

*Career Development, Education,
Training & Certification*
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Progressive Insurance
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The Key Assertions

1. *IT employment is very robust*
2. *Software testing is at the intersection of several crossroads. The question is not how we can become more technical, it is how we can become more effective.*
3. *Effective retooling may or may not involve becoming a (junior) programmer.*
4. *Commercial short-courses are not well suited to developing new skills.*
5. *Current certificates in software testing offer little value.*
6. *In-house training can be much more effective, and I have an approach that might help make it more practicable.*

IT Employment

- *Unusually high employment (1997-2000) in Silly Valley and in computing generally*
- *Then we had a perfect storm . . .*

IT Employment

- *Year 2000 caused \$650 billion in IT-related spending (but that ended in 2000)*
- *Microsoft was allowed to eradicate its main competitors*
 - *(Remember when you used to look forward to cool new features in office products? Why do you buy or upgrade today? Security fixes?)*
- *Laws changed, eliminating software vendor liability to customers, making the marketplace more cautious*
- *Some dumb ideas got funded in 1996-2000 and failed.*
- *Massive shareholder fraud scandals scared the securities markets and helped dry up venture capital as it was coming back from Y2K / dot-bomb.*

So, we had a couple tough years

- *What's the industry actually looking like today?*
 - *It's harder to get a job in software publishing*
 - *Not many people are getting rich quick with golden stock options*

But 97% of IT graduates get jobs in their field (Industry Canada)

