A Curricular Vision

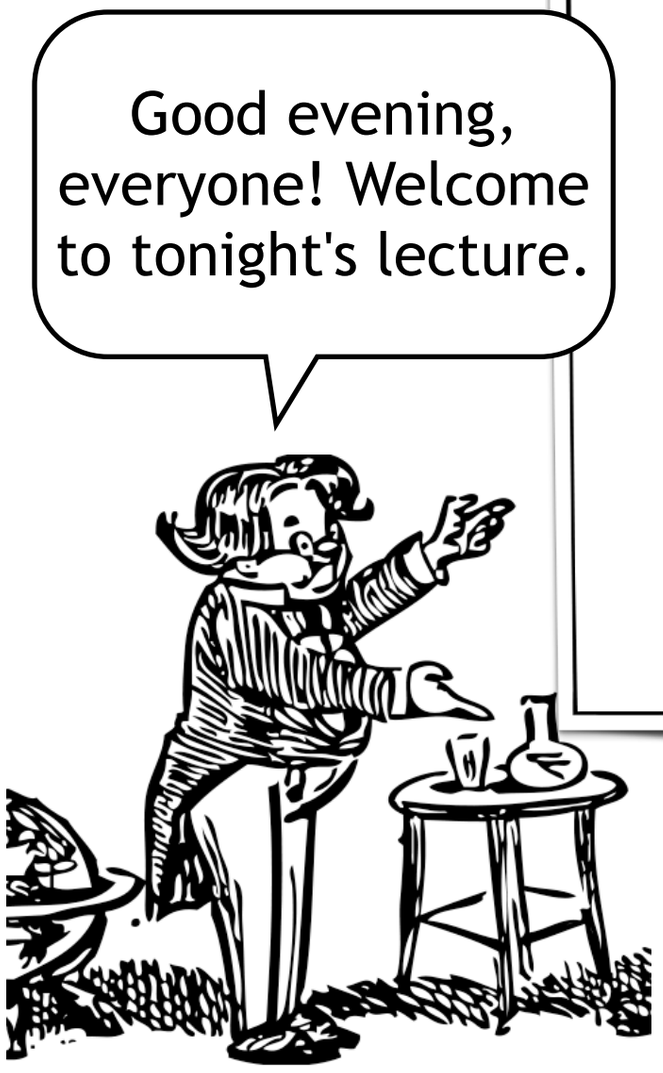
Chris Riesbeck

Northwestern University

A presentation found in a time capsule—
from the future!

http://www.futurepkg.com/shop/images/capsules/new_sally2.jpg

The Curricular Revolution: The View from Today



It may be hard to appreciate just how different education was, as late as the early 21st century.

Let me describe some of its more bizarre aspects, from curriculum to classroom.

Universities used to offer a long list of majors, like this!

- Aerospace Science & Engineering
- African American & African Studies
- Agricultural & Environmental Education
- American Studies
- Animal Biology
- Animal Science
- Animal Science & Management
- Anthropology
- Applied Mathematics
- Applied Physics
- Art History
- Art Studio
- Asian American Studies
- Atmospheric Science
- Biochemical Engineering
- Biochemistry & Molecular Biology
- French
- Genetics
- Geology
- German
- History
- Human Development
- Hydrology
- International Agricultural Development
- International Relations
- Italian
- Japanese
- Landscape Architecture
- Linguistics
- Managerial Economics
- Materials Science and Engineering
- Mathematical & Scientific Computation

http://admissions.ucdavis.edu/majors/

Majors in turn were made up of courses like this.

SOPHOMORE LEVEL COURSES

Third Semester (17 cr)

ENGR 29700 - Computer Tools for E
MATH 26100 - Multivariate Calculus
PHYS 25100 - Heat, Electricity, and
EEN 22000 - Fundamentals of Electr
ME 20000 - Thermodynamics I (3 cr

Fourth Semester (17 cr)

ECE 20400 - Introduction to Electrica
MATH 26600 - Differential Equations
EEN 24000 - Basic Mechanics (4 cr
EEN 26000 - Sustainable Energy (3
ME 32700 - Engineering Economics

JUNIOR LEVEL COURSES

Fifth Semester (16 cr)

ECE 49500 - Fundamentals of Electr
EEN 33000 - Dynamic Systems Mod
ME 27200 - Strength of Materials (4
EEN 31000 - Fluid Mechanics and H

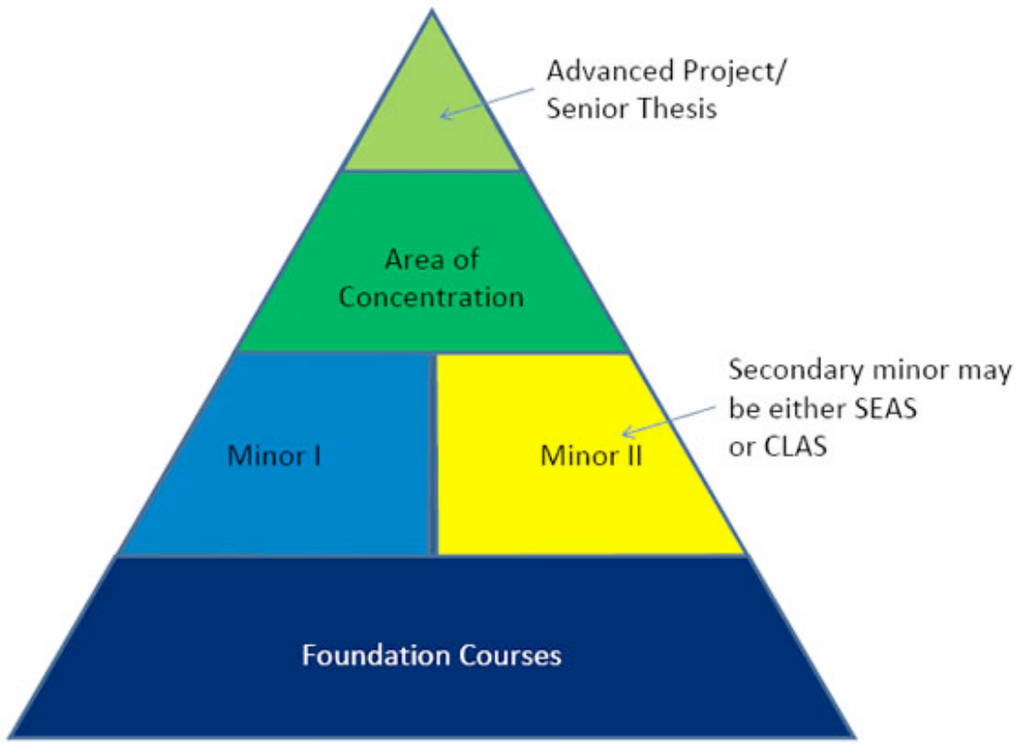
http://engr.iupui.edu/energy/plan.shtml

Recommended courses

ANAT 101	Anatomy and Physiology I
ANAT 102	Anatomy and Physiology II
BMES 680	Special Topics: CAD/CAM in Biomedical and Tissue Engineering
MATE 661	Biomedical Materials I
MATE 662	Biomedical Materials II
MEM 444	Biofluid Mechanics
MEM 478	Computer-Aided Tissue Engineering
MEM 684	Mechanics of Biological Tissues
MEM 685	Mechanics of Human Joints
MEM 686	Mechanics of Human Motion

http://www.drexel.edu/catalog/plan/mech-biomechanical.htm

Most courses taught basic theory, applied to synthetic examples.



start here!

http://www.seas.virginia.edu/acad/programs/engrsci/

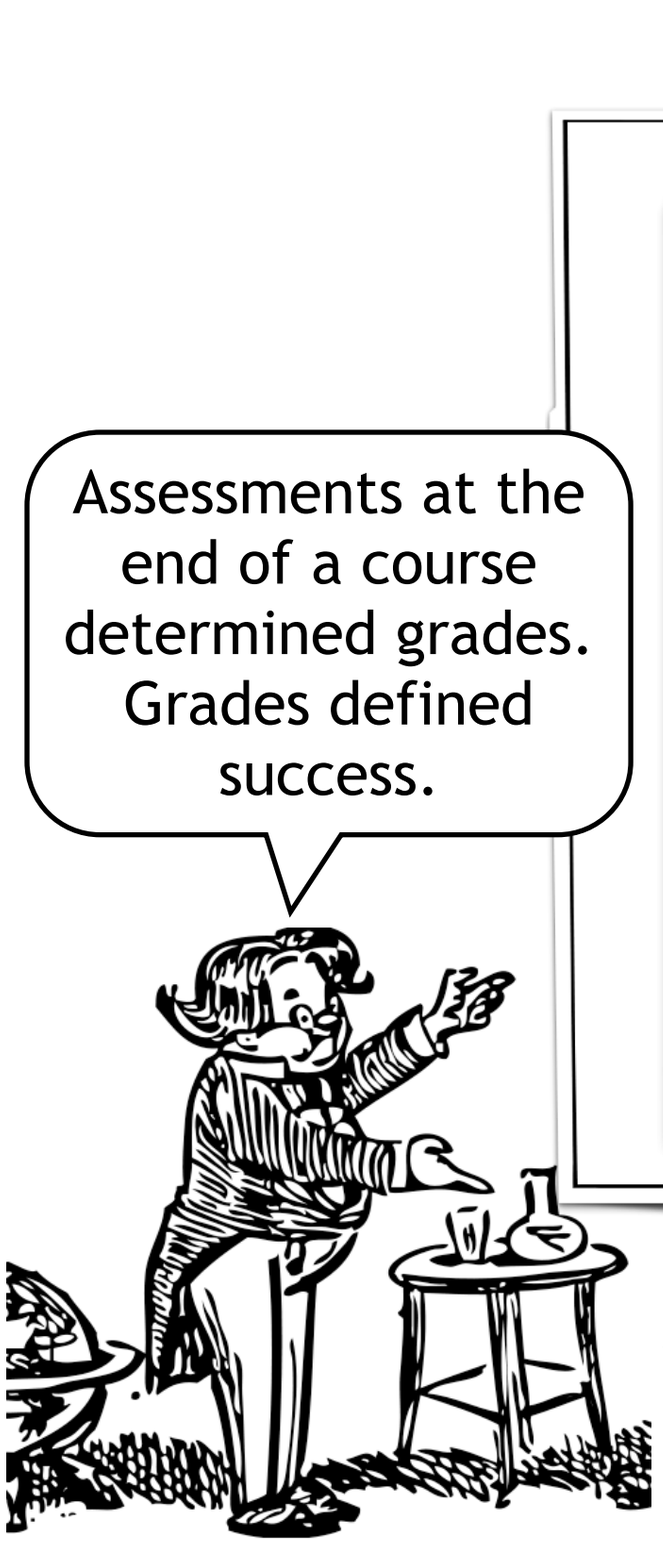
Real world practice came only after years of study.

