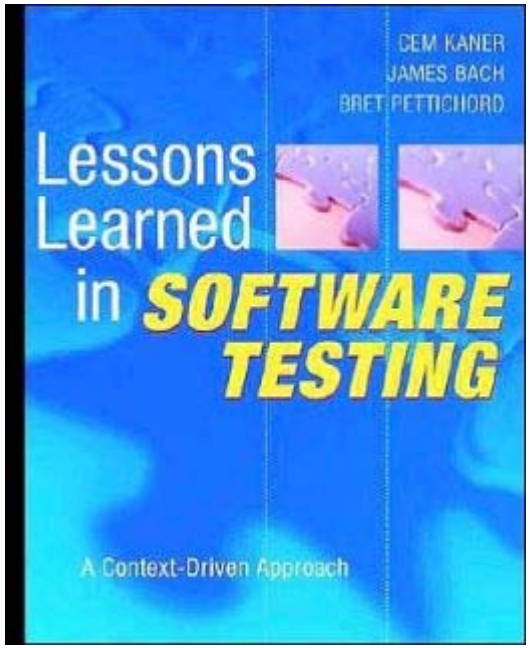
Lessons Learned in Software Testing

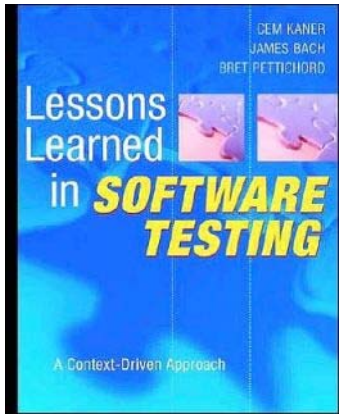


- An excellent book covering a range of testing topics
- Practical rather than academic
- In the next few lectures, we'll discuss some of the key "lessons" from this book, and how they apply to all testing efforts
  - Focus on the practicalities of testing, not the technical details: testing is more about a state of mind than a particular "kind of programming"

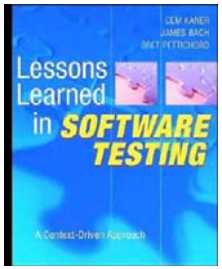
Testing: What, Not How

- The technical side of testing usually depends on what you are testing
  - To test a file system, you need to understand file systems
  - To test Java code, you probably want to know Java well
  - Test programs aren't "special" programs
    - Often just use a standard scripting language or the language of the program you are testing
- The big difference is the *goal*
  - In typical programming, you want to produce a program that, given input X produces output Y
  - In testing, there is no such simple goal
  - Many radically different solutions
    - You have to THINK *more* than in most coding

How to Test Software

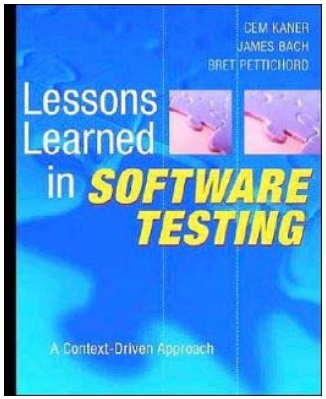


- Five major themes
  - **The testing role**
    - What does a tester *really* do?
  - **Thinking like a tester**
    - Are there differences between thinking like a programmer/developer and thinking like a tester?
  - **Testing techniques**
  - **Reporting bugs and working with others**
    - If a tree falls in the forest and no one hears it, can the bug possibly be fixed?
  - **Planning and strategy**



