"If I'd wanted to study, I would have gone to a real college"

The challenge

There we were, the faculty members and advisors for the Instrumentation program at Bellingham Technical College, sitting together in our semi-annual committee meeting discussing job markets and trends, when one of the long-time advisors of our program entered the room.

"Sorry I'm late. Traffic problems."

We all smiled and greeted Sam as he sat down. He seemed eager to share something with the committee, and his appearance became an opportunity to change the subject for a conversation that had lost much of its momentum.

"I'd like to share something with you today, regarding a question raised at an earlier meeting," he said. "Remember when we asked ourselves what was the most important thing a graduate of this program should learn?" We all nodded, recalling the discussion from about a year previous. "At that time, I answered like everyone else: graduates need to have a strong understanding of the fundamental principles of their trade." We had all agreed previously that this was paramount. If a student failed to understand basic physics, electricity, and other scientific areas of knowledge, they would be handicapped in understanding the many applications of those knowledge areas in the technical field of Instrumentation. "Well," said Sam, "I'd like to change my answer."

Now, this captured our attention. What could possibly be more important to a vocational student's training than a mastery of their trade's fundamental principles?

"The most important thing a student can learn," continued Sam, "is how to learn on their own. Technology is rapidly changing, and a person who cannot teach themselves will find their mere knowledge of the fundamentals insufficient for future challenges."

Sam's words were absolutely true, and we all knew it. A person with a strong knowledge of "the basics" but with no ability to teach themselves could never succeed in a fast-changing profession, at least not without the help of others to continually teach them what they did not know. Conversely, a person knowing nothing but how to teach themselves could always learn what they needed to know in whatever profession they chose, with or without anyone else's assistance. *Ergo*, the ability to learn independently is more important than a mastery of specific knowledge areas.

Furthermore, Sam's idea had validity well beyond the immediate context of vocational instruction. Truly, one cannot excel in any vocation without being able to teach themselves new things. But many non-vocational endeavors also benefit from the same skill of self-instruction: to excel as a parent, one must acquire knowledge and skills generally not taught in school, but vital to the development of a child; to succeed as a democracy, citizens must educate themselves regarding the latest issues and solutions, rather than rely on authority figures to tell them what is happening or what to do about it. The ability to learn independently is a valuable, general life skill. Instructors could add far more value to their students' education by focusing on teaching them how to teach themselves – regardless of the specific context in which this skill was taught.

Sam related his experiences with employees unable to teach themselves new technology, and how it burdened both the organization and the employees' own professional potential to be utterly dependent on expensive training and/or the guidance of supervisors in learning what needed to be learned. For many of use in the room, Sam's description of the helpless employee was all too familiar. His next statement, though, was even more disheartening.

"The problem is, *how do you teach people to teach themselves*?"

After a moment of reflection, I had to admit that I couldn't answer that question any better than Sam could. Certainly my own curriculum did not make "learning to learn" a priority, and neither did the curriculum of any course I had ever taken.

That advisory committee meeting marked the beginning of a critical self-review. How could I, as a technical college instructor, meet this challenge? Next year I was scheduled to teach a section of the Instrumentation program I had never taught before. Perhaps I could use this opportunity to try new ideas, with the ultimate goal of creating independent learners . . .

Review and preparation

In preparing for this new teaching assignment, I had two major goals:

- Develop a curriculum to teach students how to teach themselves.
- Organize the curriculum into "modules" for short-term industry training.

Up to this point, our main focus in the Instrumentation program had been to educate new students, but we realized there was an untapped market in our area for continuing education of industry professionals, and that we might better serve this market if our curriculum were divided into segments suitable for delivery in the form of short-term training sessions. Thus, one of my tasks in preparation was to "modularize" the content of our program to meet this industry need.

It took a few weeks of effort before I realized these two goals were mutually exclusive. Industry training, at least in its popular form, is roughly based on the model of a fire hydrant: sit in front of it, open the valve, and take a big drink. Due to time limitations, trainers present information at a rapid pace, with participants retaining only a fraction of what they see and hear. What knowledge they do gain seldom passes on to co-workers after the training session, and is forgotten almost as rapidly as it is presented, necessitating continual re-training. While working as an Instrumentation professional, I attended many training sessions, witnessing the inefficiency of the process firsthand. I have never seen a case where trainees leave a training session with increased skills as independent learners. Quite to the contrary, training sessions condition the trainees to become more dependent on the training cycle by forcing them into the role of a passive recipient. They often leave with the impression of the instructor being something of a genius for being able to present so much information so quickly, and instilling within their own minds a sense of inferiority for not grasping all of it at the delivered pace.