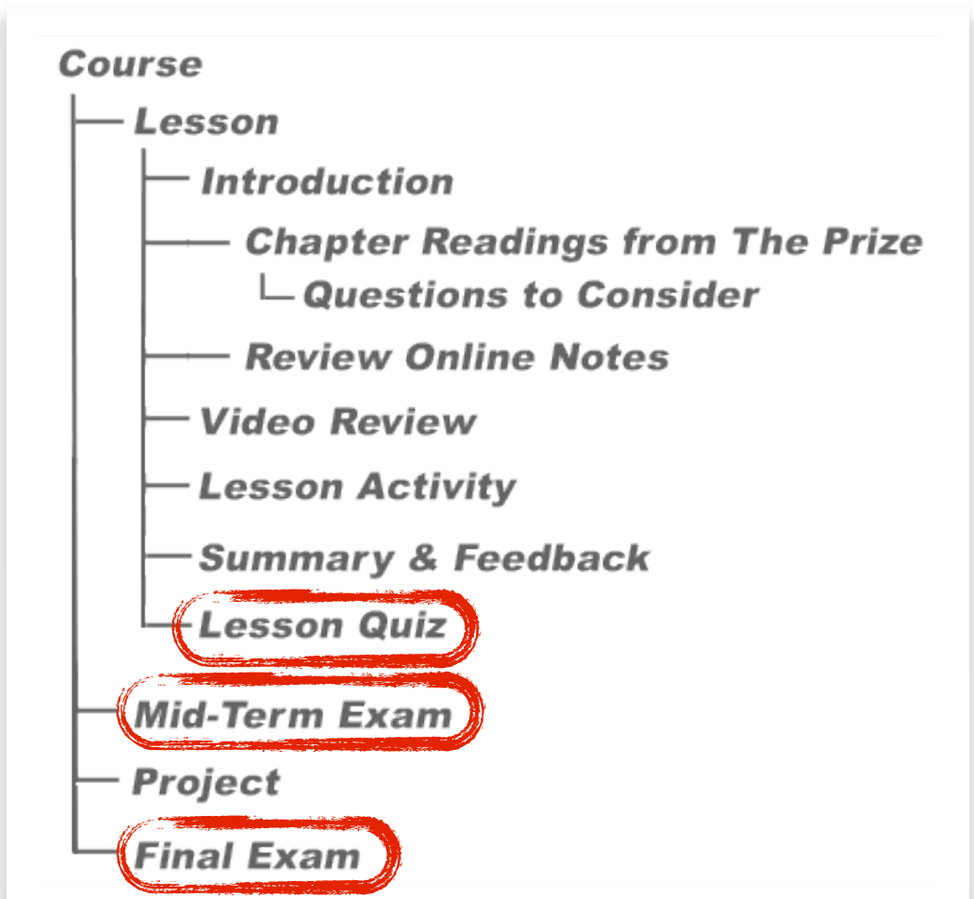
A typical class schedule: lectures, quizzes, and a final exam.

- Course
  - Lesson
    - Introduction
      - Chapter Readings from The Prize
        - Questions to Consider
      - Review Online Notes
      - Video Review
      - Lesson Activity
      - Summary & Feedback
      - Lesson Quiz
  - Mid-Term Exam
  - Project
  - Final Exam

https://www.e-education.psu.edu/egee120/node/47

Assessments at the end of a course determined grades. Grades defined success.

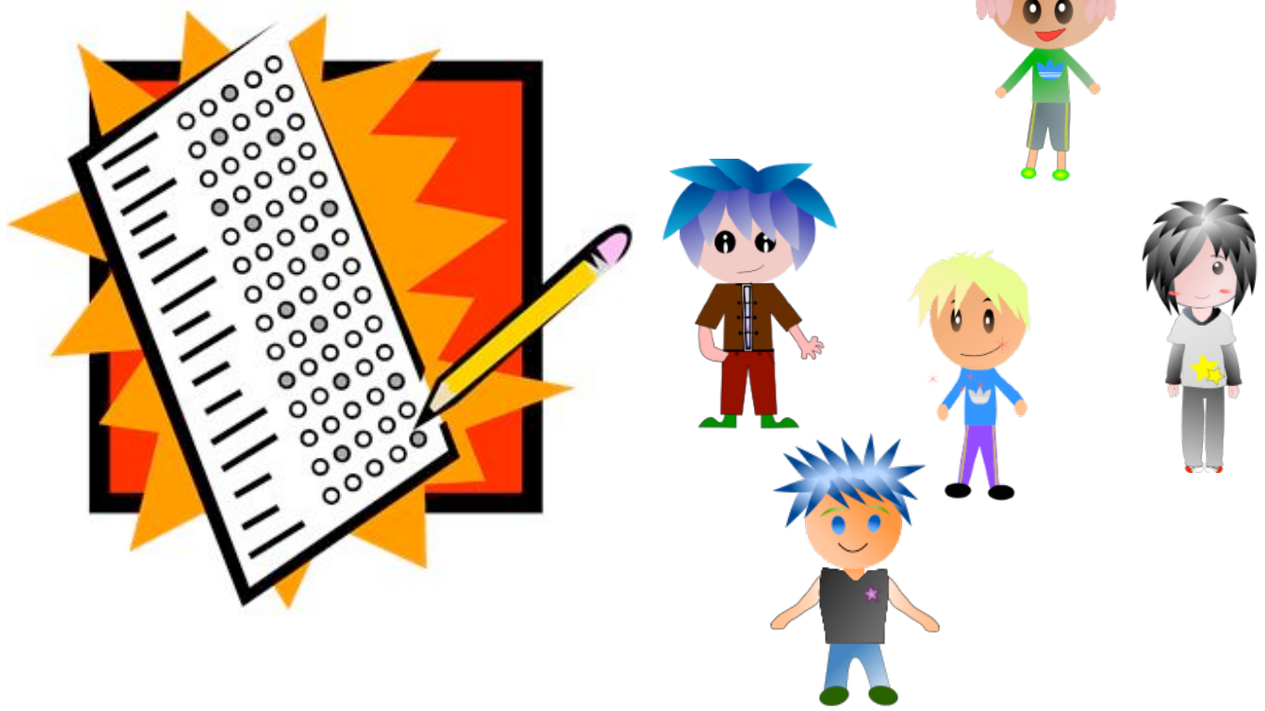




https://www.e-education.psu.edu/egee120/node/47

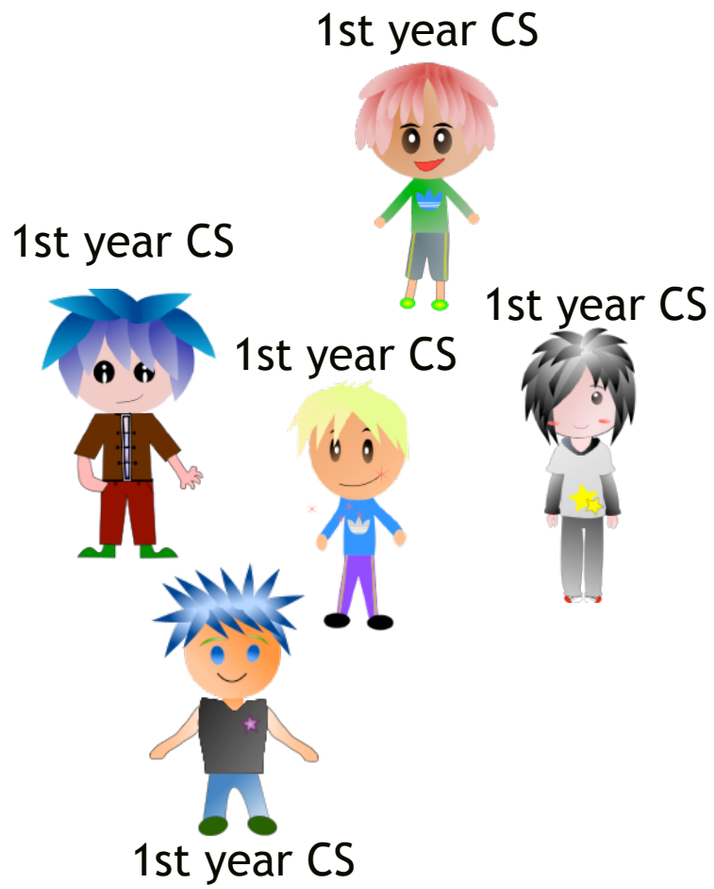
Students were thus discouraged from in-depth independent exploration. Faculty were pressured to "teach to the test."

Assessments measured ability to do the work for the course just finished.