90% of them full-time

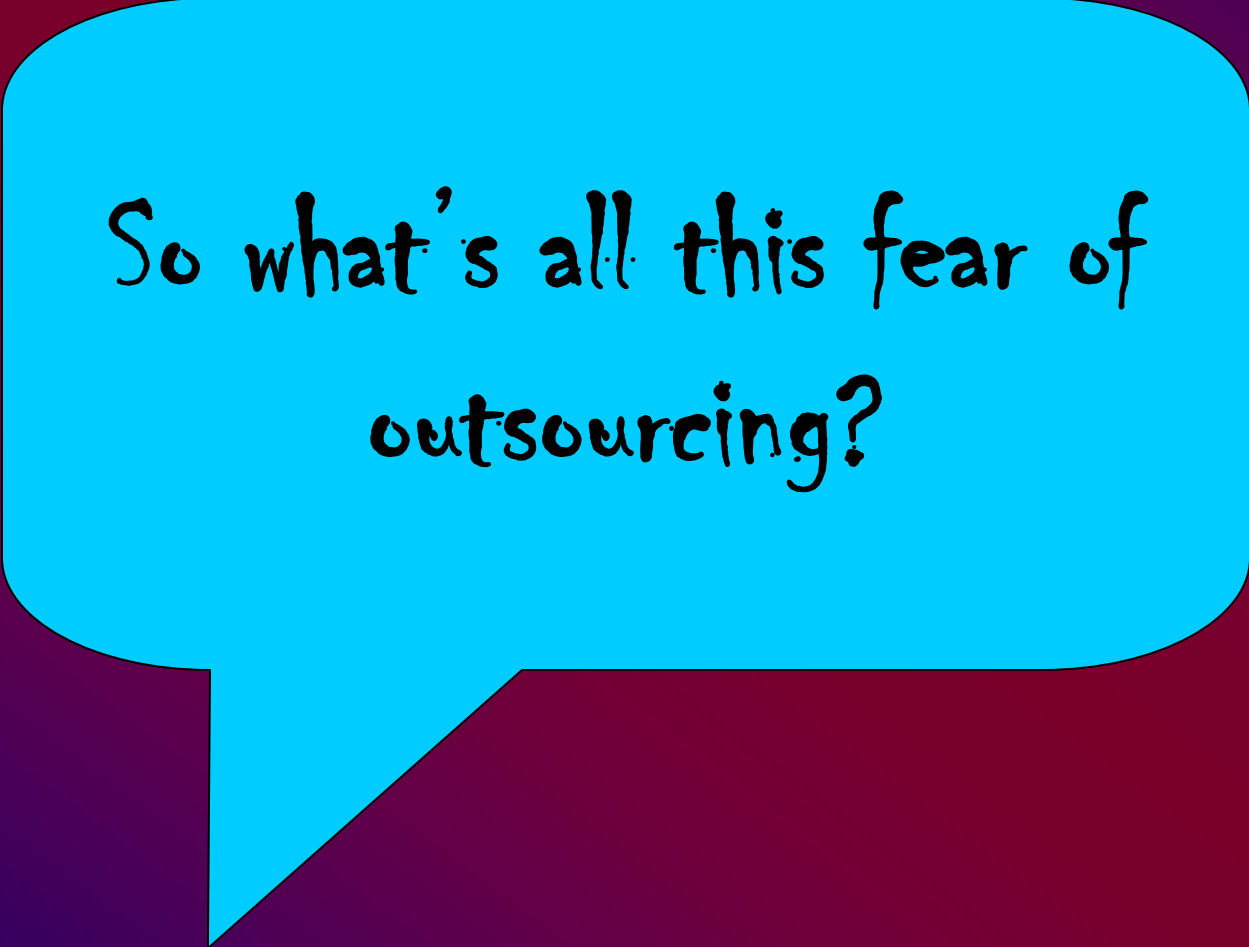
IT Employment

*Do you have a
shortage of work at
Progressive?*

IT Employment

- *Companies like Progressive need software-related services in order to run their business.*
- *Working for Progressive isn't as high-profile as working for a software publisher*
 - *because what you do supports the operation of the business*
 - *instead of being the product of the business.*
- *You don't get to be prima donnas.*
- *You just get good jobs that pay well, doing stuff that your employers (and their customers) really need*
 - ... *and you don't have to work 80 hours per week*

IT Employment Should Be Healthy



So what's all this fear of
outsourcing?

IT Employment

- *Peter Drucker (in Managing in the Next Society) stresses that businesses should*
 - *Manufacture remotely, but*
 - *Get their services locally*
- *The local service provider is:*
 - *More readily available*
 - *More responsive to the changing needs of the client*
 - *More able to understand what the client needs*

The cost of bad services is typically much greater than the savings from paying less for them.

IT Employment

So when do you break
even on remote services?

IT Employment

- *Possibilities:*
 - *Local services are*
 - *too busy*
 - *unresponsive to changing needs*
 - *inattentive to the particular needs of this client*
 - *Or, Remote services are*
 - *extraordinarily skilled*
 - *managed in a hybrid (local/remote) package that puts local representatives onsite and adjusts offsite on the request of the local*
 - *Or, Executives are irrational*

IT Employment

- *Some executives are irrational, but there are rational outsourcing enthusiasts*
- *Local service provider:*
 - *IEEE standards, CMM, ISO, the many heavyweight process models shift the business practice of the service provider toward a manufacturing style.*
 - *The more you invest (enormously) in that infrastructure, the easier it is to offshore the work*
 - *Not because the offshore is a good choice*
 - *But because the local service is no better.*

IT Employment

- *The heavyweight processes have never been our friends, because they offer so little benefit at such a high price.*
- *Today, they are even less desirable:*

If you're going to get poor service anyway...
You may as well get it cheaply.
Welcome to outsourcing.

IT Employment

- *There are more jobs than skilled people available...*
 - Availability,*
 - skills,*
 - attitudes and*
 - willingness to deliver responsive services*
 - are at least as important as price*
 - in fostering outsourcing.*

Whither Software Testing?

- *Most test techniques are from 1960's and 1970's*
- *Back then:*
 - *Big program was 10,000 statements*
 - *COBOL was easy to read*
 - *It was possible for a tester to read the entire program, identify all of the variables, and trace most of the key transformations from input to output in the program.*

Whither Software Testing?

- *Most test techniques are from 1960's and 1970's*
- **Today**
 - *My cell phone has over 1,000,000 lines of code (many have much more)*
 - *Programmer efficiency has increased enormously*
 - *Tester efficiency has increased incrementally*

As programs get more vast
The pool of tests we can lovingly handcraft
Diminishes, in proportion to the code
Every day.
We risk becoming irrelevant.

So, What Can We Do?