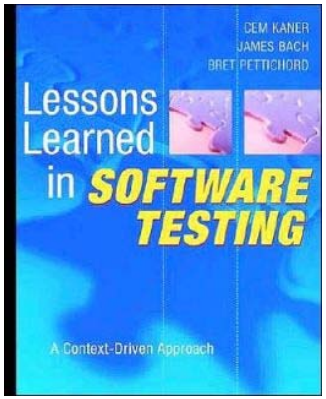
Theme 1:
The Testing Role

The Testing Role



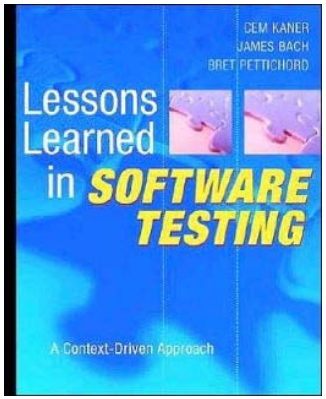
- Lesson 1: "You are the headlights of the project"
  - A software project is like driving off-road in rugged terrain, at night
  - The tester lights the way!
  - Testing is about *finding information*

The Testing Role



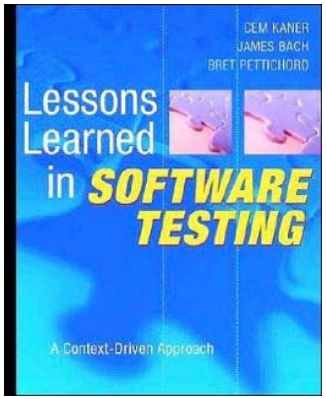
- Lesson 2: "Your mission drives everything you do"
  - Testing depends on the project
    - Goal could be "find every bug, at any cost"
    - Or "satisfy this FAA requirement"
    - Or "knock this into shape for beta release"
    - Or "keep costs minimal without making the initial version too embarrassing"
    - Or "find out if this program we're considering buying is worth paying for"
    - Or just "Satisfy the client"

The Testing Role



- Lesson 5: "Find important bugs fast"
  - In most cases, finding "killer" bugs is part of the tester's key mission
    - Test changed code before stable code
    - Test critical functions before rarely used things
    - Test for catastrophic problems before problems users can work around
    - **Test things someone will definitely care about before you test things you aren't sure anyone will care about at all**

The Testing Role

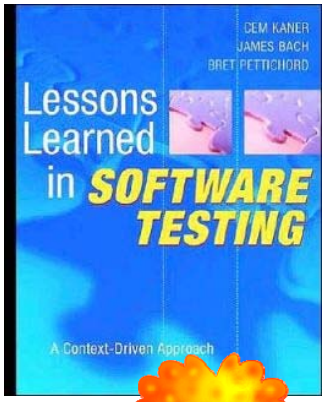


- Lesson 7: "Question everything, but not necessarily out loud"
  - Testing well requires *skepticism* and even a touch of *paranoia*
  - Being skeptical and paranoid all the time can put programmers and managers "on defense"
  - Be helpful, don't be a pest
  - Use things you keep to yourself to guide testing, though!

"Trust no one"

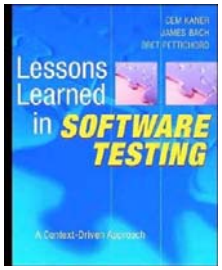
THE X-FILES

The Testing Role



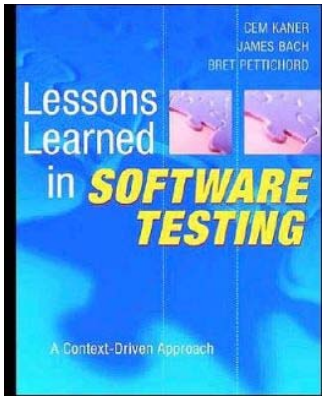
- Lesson 14: "Beware of becoming a process improvement group"
  - Tempting to say "I'm tired of finding bugs, let's make sure these clowns quit introducing so many bugs"
    - It would be nice if programmers worked more carefully, sure
    - But that's usually not your job
    - Even with management support, testing is seldom a good "home" for a development process criticism society