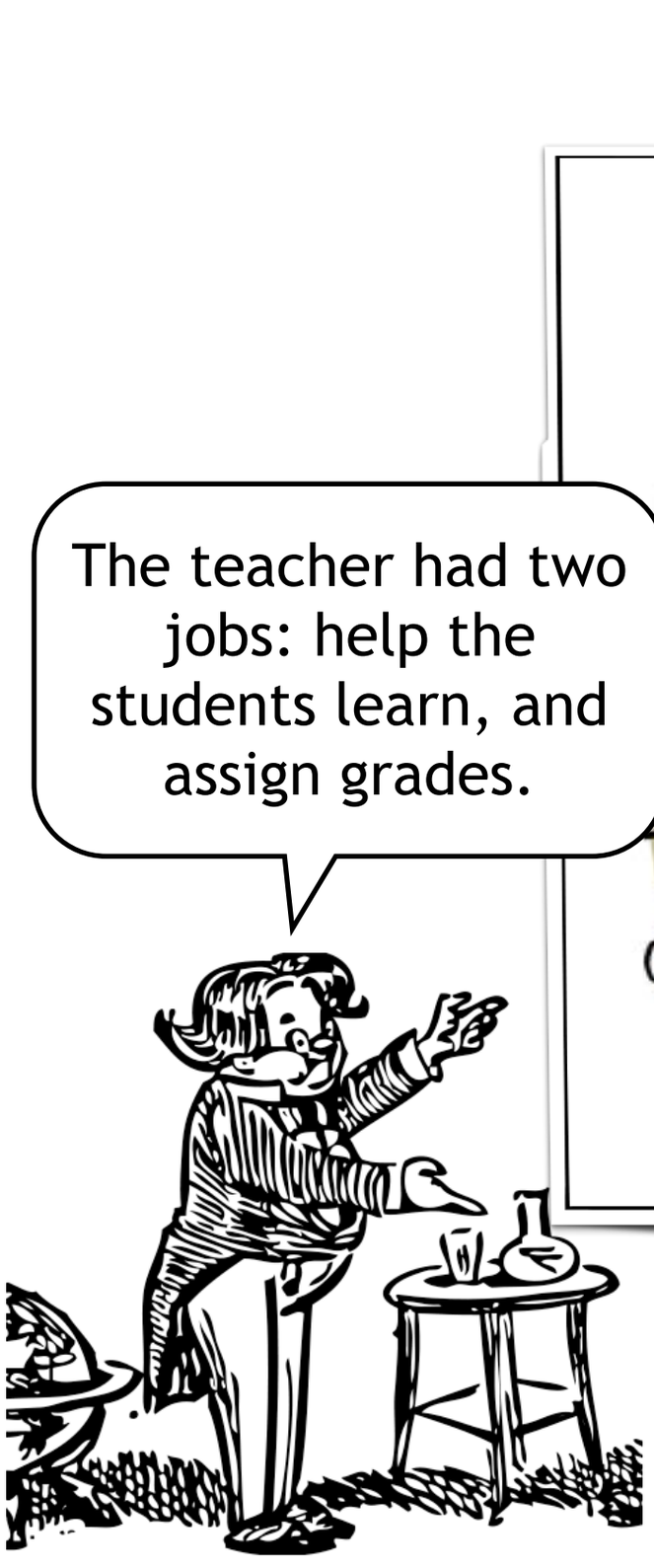


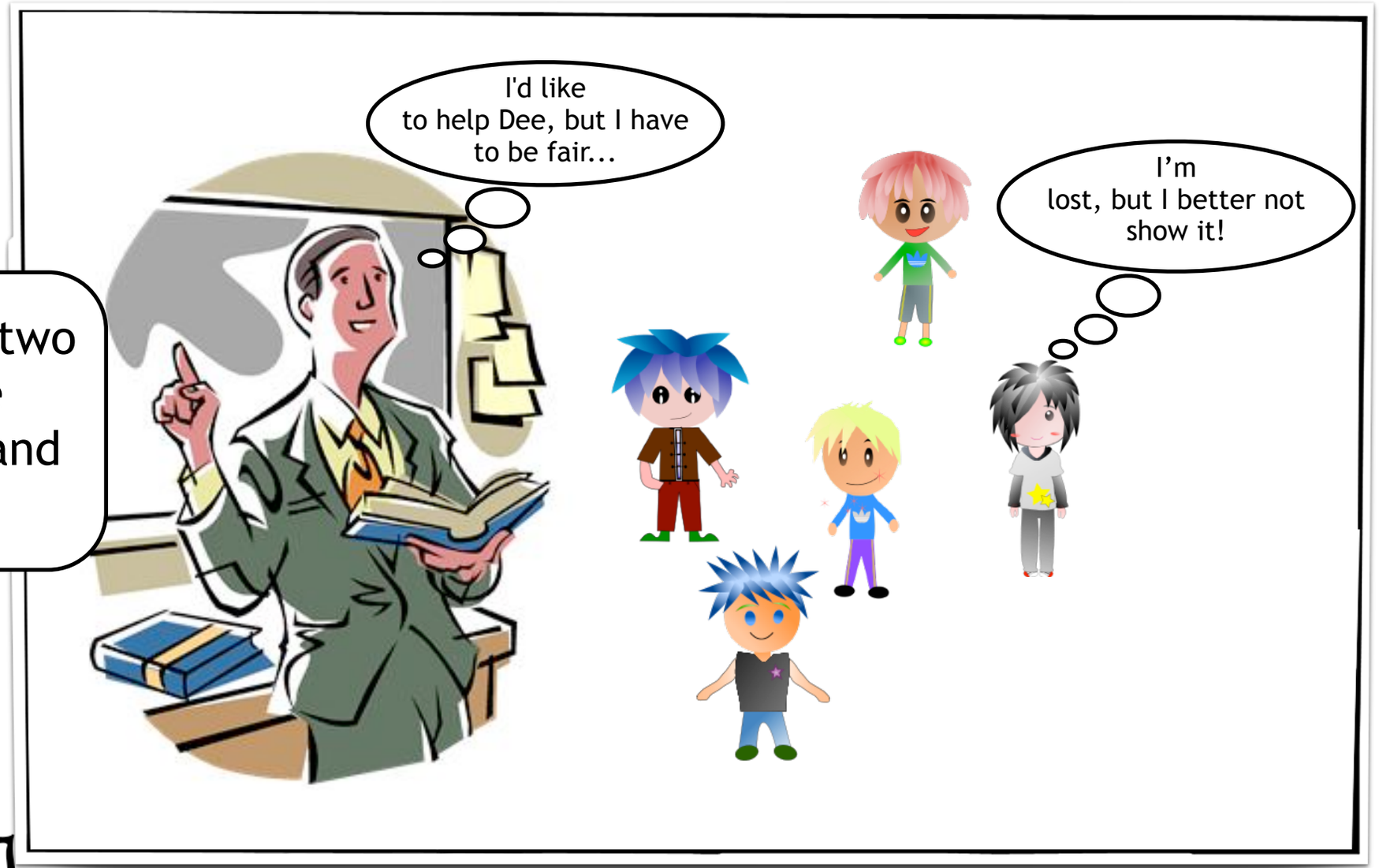
Nothing measured ability to do future work. Nothing aligned courses to future needs.

Students in a class were of the same age, ideally with the same level of prior experience.



The teacher had two jobs: help the students learn, and assign grades.

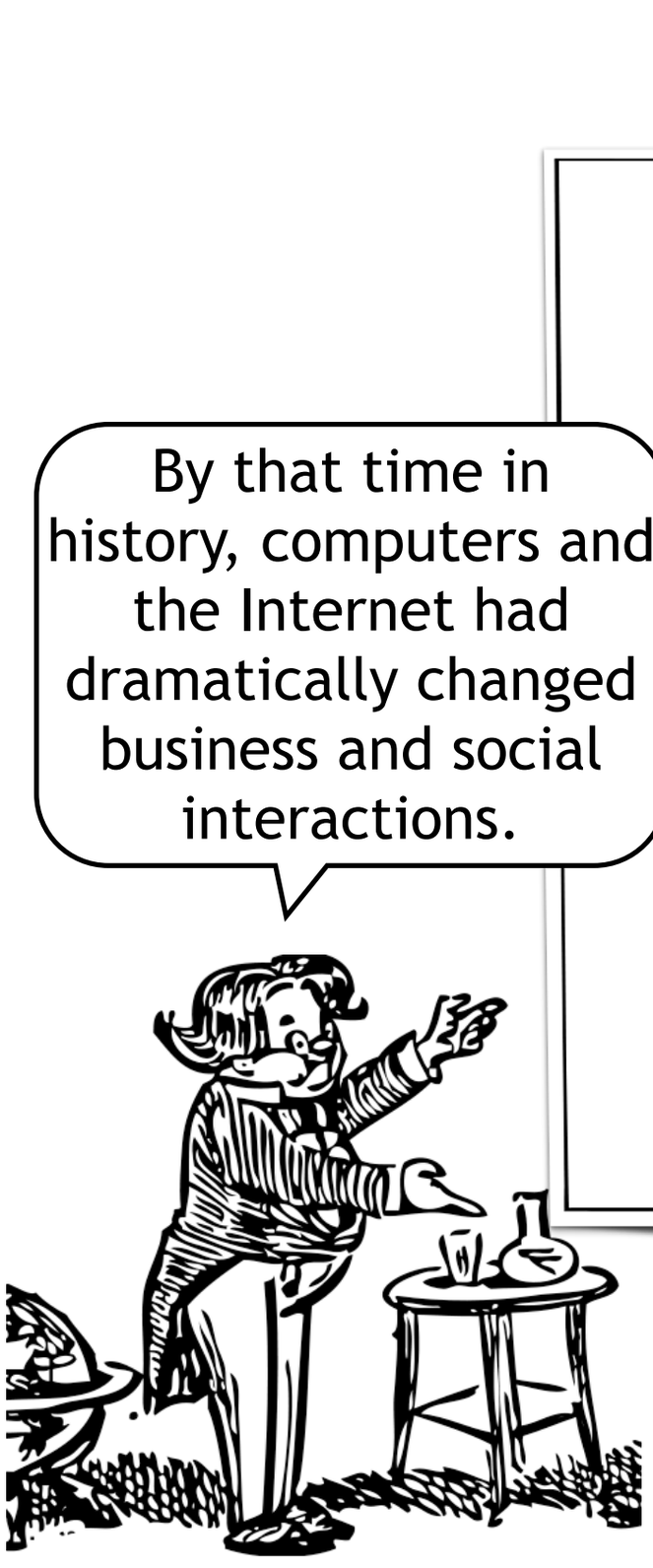




Both sides felt the inherent conflict between those two functions.

