Creativity, Innovation, and the New Sciences of Learning

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- Better K-12 education
- Increased Higher Education quality and funding
- Increased R&D funding
- Intellectual property protection and tax credits

Missing: An understanding of how innovation works, how people learn for creativity, and how to redesign learning environments

[1I
The Innovation Process

[2]
Knowledge and Learning for the Innovation Age

Instructionism

- Knowledge is a collection of static facts and procedures
- The goal of education is to get these facts and procedures into learners' heads
- Educators know these facts and procedures; their job is to transmit them
- Simple facts and procedures should be learned first
- To evaluate learning, assess how many facts and procedures have been acquired

The Innovative Engineer

- Deep understanding of complex concepts
- Ability to work in teams
- Ability to manipulate concepts creatively
- Integrated and contextualized knowledge
- Ability to innovate collaboratively

Teaching for Creativity

- Aim for deep conceptual understanding
- Build on learner's prior knowledge
- Encourage reflection
- Provide authentic situated practice
- Develop curriculum that is inquiry, project, and problem-based
- Assign collaborative work that is mediated by complex representations

The Key Components

- Start with a problem or design challenge
- Learners explore the problem through inquiry and discussion
- Learners work to find solutions
- The process must be guided and supported by the learning environment
- Learners create tangible products that address the problem

[3]

The Vision is Taking Shape

Computer Science “Threads,” Georgia Tech

1. Computational Modeling
2. Embodiment
3. Foundations
4. Information Internetworks
5. Intelligence
6. Media
7. People
8. Platforms

Washington University NSF CPATH-T Project

- Lectures viewed privately; classtime used for interaction, dialogue, and critique
- Shift from semesters to “modules”
- Curriculum divided between *foundation courses* and *studio courses*
- Foundations: Problem-based learning, like a study session guided by instructor
- Studios: Long-term projects, culminating in a public “show” to be evaluated by a panel

Four Challenges

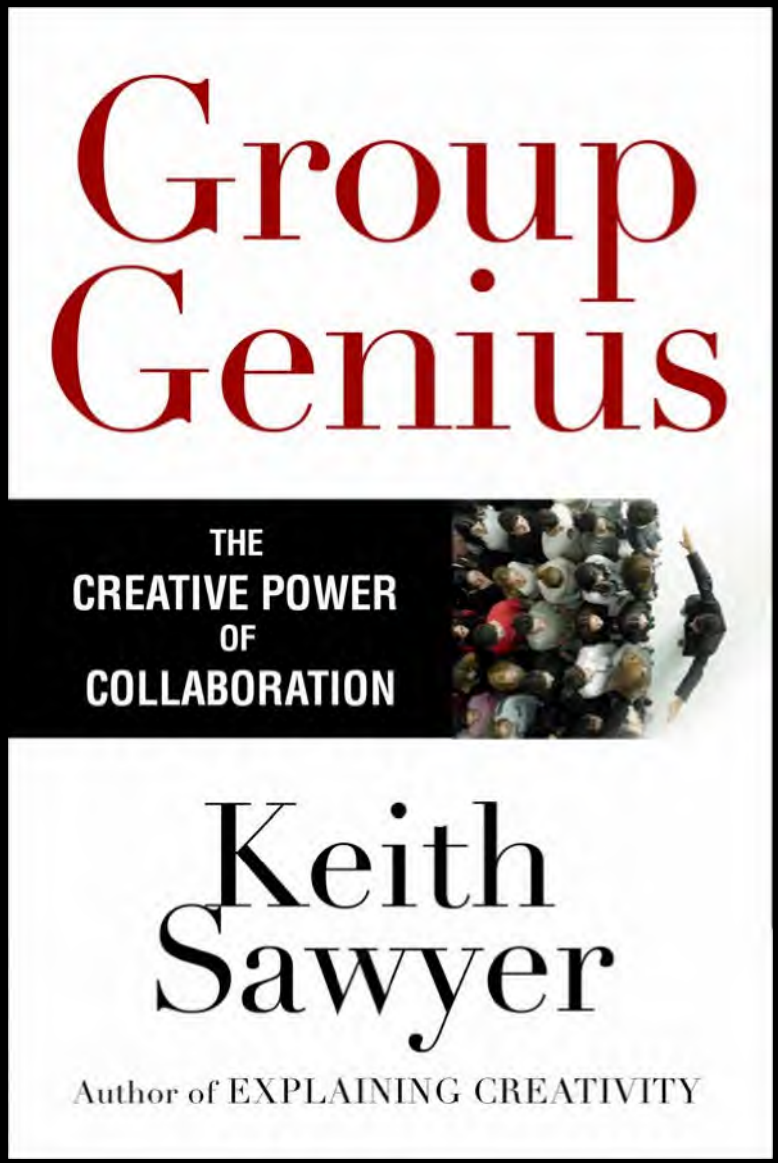
1. Identifying a good problem or design challenge
2. Support active learning
3. Fostering effective collaboration
4. Supporting the creation of shared artifacts and effective critiques

[4]
How Do We Get There?

- The innovation process is a constant combination of many small ideas;
- Each idea builds incrementally on a chain of prior ideas.
- The innovation process is accelerated in collaborative teams,
- and when ideas are shared across teams and organizations.

Collaborative Webs

- Fluid boundaries
- Flexible organizational structures
- Teams form and disperse spontaneously
- Professionals belong to multiple teams
- There is no separate group tasked with innovation



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