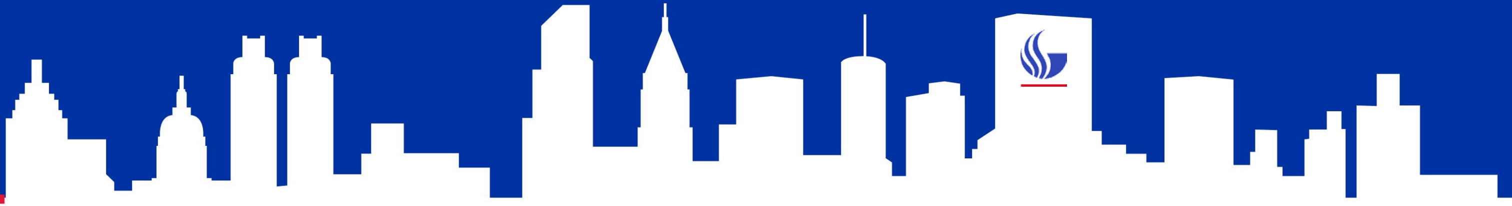
Things Software Developers Should Learn about Learning



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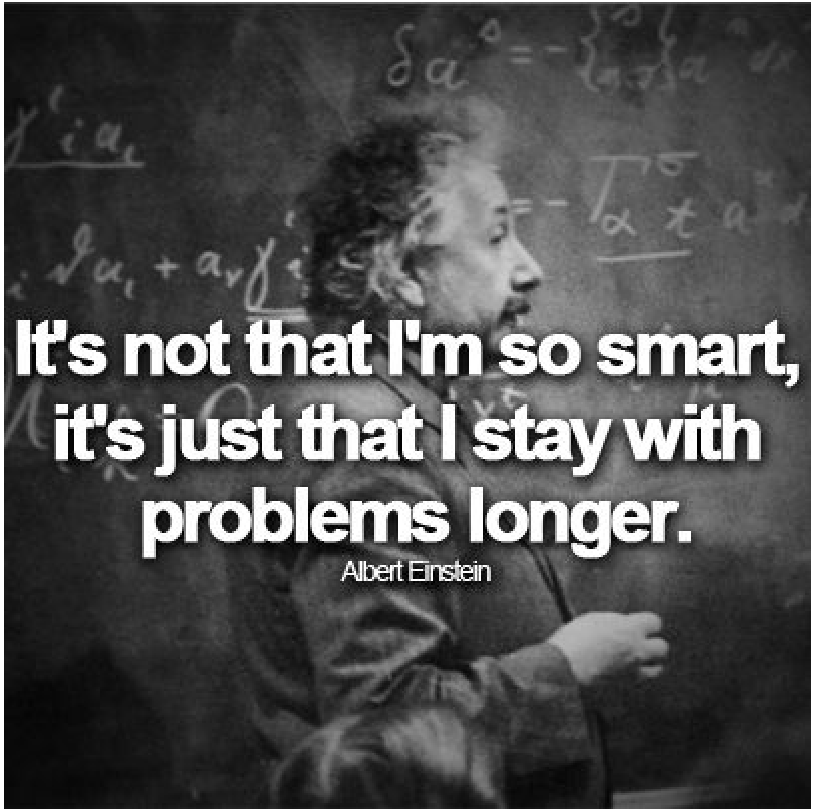
This Talk is For…

- Students and Junior Engineers
- Engineers learning new tools or skills
- Mentors
- Recruitment and hiring
- Developers of new tools

Experts Recognize, Beginners Reason

The value of expertise is pattern recognition

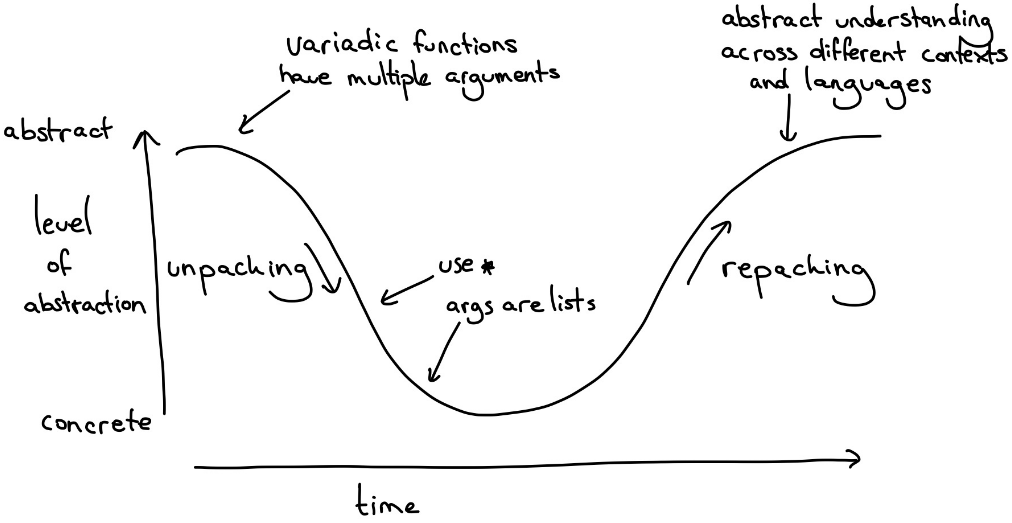
Takeaway: If beginners can't do something now, practice identifying patterns and practice the component steps to automate them