Technology and Learning in the early 21st Century

By that time in history, computers and the Internet had dramatically changed business and social interactions.



So, how had technology changed education?

For the worse, mostly. Instead of removing compromises made to teach 30 or 100 students in a classroom...

MOOCs

flipped classrooms

multiple choice quiz makers

automated essay graders

gamification

...technology was used to compromise the education for thousands of students at a time.

Ideas in Learning in the early 21st Century

Many excellent ideas were explored on how to foster true collaborative team-based learning by doing...

collaborative learning

portfolios

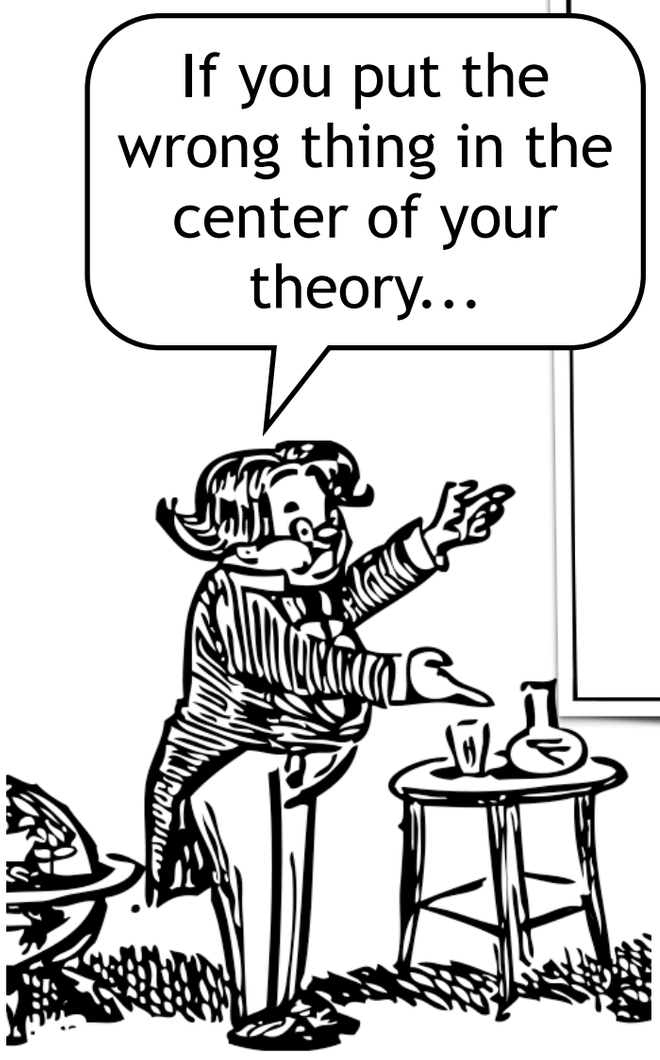
project-based learning

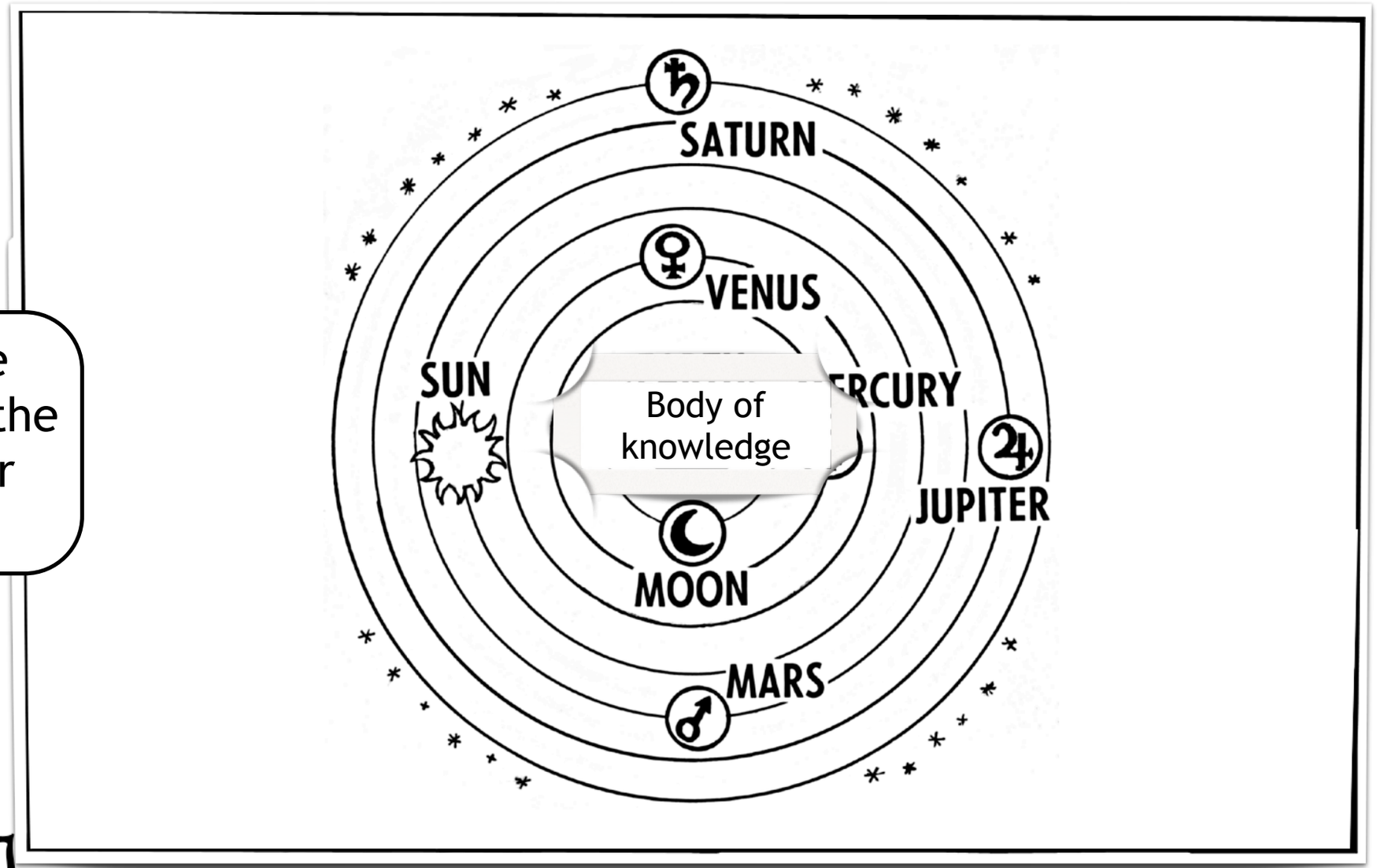
goal-based scenarios

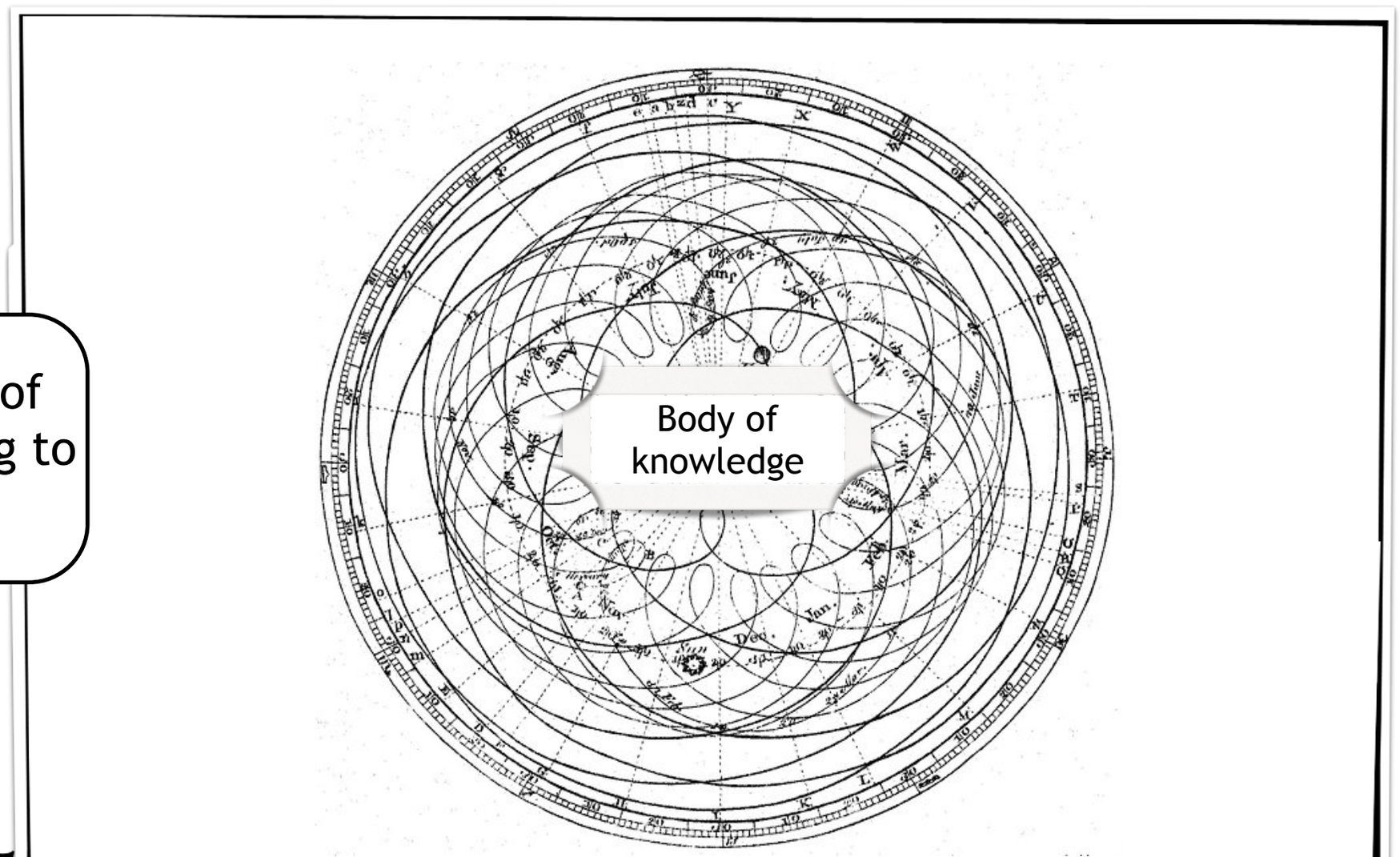
simulations

serious games

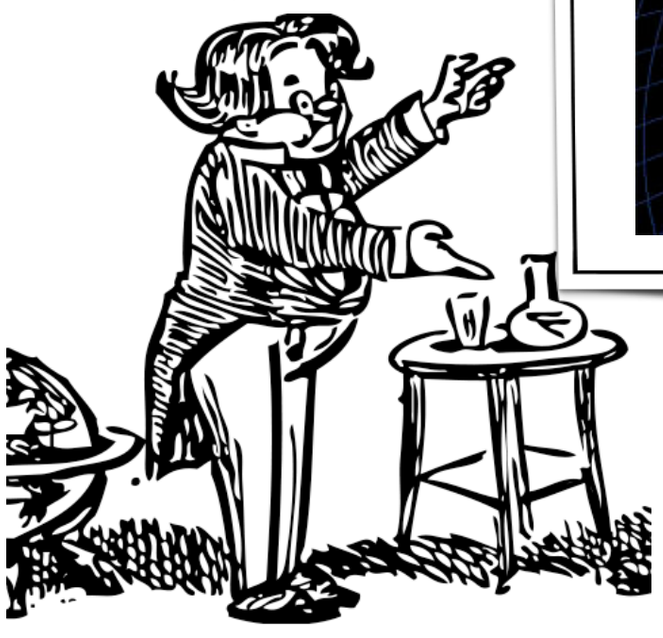
...but they all missed the biggest problem.

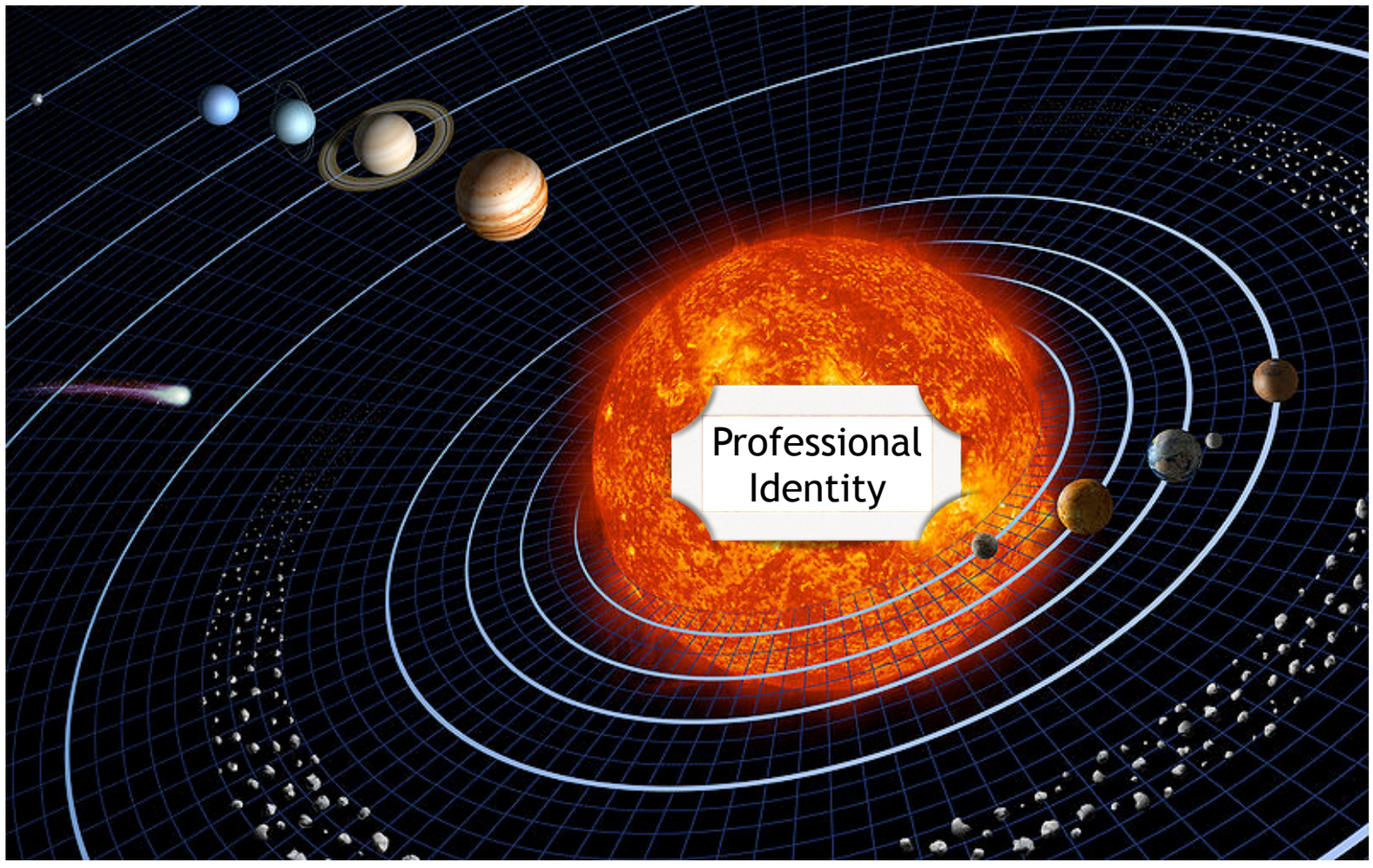






The goal of learning is not "to know something" or even "to do something."

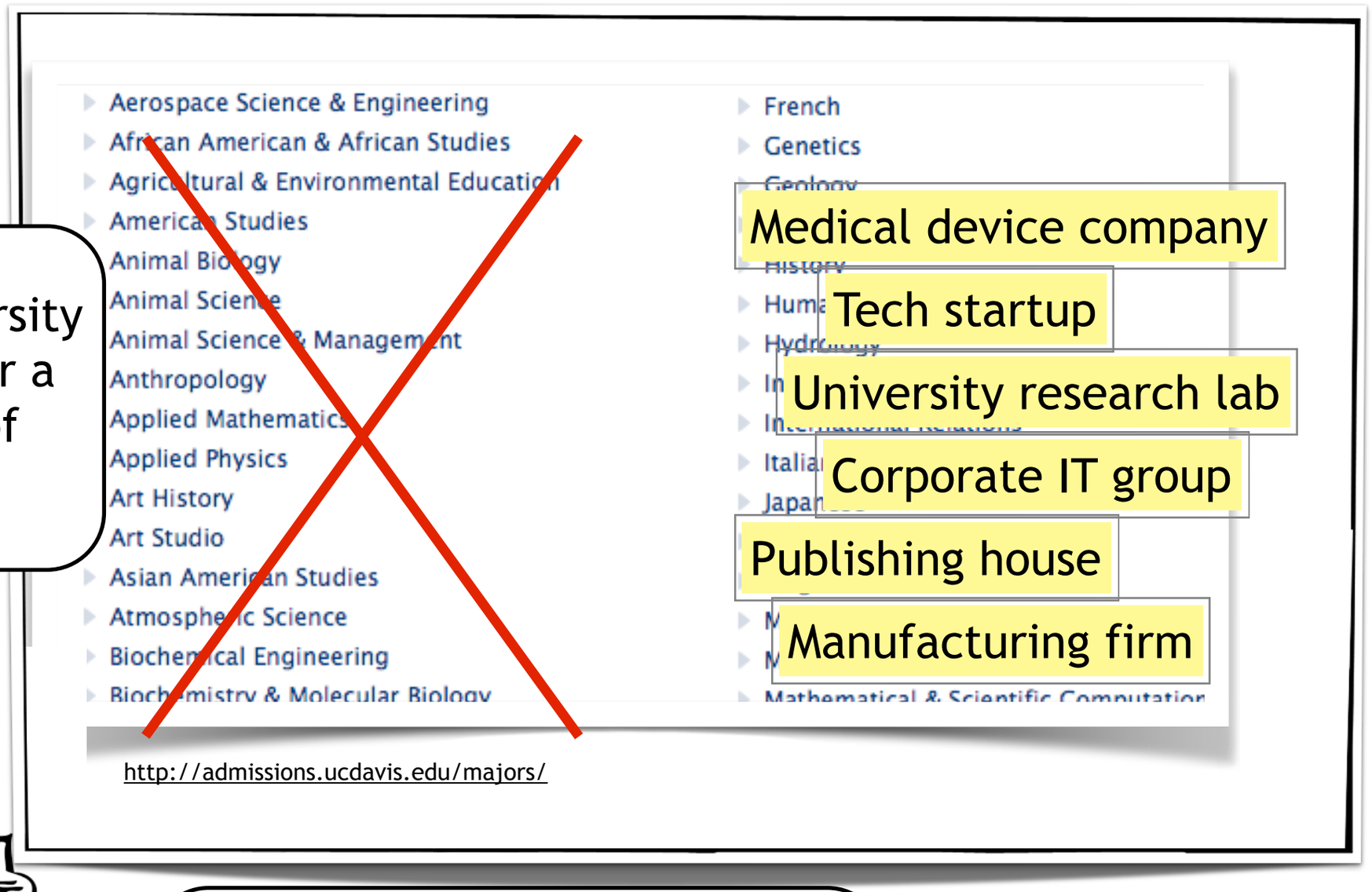




The goal is "to be something."