How testers see programmers



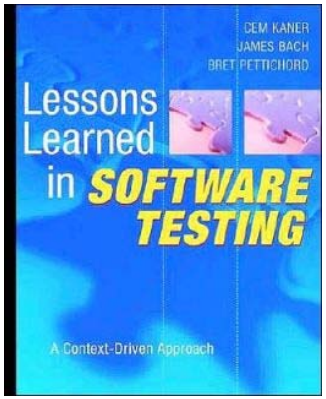
Theme 2:
Thinking Like a Tester

Thinking Like a Tester

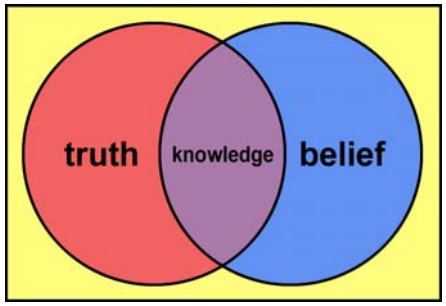


- Lesson 16: "Testing is applied epistemology"
  - What the heck is epistemology?
    - The branch of philosophy that covers *evidence and reasoning*
    - "*How* we know what we know"
  - The key questions of testing:
    - "*How* do you *know* the software is good enough?"
    - "*How* would you *know* if it wasn't good enough?"
    - "*How* do you *know* you've tested enough?"

Thinking Like a Tester



- Lesson 17: "Studying epistemology helps you test better"
  - Key topics in epistemology:
    - Gathering/assessing evidence (tests!)
    - Making valid inferences (if this works, that probably also works)
    - Justification of beliefs:
      - How do you know Antarctica is there?
      - How do you know your brakes work?
    - Avoiding fallacies in informal reasoning
    - Using knowledge to make decisions



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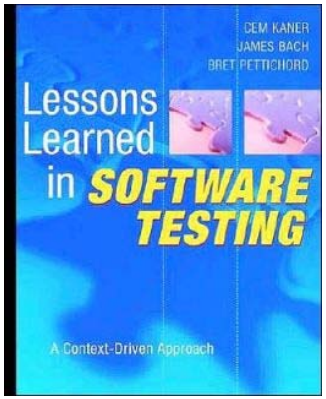
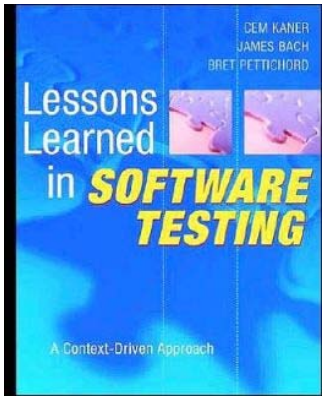


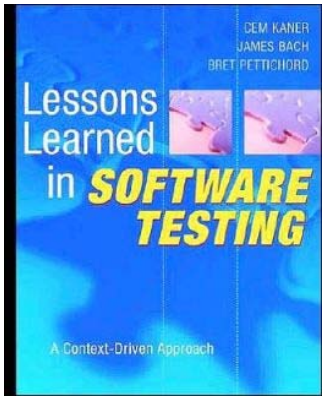
- Lesson 20: "Testing requires inference, not just comparison of output to expected results"
  - Must design tests and (usually) infer from a general spec the specific output that should result
  - There is no universal table from inputs->outputs
  - Must infer which other behaviors are "also tested" by each test

Thinking Like a Tester



- Lesson 22: "Black box testing is not ignorance-based testing"
  - Requires *lots of knowledge:* of requirements, environment, configurations, data accesses, software this program works with, and of users
  - Just avoids building tests based on the source code as the primary source of test ideas
    - After all, to some extent the programmer can do that better, in unit tests

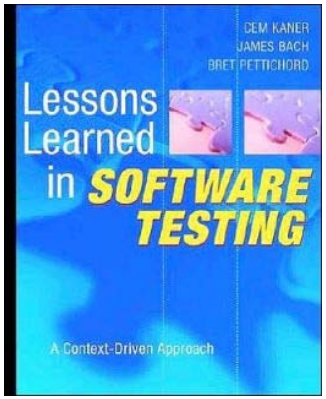
Thinking Like a Tester



- Lesson 24: "All tests are an attempt to answer some question"