It also dawned on my reluctant mind that our pedagogical model at the college was based around this same "fire hydrant" methodology: present an incredible amount of information in a short time, and hope that students retain at least some of it. As bad as this philosophy is, it makes perfect sense why it is this way. One reason is that vocational instructors are typically ex-industry professionals, indoctrinated in this method by years of short-term training. They teach as they have been taught. Secondly, knowledge-specific learning outcomes – written as long lists of specific subject areas and skills – are most efficiently dispatched in this rapid-fire format. Not that students will actually retain all these things as they are presented, mind you, but an instructor faced with a long list of topics to cover is tempted to present them as quickly as possible due to time constraints.

Meanwhile, amidst these disheartening revelations, I had to prepare myself for the year ahead. There were many areas of subject matter in which I needed refreshing, and some areas I never learned well at all from my own college education. I knew what I had to do: research these subjects, work through example problems, and study until I became as proficient as I needed to be in order to teach it.

I also knew the specific subjects I had to learn (or re-learn, as the case may be): the long lists of outcomes in our syllabi showed me that. What did I do to learn? Simple: I would challenge my existing knowledge of a subject by trying to apply it to real-world conditions and/or "thought experiments." If I didn't know enough about a topic to successfully apply it to a realistic problem, I would research and study until I did. If ever I was completely baffled by a problem, I could determine my own conceptual weaknesses by incrementally simplifying the problem until I *could* solve it. Whatever complexity I eliminated from the problem that enabled me to solve it was where my understanding was weak.

In doing this, it occurred to me that I was applying self-teaching methods, and that these skills were never directly taught during my years of formal education. As a student, I discovered I could learn by challenging myself with questions. These might be problems supplied by the instructor, textbook exercises, or questions arising from my own curiosity. If I could not answer these questions, then I knew my knowledge

was incomplete. Once I knew what I didn't know, I not only knew where to focus my study efforts, but I also felt more motivated to study because I could perceive my own needs.

Being a technical person, I often relate aspects of my experience with engineering principles. Here, it became evident to me that the process of instruction involves a *feedback loop*. A students' knowledge is assessed by comparison with a standard, then corrective means taken according to the degree of disparity with that standard. In traditional modes of instruction, this feedback loop is external to the student: the instructor assesses the student's mastery of a subject through tests and dispenses correction in the form of targeted teaching commensurate with the student's needs. In group-learning processes, this feedback loop is still external to the student, but brought to a more personal level by the involvement of peers: students help each other assess mastery of a subject and collectively strive to fill whatever knowledge gaps exist. For true self-instruction to occur, however, the feedback loop must be internal to the student, so that a student assesses their own subject mastery and plots their own course of correction.

I came to be a self-directed learner out of frustration: my teachers' instruction rarely met the demands of my curiosity. Being a naturally curious person constituted the first half of my internal feedback loop: it was natural for me to realize my own ignorance. I would constantly ask, "How?" and "Why?" when presented with new facts, especially if those facts contradicted what I thought I already knew. The remaining half of the feedback loop (filling the knowledge gaps revealed by self-inspection) developed with the help of perceptive teachers encouraging me to seek answers on my own.

If my students were to ever become self-teachers, I knew I would have to foster this internal feedback loop in every one of them. It seemed best to do this by providing lots of stimulating problems and scenarios to pique their curiosity, and provide resources for them to discover their own solutions. To this end, I started writing a series of modular worksheets organized by topic, each containing questions and sample problems designed to lead students into an understanding of the subject. I would arrange these questions in Socratic sequence (one question logically leading to the next), prodding the student to think deeply and critically. My goal was to cover every single subject in the curriculum in the form of questions. Each worksheet would also contain an "answers" section, with just enough information given in each answer to let the student know whether he or she was on the right track, without betraying the process of solution or the source(s) of information. To make things realistic and interesting, I would structure many of the questions loosely enough to support multiple correct solutions.

To better simulate real-world learning, I would not assign reading for my students. Reading would happen naturally in the course of finding answers to these questions. The campus library would become our second classroom, where students would research together. After researching, we would discuss answers, problem-solving methodologies, and sources as a group. My input as the instructor would be for clarification only, and my primary task would be to ensure that each student was learning to learn. Ultimately, my students would know it was *their* task and *their* responsibility to master the subject matter.

