver.

This program offers high school students access to over 20 technical training programs with teachers who have industry experience (firefighting, nursing, auto technology, accounting, computer science, architecture, advanced manufacturing, you name it). Students were able to explore a career in depth while also earning college credit (for free to the student) removing a significant financial obstacle.

Overall, the access and choice learners have make this program is a success, but it is also an outlier in our current education system. Another thing that I learned at that school was that my own college experience (Liberal Arts - English and Theatre) was an experience of privilege.

As a teenager in a college town, I wasn't thinking too seriously about how my schooling would lead a job. I took it for granted, I went to school because it was a cultural norm, and I more or less could study whatever I wanted without fearing how I'd make rent. That privilege isn't true for many students, and many of our institutions still need to change.

The good news is that I think we know how to change the education system -- clear more paths from school to the workplace and expand professional learning opportunities at work. But that is hard change to do at scale - so there is probably an opportunity for others to contribute.

From my view, I think the conventional notion of college (liberal arts or technical) will need to continue to transform over the next 10 to 20 years. Those are my brief thoughts. Looking forward to connecting more soon!

Josh

Jeff (Yefim) Zhuk

Thank you, Josh, for thoughtful feedback. You brought up very good points! There is no such thing as a job for life anymore. Changes are the most permanent subject of our reality. Adaptation to changes is not necessary a painful process. This process can be improved and accelerated. This is the topic of the article.

[Deanna Craig](#)

Java Developer w/ .Net experience

Education of today is definitely in need of an adjustment. The current focus of college/university and the "one size fits all" way of education is simply not enough. This article makes some very valid points. Education should be in sync with the job market demands.

When I was looking for job opportunities in software development, for junior developers, the requirements were definitely not realistic for even someone fresh out of college. I myself was working on an Accounting degree and decided to change my career and was fortunate enough to join a program that was technology focused, this is where I became one of Jeff's students.

His style of teaching gave me a realistic knowledge of working as s software developer. With no degree in Computer Science or Information Technology, I was still capable of finding a job and impressing my team with my knowledge and understanding of Java programming.

This focus on college graduates leaves adults who want to make a change out. More and more adults are looking for ways to transition into new career opportunities. For the working adult going back to college to obtain new degrees isn't always possible.

The job market is begging for more talent but the current system can't meet the demand. Going back to the point of the article, we need change the focus on the "fix". In technology it is imperative to not only know how to code but know why we code.

Now that I've worked on big sides I see the disconnect that exists between IT and the business. ITU represents the schools of the future, of course colleges and universities will still play an important part in the total educational system but it won't be students and working adults only option.

One day I hope to teach online to people interested in learning technology.

Great job Jeff!!

Jeff (Yefim) Zhuk

Thank you Deanna! It is great to feel support from a former student, today an IT professional, tomorrow a subject matter expert capable to share her knowledge with more people.

When I think of Detroit, I see great opportunities there. We need self-driving and flying cars, and new transportation options. Yes, automation grabs simple jobs. But when new technology closes one door, it opens several others... We are re-trainable. We proved this many times over.

Current reaction to market changes is painfully slow. With the methods and system described in the article we can and will accelerate professional adaptation, help establishing direct channels connecting students with job market.

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