Here's a really dumb idea:

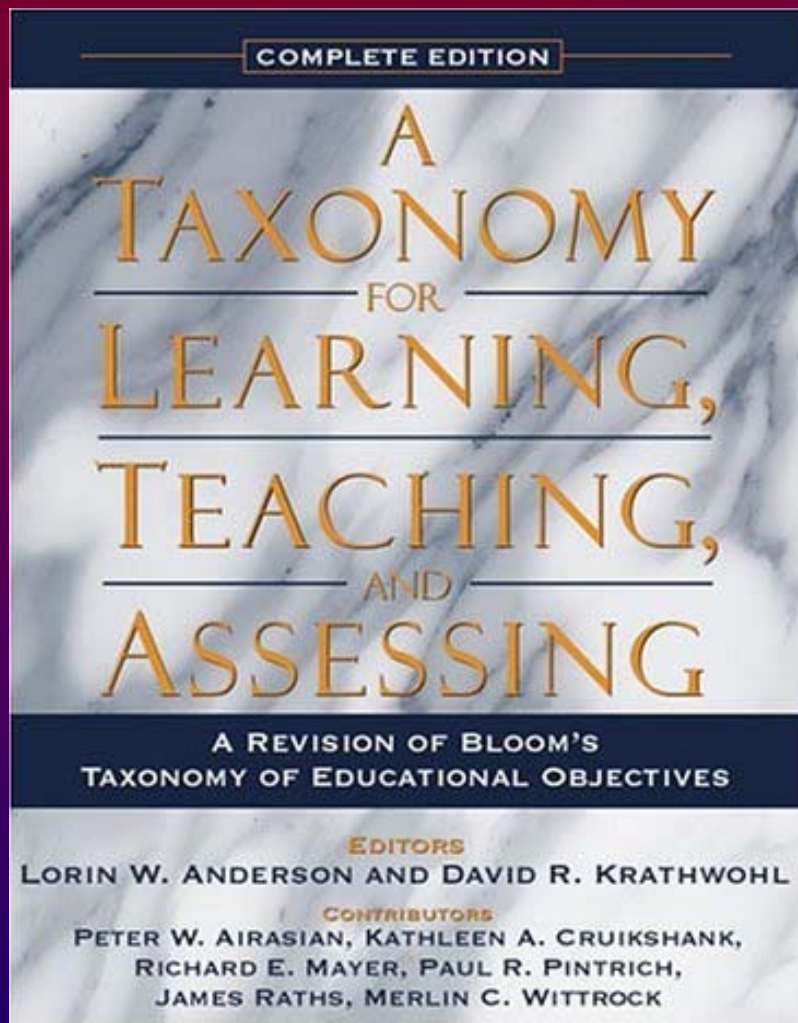
- *Maybe we should study the ideas of the 1970's even more intensely*
- *Take some courses in the traditional approaches*
- *And get certified in testing practices that require*
 - *Repeated use of the same old tests that rarely find new bugs*
 - *Automation techniques that, at best, do the same things manual testers would have done, just a bit more quickly and a bit less thoughtfully.*
 - *Intensely time-consuming documentation*
 - *Detailed (accurate) specifications from other people*
 - *Other people to grant us the independence to test however we consider appropriate*

The certification challenge, as I see it

Software testing

*is cognitively complex,
requires critical thinking,
effective communication, and
rapid self-directed learning.*