Education Today

Today, a university does not offer a collection of majors…



… but a set of **contexts for learning,** modeled on real life, where all students can explore a range of experiences and challenges.

Today, a major is not a collection of bodies of knowledge...

Fall	Win
ICS 21 Intr CS 1 CS 60 CG a d Society th 2A Calcu s 1	ICS 22 Intro ICS 61 Ga he Design Math 2 Calcu Writi g 39B
65 C++ th 6G Linear Algebr 51 Computer Org. ysics 3A	ICS 6D Discre ICS 160 Grap Game Platfor CS 112 Comp GE III/VII
e of: ICS 162, ICS 3, ICS 166 S 171 Artificial I telligence F&M 85A Visual Media CGS Elective	ICS 167 Multi Systems One of: CS 122A, Inf 1 Inf 131 Upper Di Writing GE IV

//www.ics.uci.edu/ugrad/degrees/degree_cgs.php

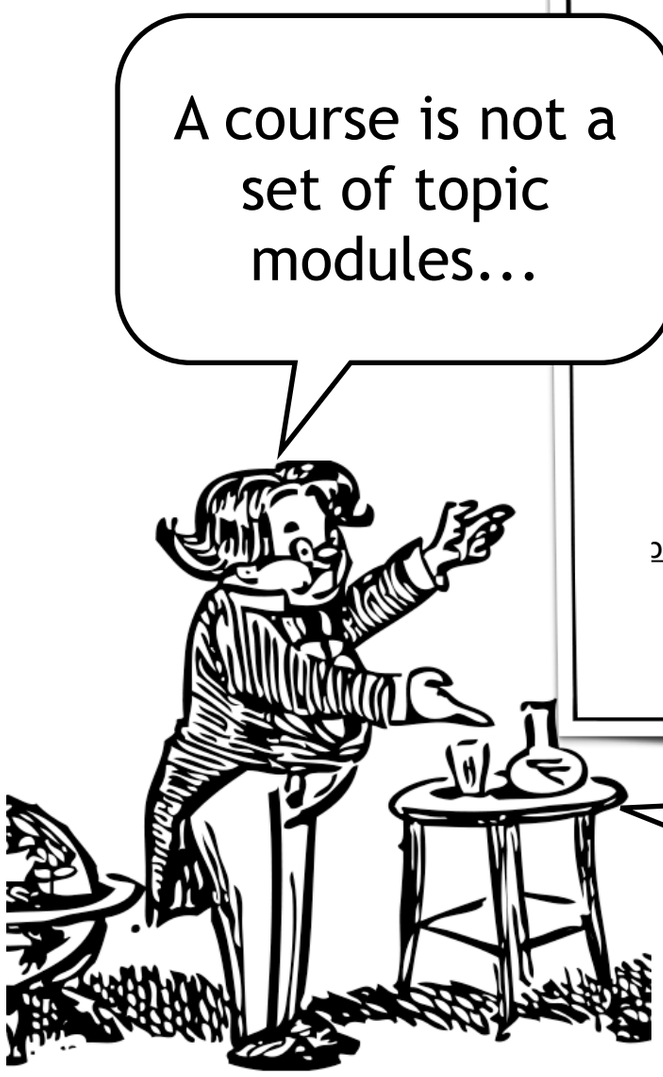
Rotations
- Internal Medicine
- Nutrition Advisor
- Superworm
- Sports Medic
- Designer Genes
- Plant Plague
- Medical Detective

Rotations
- Web Page Author
- Robot Developer
- Web Application Developer
- Database Developer
- Software Team Developer
- Startup Entrepreneur

http://vista.engines4ed.org/home/index.htm

... but a progression of roles from novice to skilled practitioner.

A course is not a set of topic modules...



Unit 1 Principles of Athletic Training

Unit 2 Basics of Human Anatomy and

Unit 3 Lower Extremity Injuries

Unit 4 Upper Extremity Injuries

Unit 5 Head Injuries

Unit 6 Injury Prevention

Unit 7 Other Athletic Conditions and Concerns

ps://sites.google.com/a/bmhs.org/sports-medicine/syllabus

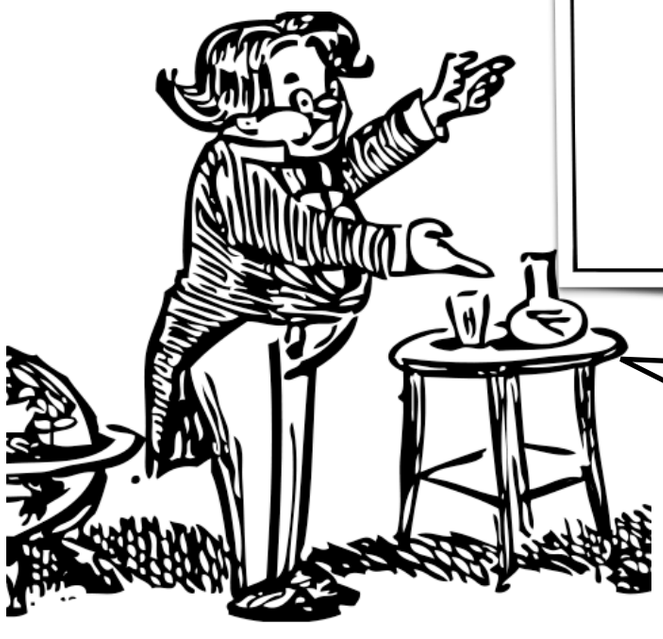
Your Cases

- Case 1: Tennis Twist
- Outreach 1
- Case 2: Skateboarding Slip-up
- Case 3: Ankle Angst
- Outreach 2
- Case 4: Track Star Troubles
- Conclusion/Reflection

http://vista.engines4ed.org/sportsMedic/index.htm

... but a sequence of increasingly challenging scenarios.

These scenarios occur within the venues, providing a familiar context that students return to over time.



Corporate IT group

web site project	web app project	mobile app project
html / css	javascript, java	
programming concepts	team project skills	
logical reasoning	planning	

University research lab

compiler project	distributed OS project
c/c++ programming	networks
formal languages	systems concepts

Through these repeated experiences, students learn both practical and general reasoning skills, and find areas where they wish to become experts.

Members in team-based scenarios are ideally not at the same "grade level" or in the same "major". Some may not even be students.