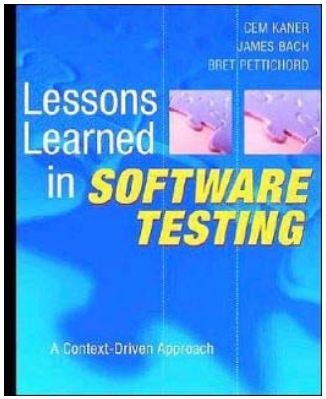
  - Epistemology again
  - If a test doesn't answer any interesting questions, it probably isn't worth running
    - Caveat: automatic generation may produce a huge number of tests where each in isolation is likely "useless" but the entire set of tests is highly effective
  - When manually testing, or scripting a specific test, think about (1) the question and (2) how to interpret the answer (are there ambiguous responses?)

Thinking Like a Tester



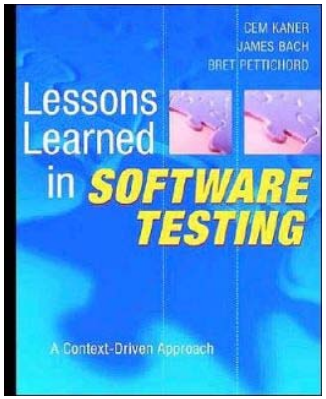
- Lesson 25: "All testing is based on models"
  - You have some model of what the software being tested should do
  - You may have an explicit reference model
  - You may model the various components and how they interact
  - You very likely will model the *user* of the software!

Thinking Like a Tester



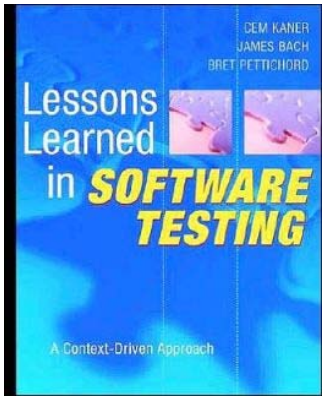
- Lesson 33: "Use implicit as well as explicit specifications"
  - Almost all software systems have (highly) incomplete specifications and requirements
  - You're going to have to decide what the software "should" do in cases that are not specifically addressed
  - Use common sense, general notions of software safety, security, reliability, and usability
  - Use *domain knowledge* of whatever the software is actually for

Thinking Like a Tester



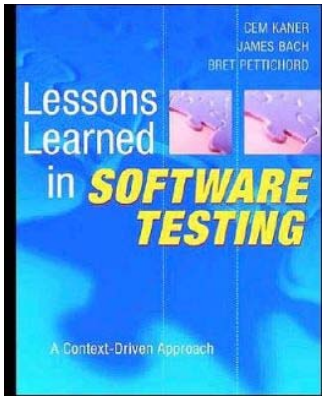
- Lesson 38: "Use heuristics to quickly generate ideas for tests"
  - Test boundaries & corner cases
  - Test error messages/conditions
    - "Rip out the hard drive, unplug the network"
  - Test unusual configurations
  - Run the tests that are annoying to run
  - Avoid redundancy, do not duplicate
    - For some critical conditions, automation's cheap and you're not sure it's totally redundant, try lots of small variations

Thinking Like a Tester



- Lesson 41: "When you miss a bug, check whether the miss is surprising or just the natural outcome of your strategy"
  - Anyone can get unlucky
  - Make sure you aren't systematically going to "get unlucky" in this particular way

Thinking Like a Tester



- Lesson 45: "… avoid '1287'"
  - This lesson I've left out part of (if you want the rest, read the book!)
  - Magic numbers are bad in test procedures & test code just as in normal programming
  - Explain the reasoning behind a "test procedure" (whether for a person to follow or a machine to run) like 'Type 1287 characters into field 1'
    - Why 1287?
    - For a human: "enter a very large (>1024) characters into the field"
    - For a machine: "fieldVal = genString(largeTextSize)"