It's not that I'm so smart, it's just that I stay with problems longer.
Albert Einstein

Predictors of programming ability are unclear

- Mindset: aptitude vs. practice
- Failed predictors of aptitude
  - Prior experience
  - Personal Characteristics
  - Preferences
- Best predictors related to rate of learning
- **Takeaway:** Many perceived predictors of programming ability have no empirical evidence

Understanding a Concept Goes from Abstract to Concrete and Back

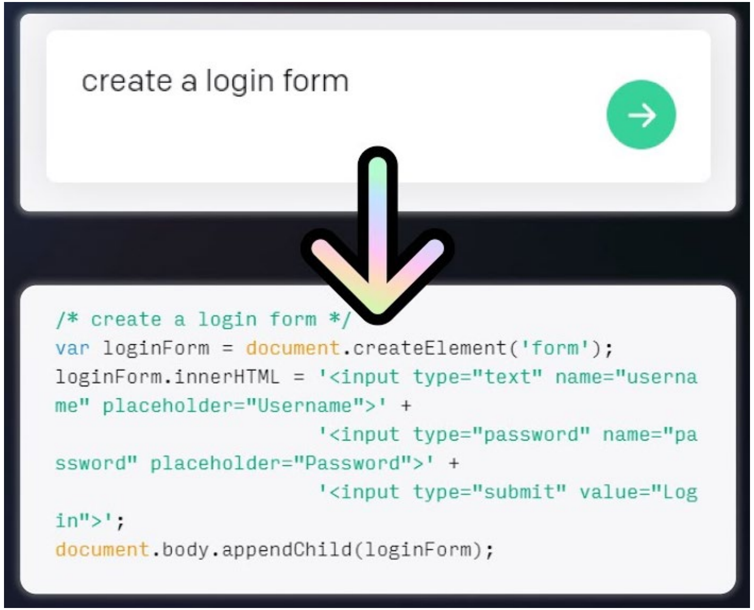


Takeaway: Cycle between abstract concepts and concrete examples to learn

The Internet and AI Have Not Made Learning Obsolete

The Internet and generative AI (OpenAI Codex, GitHub Copilot) are good at low-level details, but using them has a cost

Takeaway: Developers still need to learn the conceptual information that is offloaded to tools

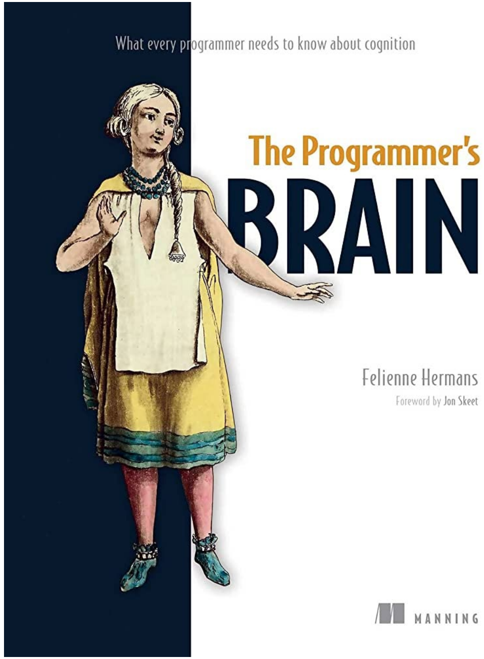


create a login form

```
/* create a login form */
var loginForm = document.createElement('form');
loginForm.innerHTML = '<input type="text" name="userna
me" placeholder="Username">' +
                      '<input type="password" name="pa
ssword" placeholder="Password">' +
                      '<input type="submit" value="Log
in">';
document.body.appendChild(loginForm);
```

What You Can Do to Support Learning

- Learners - Practice identifying and applying patterns
- Hirers – Consider how you predict programming aptitude
- Mentors - Provide concrete examples and abstract concepts
- Mentees – Aggregate examples to discover underlying principles
- Learn low-level skills before relying on AI tools



Paper coming soon to Communications of the ACM

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