Rejection and re-focus

On the first day of class, I described Sam's challenge to teach students to be self-teachers, and how this new inquiry-based learning method would be the main tool for doing this. My students were genuinely excited about the idea. They immediately recognized the value of being able to teach themselves, and how this would prepare them better for the real world where they would no longer have me as an instructor telling them what they needed to know.

The first few weeks went well, with students eagerly researching the material, but then the enthusiasm began to dwindle. Then one day, I was approached by five of them for a private discussion.

"Tony, we would like to talk to you this new learning method," the leader of the group said. "We don't think it's working very well, and we want to go back to the way you used to teach." I was surprised. Of course, I knew a change like this would take some adjustment, but I didn't expect anyone would dare suggest the "fire hydrant" method was worth returning to. What about the goal of learning to become self-teachers? What happened to the recognition of this as the highest end of education?

"Well," I said, "perhaps we can improve the way we're doing things here so that it works better. I still feel strongly that you need to learn to become self-teachers above all, and that the old way of doing things does not accomplish that goal."

"I don't think learning to teach yourself is that important," one student said. "After all, at work there will always be someone to help you out if you don't understand something. That's the way it is at my job." I couldn't believe my ears. Had this student been asleep in class when we discussed the rationale behind this new method of learning? Had I not been clear enough on the advice of the advisory committee members, or on the lessons learned from my own work experiences?

I replied that this skill *was* important, and that we just needed to find a better way to teach it. If the present method was not accomplishing the goal, perhaps we could look for another way . . .

"Bottom line," the student said, "is that I like your old way of teaching much better, when you explained everything in detail for us. *If I'd wanted to study, I would have gone to a real college, not a two-year school like this.*" His four companions all nodded in agreement.

In my mind, all I could think of was the "Dilbert" comic where Alice resists her desire to punch the pointy-haired boss for some act of managerial ineptitude: *must . . . control . . . fist of . . . death*!

With all the composure I could muster, I replied that I would thoughtfully consider what was said, and that we would discuss this matter with the whole class the next day. For the rest of that day, I considered my students' words. Despite their undeniable frustration at the current state of things, I knew they were absolutely wrong in one important regard: becoming independent learners is not just important, it is *all*-important.

Recalling classes from years past, I could see the results of "fire hydrant" education in the poor retention of knowledge throughout a student's tenure at our college. I knew that many students never bothered to read their assigned texts because they knew I would tell them what they needed to know during lecture. I also knew that some students feigned ignorance during their lab time in order to obtain help from me, because they didn't want to do the hard work of learning themselves. While this new learning process doubtlessly needed some fine-tuning, the real objection here was not the method, but rather the radical idea that learning might require significant effort on their part.

But, alas, I had little reason to be upset. My students were young, and their attitudes had been rewarded by a full year of "passive" instruction where I labored to make the learning process easy. Their reluctance to work was something I had actually contributed to, and it was my responsibility to repair the damage.

The next morning I wrote a summary of my thoughts and feelings on the subject, in preparation for discussion. Here is an excerpt:

> Recently, I've received feedback about how the research-based learning process is working (or not working). Some of this feedback has been constructive, and some has not. In order that everyone understands what constitutes "constructive feedback," I present the following definition. In order for feedback to be constructive, it must address this fundamental question: *How do we improve the quality of education in this program, to address its present shortcomings, and to meet as best as possible the stated goals of the program's advisors?*

> All other concerns must be subordinate to this primary goal. Such concerns include:

> - How hard you must work.
> - How hard anyone else must work.
> - Your expectations of teaching style (from having me as your instructor last year).
> - Expectations that this school should be something less than a "real college."

> With all due respect, if developing your research and critical-thinking skills means you have to study more than you're accustomed to, so be it. If it means you might have to work harder than students in another class (who learn under a more traditional lecture model of education), so be it. If it means I won't be teaching in the same style as the previous year, so be it. And if it means that this institution starts to feel more like a college than a high school, then it's about time: so be it.

The students received the message better than I had hoped. They knew I would not go back to the way things were, and that their only option was to work with me to find a solution to the dilemma. I proposed

that we modify our research/discussion time schedule to provide faster "turnaround" and more immediate feedback, and the change was accepted without complaint. Also, I resolved to become more pro-active during my students' research time: rather than wait for them to ask for help, I would actively monitor their study and discussion, offering assistance when needed.