Characterizing Cognitive Complexity



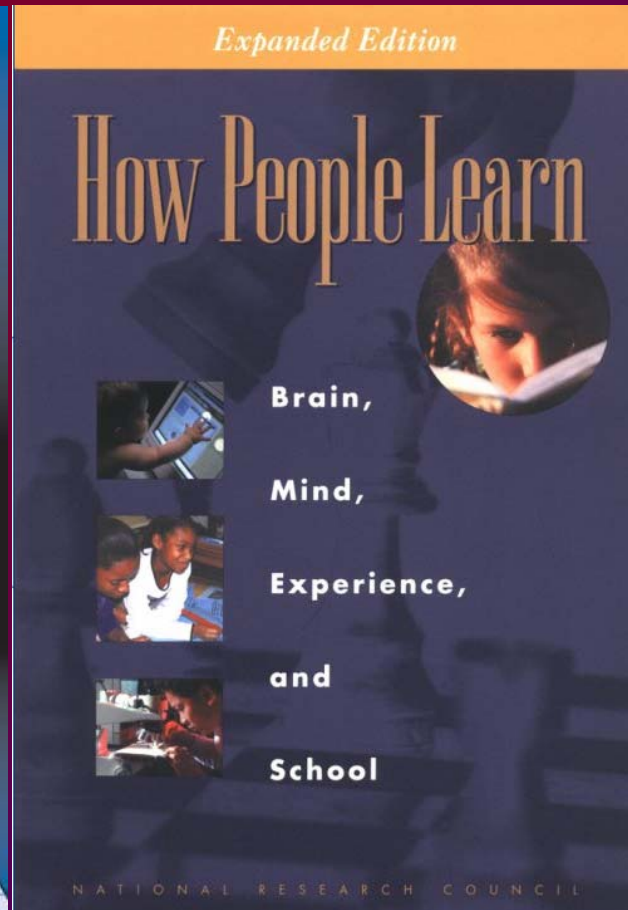
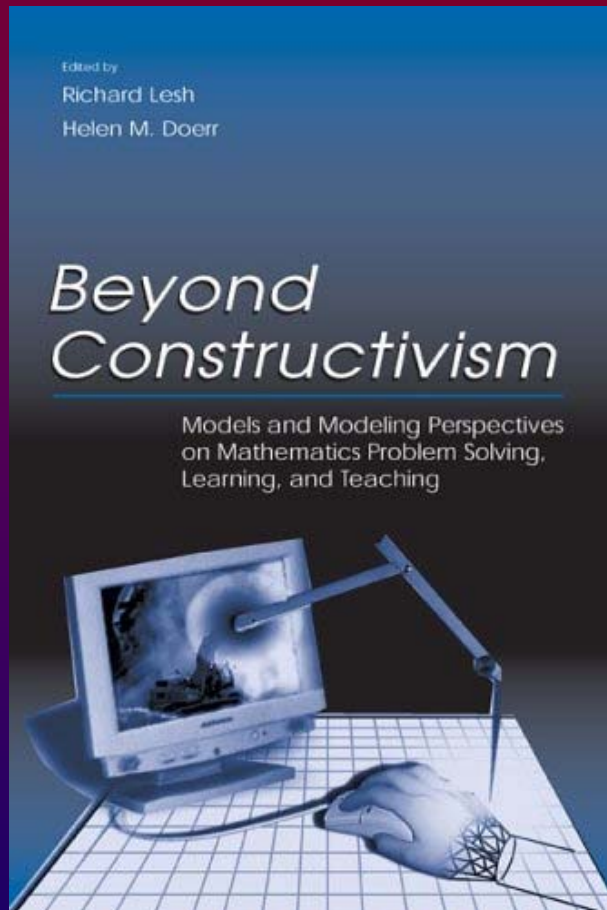
- *Anderson & Krathwohl (2001) provide a modern update to Bloom's (1956) taxonomy*

Characterizing Cognitive Complexity

Knowledge Dimension		Cognitive Process Dimension					
		Remember	Understand	Apply	Analyze	Evaluate	Create
	Factual	lecture	lecture				
	Conceptual	lecture	lecture				
	Procedural	lecture	lecture				
	Meta-Cognitive						

Anderson & Krathwohl, 2001

Transfer Problem



- In science / math education, the transfer problem is driving fundamental change in the classroom
- Students learn (and transfer) better when they discover concepts, rather than by being told them or memorizing them

Testing Certification Today

- *Certification courses*
 - *Review traditional approaches*
 - *Quickly*
 - *Often with a heavy emphasis on how to pass the test*
- *There is no time in the short course format to build effective bridges to the situations you need to transfer learning to*
- *The test is a paper-and-pencil affair*
 - *Typically most or all multiple-choice*
 - *With no test of skill*
- *How could this possibly be enhancement or evaluation of your competence as a tester?*

Let's Step Back

- *... and ask what value we offer in testing*
 - *and how to increase that value*
 - *so that we stay relevant*
 - *as software development continues to evolve ...*

But won't we always be relevant?

- *There will probably always be bugs, so won't there always be a need for skilled testers?*

There might always be a need...

But if the methods we use don't reach enough of the risks, we're not particularly relevant in practice, no matter how relevant testing is in principle.

Why do you think testing has the role that it has, in eXtreme Programming?