administrator

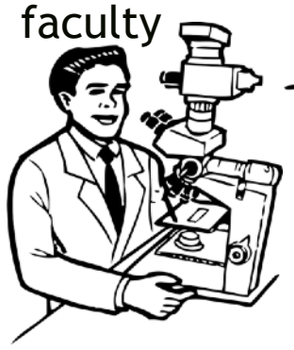
1st-year MBA

1st-year CS

1st year developer

2nd-year designer

science faculty

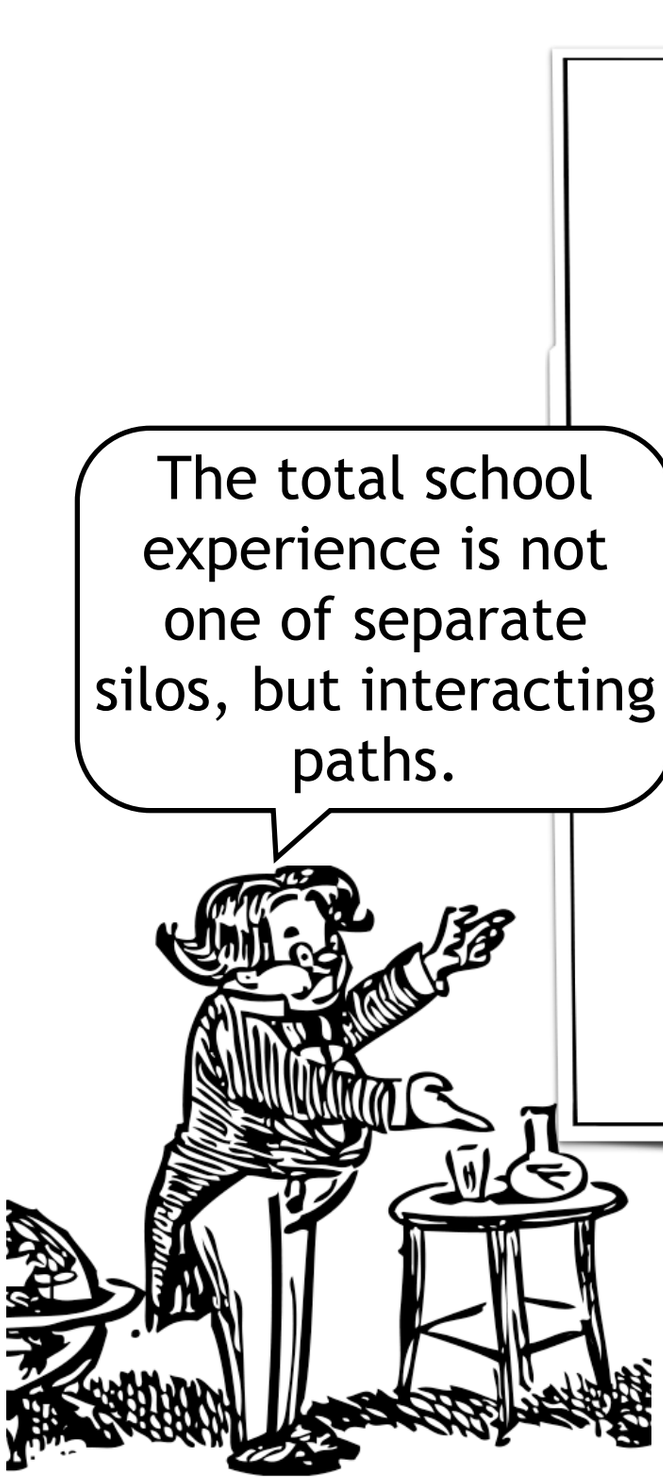


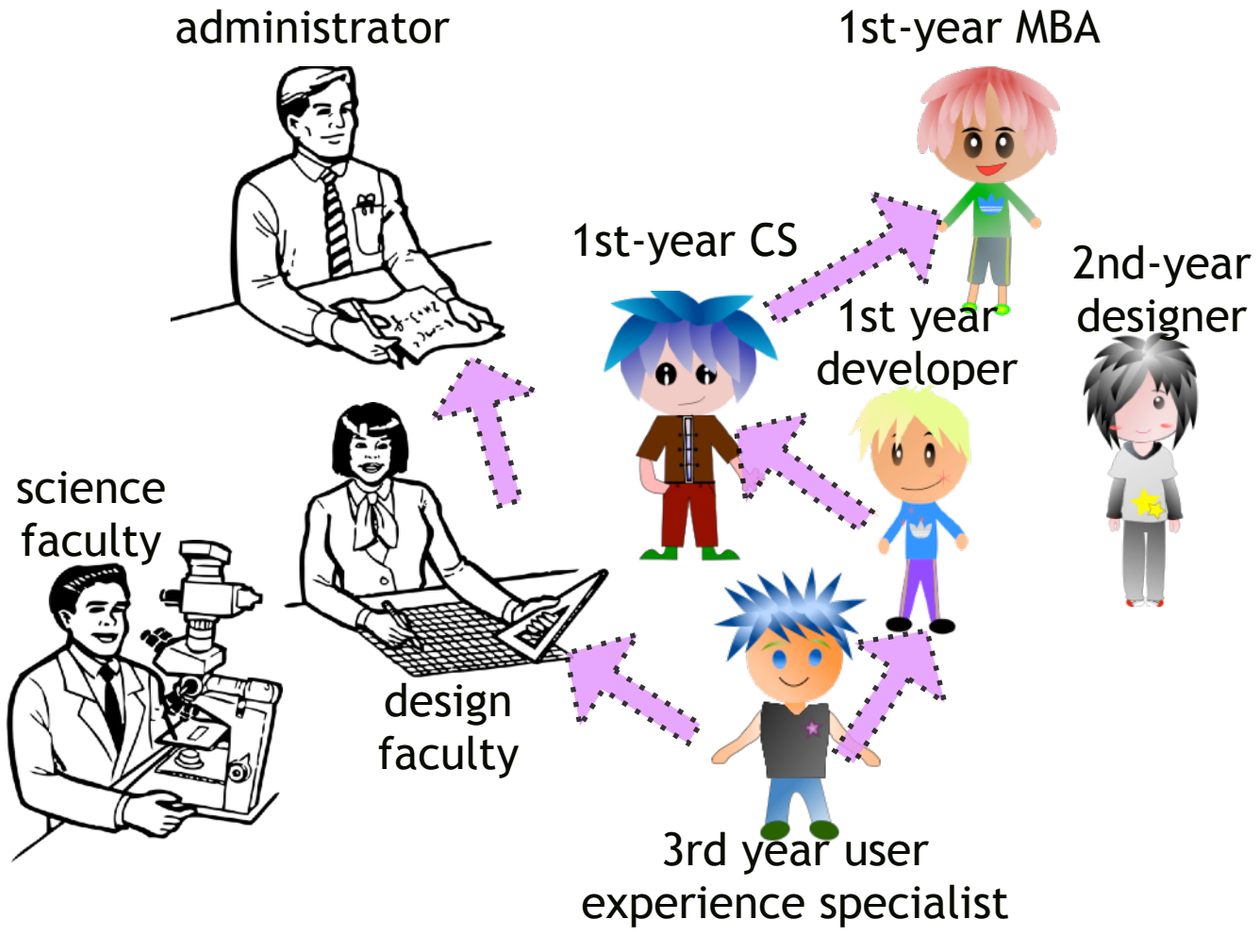
design faculty

3rd year user experience specialist

As in real life, learners in different roles may be at very different points in very different careers.

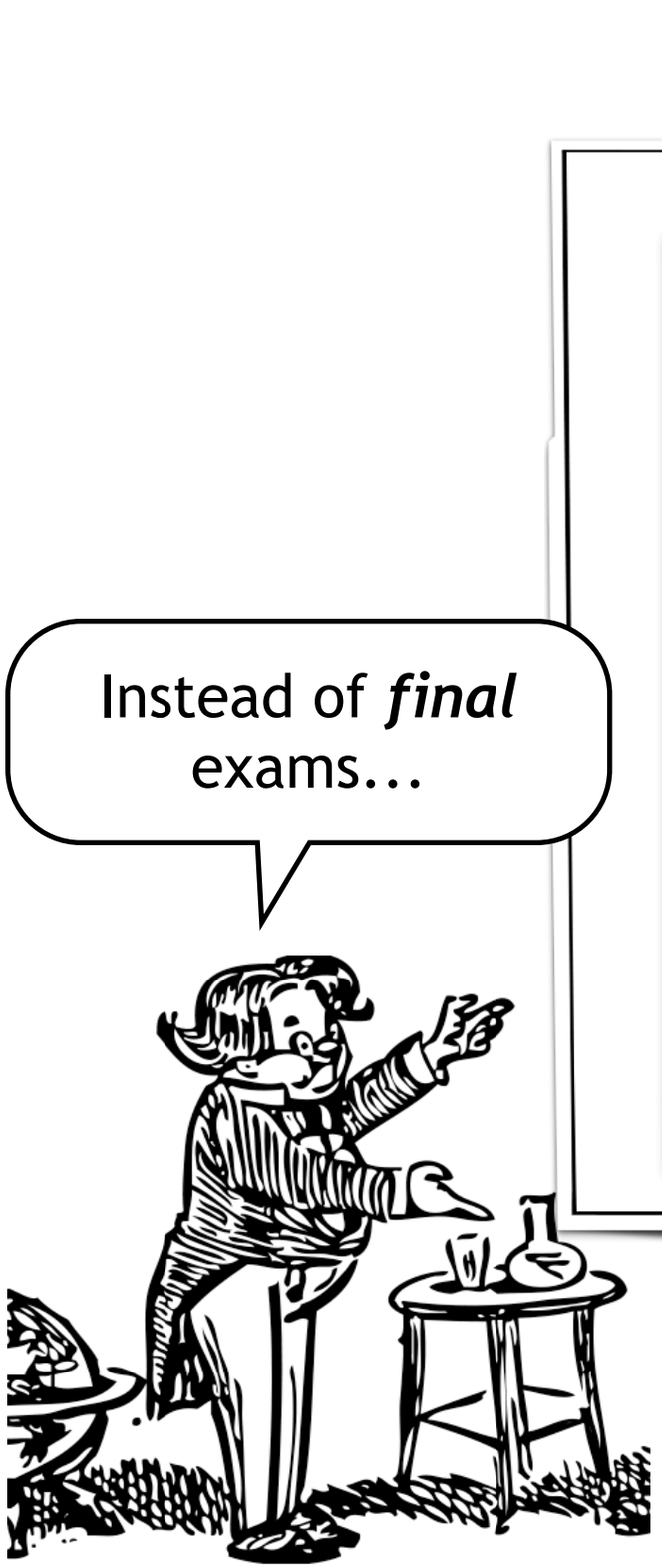
The total school experience is not one of separate silos, but interacting paths.