I am still fine-tuning this instructional method, but am happy to say that it works well. My students now do far more research and study on their own than ever before when I taught in a lecture-based format. This has resulted in students approaching me with far *better* questions than ever before, with a higher quality of classroom dialogue. On occasion when I have been absent from class due to illness or special assignments, the students were able to learn the material without the guidance of an instructor (although we all prefer it when I am present). My students frequently surprise me with the depth of their insight gained from serious research and consideration of the subject matter. It is not uncommon for even some of my academically weaker students to generate observations and analyses beyond what I had considered when writing the worksheet questions!

It is encouraging to see students take initiative to research solutions to problems rather than come to me and ask. The latter still occurs, but not nearly as often as when I taught in a more traditional format. When faced with contradicting research results (i.e. different sources of information telling them different things), they use the discussion time to determine which of the sources is probably more reliable, and gain an overall understanding of the subject that is much deeper than if I were to simply give them my interpretation, formerly regarded as the absolute, authoritative, and singularly "correct" answer.

In summary, it *is* possible to teach students to teach themselves, and they will benefit tremendously from having gained both the skill and the habit of doing so.

Vital principles

While the specific method I use is not the only way to teach students to teach themselves, I do hold certain elements to be essential for any learning-to-learn educational method:

(1) People learn best by doing. Therefore, students must be placed in an active rather than passive role whenever possible.

(2) Self-teaching must not merely be an option or an alternative, but rather an integral part of the curriculum. It takes more effort to teach yourself than it does to passively receive information from someone else. Correspondingly, people are loath to choose the more difficult path over the easier path, and therefore must not be given the easier path as an option.

(3) It is not helpful to assign active research and problem-solving work as supplementary activities. In order for students to see the value of self-teaching, it must be central to the curriculum, not peripheral. When research projects are merely tangential to instructor-led learning, students perceive the exercises as unnecessary, and much of the value is lost.

(4) Assistance must be available at every step of the process to help students learn, or else they may become frustrated. This assistance must also follow the same "active" mode as the rest of their learning. When a student requires assistance in researching information or solving a problem, lead them to the answer(s) they seek by asking questions and involving them directly in the discovery process. Dispense direct instructor-to-student transmission of knowledge like a doctor would prescribe cortisone: with caution, knowing that it is highly effective for specific problems in the short term, but crippling if used over an extended period of time.

(5) Assessment drives any educational process. And, if people learn best by doing, then they are assessed best by doing as well. Tests given on an abstract level do not assess true learning (i.e. a written exam on the subject of electric circuit theory tells you little about a student's ability to apply that knowledge to a real electric circuit; an in-class test on mathematical averages does not assess whether or not a student can actually calculate the average daily temperature of their city from last week's weather reports). Furthermore,

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performance-based assessment is inevitable. Whether or not this happens in the classroom is an option, but either way students *will* be assessed by their performance in the real world. Would we rather assess their performance while they're still students, or let the day after graduation be their first real test?

(6) Students engaged in a self-teaching process need to be assessed on their critical thinking skills and self-teaching ability, not just on the subject matter of their study. Projects and reports work well for this purpose, and also lend themselves to peer review.

I would like to see the goal of "students becoming self-teachers" printed on the mission statement of every school at every level in the educational system, and to value that goal as more than ink on paper. All courses can and should teach students how to learn, and be accountable to this goal by directly assessing each student's self-teaching ability. I would like to see educators everywhere adopt the attitude of *teaching to obsolescence:* where the ultimate goal is to produce graduates no longer dependent on the services of a professional instructor, because they can teach themselves.

Imagine if this same philosophy were applied to continuing education as well. How much more effective would it be for employees to attend training seminars where their role was just as active as the instructor's, where they left the session not only with new knowledge, but also an improved ability to teach themselves what they need to know? This would significantly raise the practical value of training (return-on-investment), and in doing so provide more incentive for business owners to invest in their employees.

In summary, I believe it is our primary goal and responsibility to teach people to teach themselves, and that many traditional modes of education fail to achieve this. I am neither suggesting that all traditional pedagogy be abandoned, nor that this particular method is the best way to teach. However, we must recognize that the vast majority of students never learn how to teach themselves in formal educational settings, and that addressing this problem begins with a fundamental reassessment of our roles as educators. Changing the status quo is not impossible, but it requires a very different mind-set from what we might be accustomed to, most certainly from those who look forward to attending a post-secondary institution that is anything less than a "real college."

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