Software testing

- *is an empirical*
- *technical*
- *investigation*
- *conducted to provide stakeholders*
- *with information*
- *about the quality*
- *of the product or service under test*

Quality

- *is value*
- *to some person*

—Gerald Weinberg

- *Note the inherent subjectivity*
- *Note that different stakeholders will perceive the same product as having different levels of quality*
- *Testers look for different things*
 - *for different stakeholders. . . .*

What's a test technique?

Ten dominating techniques

- Function testing
- Specification-based testing
- Domain testing
- Risk-based testing
- Scenario testing
- Regression testing
- Stress testing
- User testing
- State-model based testing
- High volume automated testing

These are
10 common
Examples.

There are *many*
Others.

Test attributes

To different degrees, good tests have these attributes:

- **Power.** When a problem exists, the test will reveal it.
- **Valid.** When the test reveals a problem, it is a genuine problem.
- **Value.** It reveals things your clients want to know about the product or project.
- **Credible.** Your client will believe that people will do the things that are done in this test.
- **Representative** of events most likely to be encountered by the user. (xref. Musa's *Software Reliability Engineering*).
- **Non-redundant.** This test represents a larger group that address the same risk.
- **Motivating.** Your client will want to fix the problem exposed by this test.
- **Performable.** It can be performed as designed.
- **Maintainable.** Easy to revise in the face of product changes.
- **Repeatable.** It is easy and inexpensive to reuse the test.
- **Pop.** (*short for Karl Popper*) It reveal things about our basic or critical assumptions.
- **Coverage.** It exercises the product in a way that isn't already taken care of by other tests.
- **Easy to evaluate.**
- **Supports troubleshooting.** Provides useful information for the debugging programmer.
- **Appropriately complex.** As the program gets more stable, you can hit it with more complex tests and more closely simulate use by experienced users.
- **Accountable.** You can explain, justify, and prove you ran it.
- **Cost.** This includes time and effort, as well as direct costs.
- **Opportunity Cost.** Developing and performing this test prevents you from doing other work

Contexts Vary Across Projects

Testers must learn, for each new product:

- What are the goals and quality criteria for the project*
- What skills and resources are available to the project*
- What is in the product*
- How it could fail*
- What the consequences of potential failures could be*
- Who might care about which consequence of what failure*
- How to trigger a fault that generates the failure we're seeking*
- How to recognize failure*
- How to decide what result variables to pay attention to*
- How to decide what other result variables to pay attention to in the event of intermittent failure*
- How to troubleshoot and simplify a failure, so as to better
 - (a) motivate a stakeholder who might advocate for a fix*
 - (b) enable a fixer to identify and stomp the bug more quickly**
- How to expose, and who to expose to, undelivered benefits, unsatisfied implications, traps, and missed opportunities.*

It's kind of like CSI

The screenshot shows the CBS.com website for CSI: Crime Scene Investigation. The main navigation bar includes 'EPISODES', 'HANDBOOK', 'VIDEO', 'PRODUCTION', and 'INTERACTIVE'. The 'HANDBOOK' section is active, with sub-sections for 'EVIDENCE', 'TOOLS', and 'PROCEDURES'. The 'AFIS' (Automated Fingerprint Identification System) page is displayed, featuring a list of tools on the left and a detailed description of AFIS on the right. Below the main content, there are three promotional boxes: 'CSI HANDBOOK', 'PREVIOUSLY ON CSI: Room Service', and 'CSI: VIDEO Behind the Scenes'.

CBS.com Choose a CBS Show [Adblock](#)

CSI: CRIME SCENE INVESTIGATION
THURSDAYS 9PM ET/PT

EPISODES HANDBOOK VIDEO PRODUCTION INTERACTIVE

HANDBOOK EVIDENCE TOOLS PROCEDURES

AFIS

- Agar
- Alarm pen
- Alginate
- ALS (Alternate light source)
- Amido Black
- Ammeter
- Analytical balance
- Analytical scale
- Anechoic chamber
- Angiogram
- Autoclave
- Ballistic gelatin
- Biohazard bag
- Bloody print enhancer
- Blower brush
- Boxed reference ammunition collection
- Bromoform

AFIS

Automated Fingerprint Identification System: Computer network that scans crime-scene fingerprints and compares them with millions of prints collected by law enforcement agencies around the state, region, country, and world. A print is traced by a fingerprint expert. The tracing is then scanned by the computer, which assigns values to various features of the print. Those values are compared to other

CSI HANDBOOK
Learn more about tools, evidence and procedures used by CSIs.