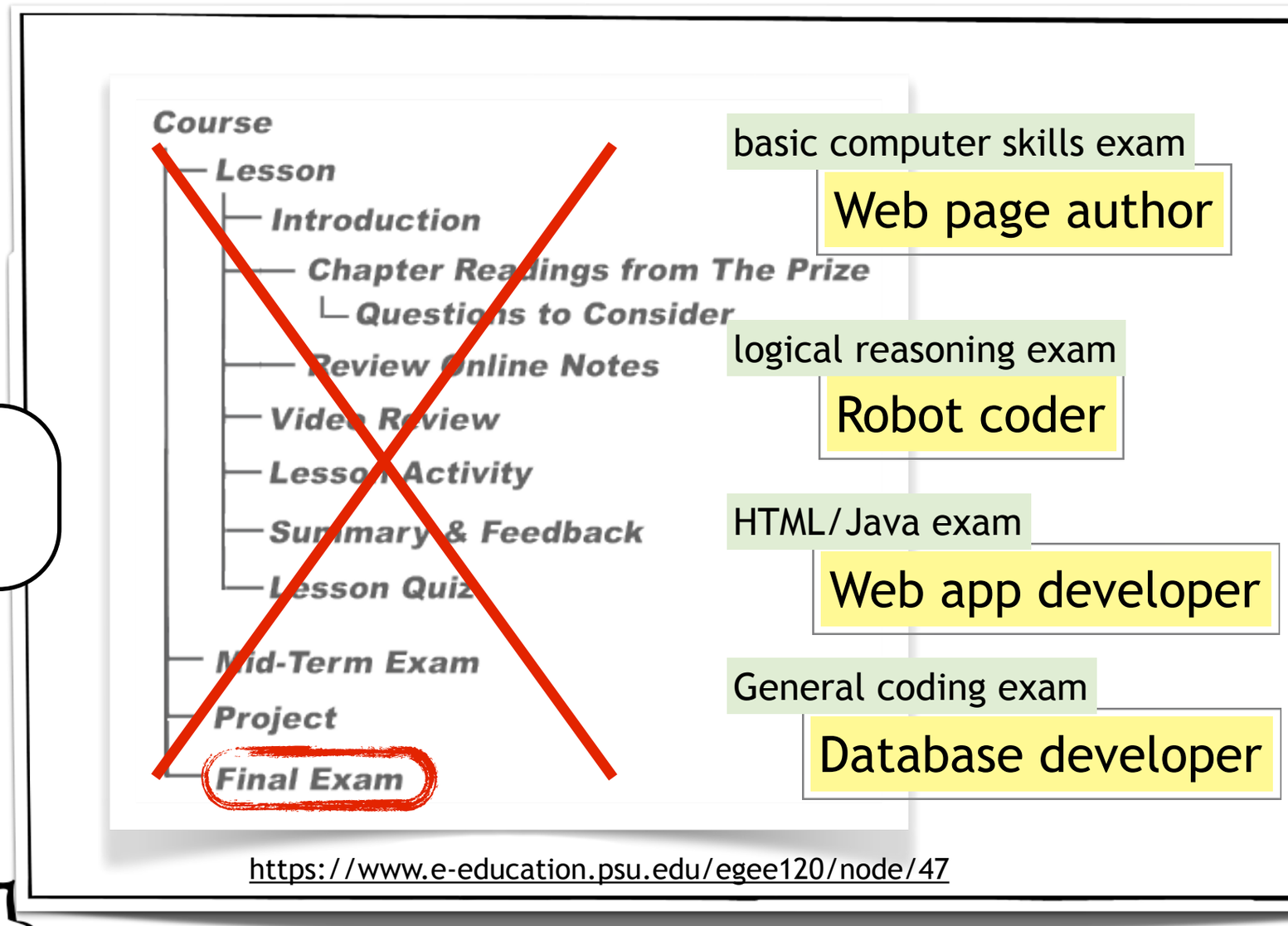




Collaboration and mentoring across ages and careers occurs constantly. Life-long learning is inherent in the process.

Instead of ***final*** exams...

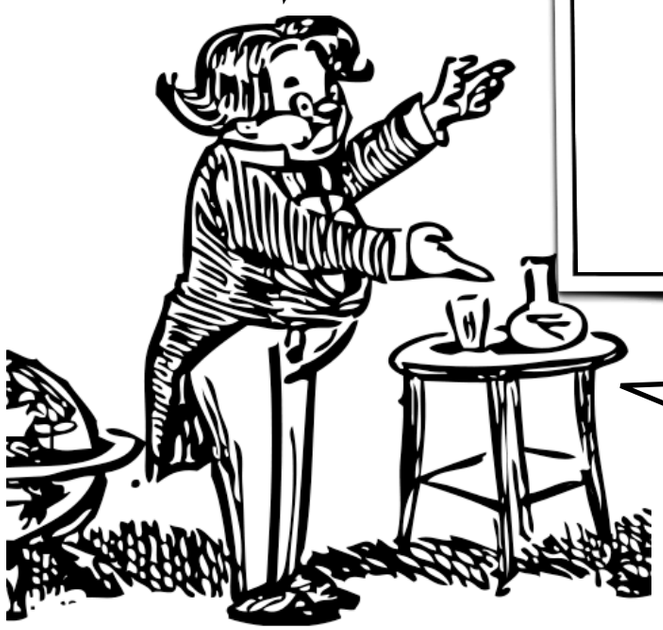




https://www.e-education.psu.edu/egee120/node/47

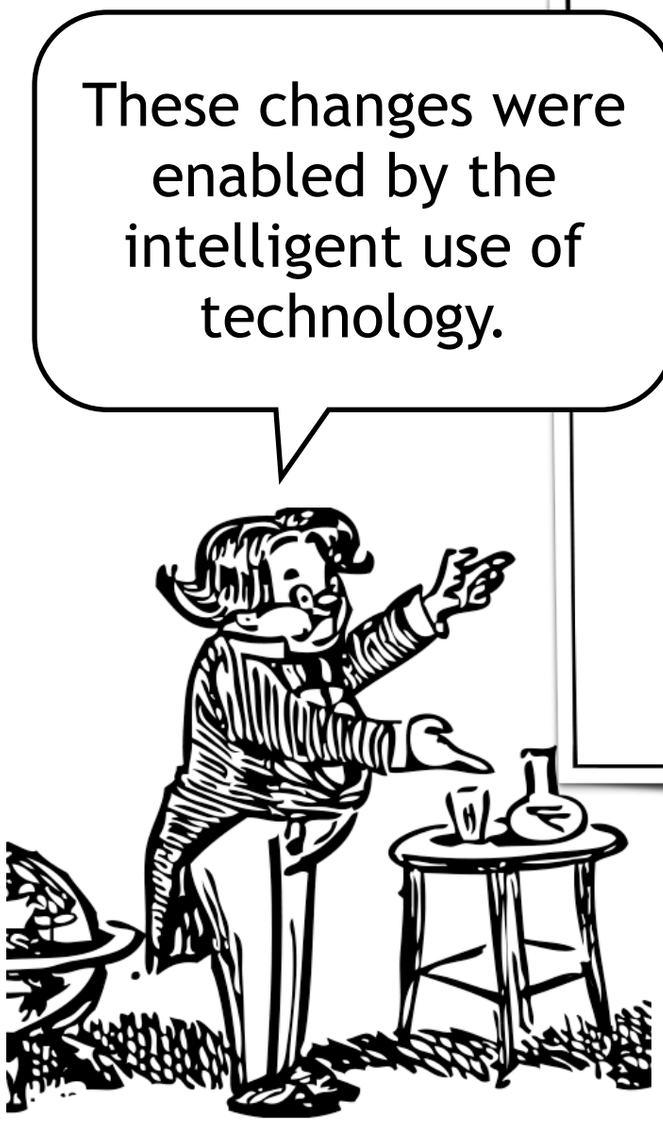
... there are ***entrance*** exams, to assess readiness to pursue the next level of roles.

With progress measured by the roles and scenarios done, teachers are no longer graders.



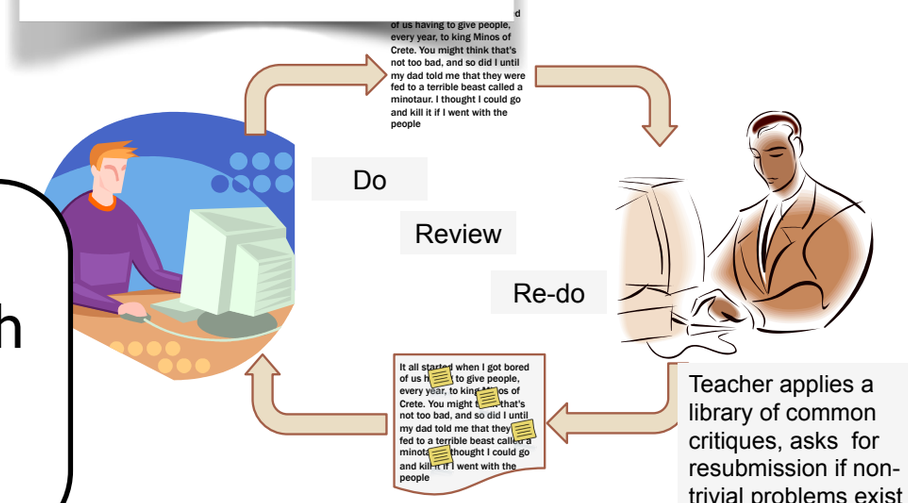
Their role is to coach, critique, mentor and inspire.

Technology and Learning today



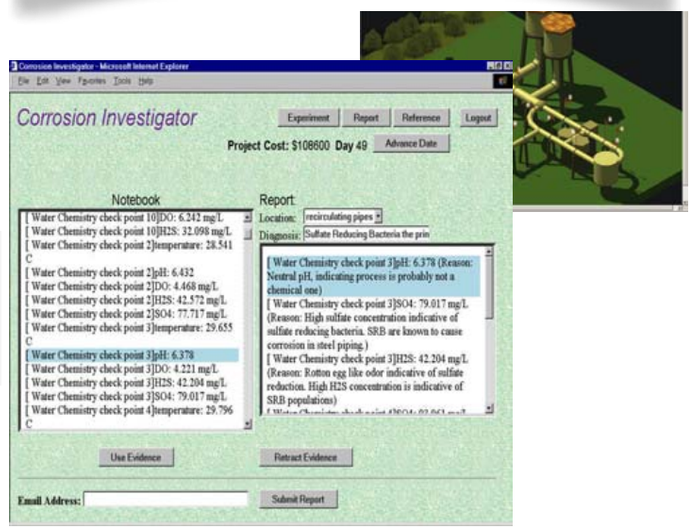
Technology within courses enables rich learning experiences...

Critiquing tools



Teacher applies a library of common critiques, asks for resubmission if non-trivial problems exist

Goal-based Scenario Simulations



Collaborative documents

Technology enables just in time delivery of goal-based scenarios to ad hoc groups of students with diverse skills and careers...

Scenario Cohort Marketplace

Looking for a web developer (HTML5 and CSS skills a must!) and a project manager to work on eBay for artists scena <link>! Contact...

Newbie BME looking for a graduate level medical device designer and biz school entrepreneur to work on "the portable dialyzer scenario" <link>! Contact...

Run a Startup simulator

Peer review sites

Mentoring communities

... via a global marketplace of learners.

To summarize some of the key transformations in the education.

Then	Today
departments	venues
knowledge-centered foundations-first curricula	role-centered practice-first curricula
topic-driven lecture courses	challenge-based scenarios
homogenous student cohorts	multi-skilled multi-career student cohorts
backward-looking final exams	forward-looking placement exams
technologies for virtual classrooms	technologies for team-based immersive scenarios

Thank you! I'd appreciate your feedback on how I did in this challenge.

Albert Willoughby

Apprentice Historian of Education

Public Presentation Challenge #2

October 1, 2045

Many thanks to the members of my cohort:

Yin Xhang: Presentation designer (apprentice)

Max Anoudi: Reference researcher (novice)

Sandy Williams: Senior historian (mentor)