EPISODES
Missed an episode? Catch up on previous stories now.

PREVIOUSLY ON CSI:

Room Service
Julian Harper (23), touted as the next Brad Pitt, is taking his bright lights moment to the max. Sex, drugs and a "High Roller Suite" are put at his disposal as he enters the ...more

CSI NEWSLETTER
Be among the first to know. [Subscribe now](#) for email updates

CSI: VIDEO

Behind the Scenes
"CSI" celebrates 100 episodes

MANY tools, procedures, sources of evidence.

- Tools and procedures don't define an investigation or its goals.
- There is too much evidence to test, tools are often expensive, so investigators must exercise judgment.
- The investigator must pick what to study, and how, in order to reveal the most needed information.

Imagine ...

- *Imagine crime scene investigators*
 - *(real investigators of real crime scenes)*
 - *following a script.*
- *How effective do you think they would be?*

We Need to Build ...

- *Skills and solutions*
- *Not more processes and scripts*

We're at a Crossroads

- *“Agile” community promotes the idea of testers joining the programming team*
 - *Abandoning the notion of a specialized testing role*
 - *They also have a role for the customer-side tester, but from their viewpoint, it's a minor one.*
 - *What role is there for you in that?*
- *At the other extreme, we see traditional approaches being heavily promoted in the context of the most successful new course marketing effort of the past 20 years (certification marketing).*
 - *What job security is there for you in that?*

Growth


- *If you were going to retool, what should you do?*
 - *junior Java programmer?*
 - *deeper black box testing skills?*
 - *deeper process management skills?*
 - *GUI test automation programmer?*
 - *toolsmith?*
 - *Ruby scripting?*

Growth in Perspective

- *Testing is a service—an investigation done on behalf of stakeholders.*
 - *What type of information do they need?*
 - *What enhancements to your knowledge and skills would you:*
 - *Enjoy*
 - *Be able to do with relatively little pain*
that would improve your ability to hunt for the information that your clients want?

Growth in Perspective

- *Maybe you should become ...*
 - *A data miner*
 - *A penetration tester (you need to know a lot about the internals of operating systems and how to debug code and read assembler to do this well)*
 - *An accountant, actuary—subject matter expert*
 - *A senior troubleshooter who does field support*
 - *A litigation support person (technical expertise support, not administrative)*
 - *A testing toolsmith*



Find your own path
To creating value for your
stakeholders.

Look for choices that will
transfer well to your next job.

What About Training?

1. *Testing is evolving slowly because there is so little educational support for it.*
 2. *University support will continue to be inadequate for the foreseeable future. Companies will therefore have to develop their own training strategies.*
 3. *Commercial short courses are often ineffective because they*
 - *try to cover too much,*
 - *at too shallow a level,*
 - *without application to the learner's specific situation,*
 - *with too little opportunity for practice,*
 - *and less opportunity for assessment and feedback.*
- *You can develop a suitable training program that integrates into your work environment at a low net cost.*
 - *The full curriculum might be broader than you first suspect.*

I have some training ideas

- *New style of instruction*
- *Videos available online*
- *Watch the video before coming to “class”*
 - *In-house, this is a short meeting*
- *In the meeting, talk about how to apply what was in the lecture*
 - *Try it out over the next week*
 - *Then meet to talk about the results*
- *Then watch the next video, and try out the next set of ideas.*

In-House Training

- *This approach takes a lot longer than 3 days*
- *But you learn a lot more*
- *And it transfers to your work as part of the process.*

- *An academic version seems to be working well for my students*

I can supply the videos and a lot of the grading notes and ideas for other activities and exercises, for free.

Source Materials on the Disk

- *Video lectures*
- *Activities*
- *Assignments*
- *Sample exam questions*
- *Some readings*
- *A little additional instructional support material*

- *James Bach, Scott Barber, Tim Coulter and I are creating a site like this at www.satisfice.com (“Satisfice University”) that will host supervised courses. (Some will cost money, others will be free.)*
- *I have a closed moodle site at Florida Tech but expect to open a public one in mid-summer.*
- *Both of these will provide access to reusable content.*