



Course design to achieve competence

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Competence

com·pe·tence

/ˈkæmpədəns/

noun 1. the ability to **do** something successfully or efficiently.

"the players displayed varying degrees of competence"

synonyms: capability, ability, competency, proficiency, accomplishment, expertise, adeptness, skill, prowess, mastery, talent; More

- ❖ Competence is more than knowing information about a topic
- ❖ Competence involves being able to **do** something with what you know

Insights from Summits and surveys

Surface Processes

- **Sediment deposition & erosion**
 - Stream/River flow, morphology, deposition, erosion, effect of floods
 - Transport relationships (all surface processes)
 - Magnitude and frequency relationships of surficial deposits
 - Subsurface analogs
- **Terrestrial and marine surface interactions**
 - Biological, chemical, and physical interactions
 - Rates of chemical and physical changes
- **Landscape alteration (geomorphology)**
 - Surface mechanical and chemical processes
 - Karst formation
 - Glacial till and overburden thickness
- **Habitability, sustaining life**
 - Ties to natural hazards

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❖ Employers Summit: lists of content topics

Insights from Summits and surveys

Skill List (A-awareness (had in class); P-proficiency (had to use/apply); M-mastery (project, etc. requiring demonstration of ability); E-expert (MS or PHD))	Level of Mastery
Critical thinking/problem solving skills	P
Communicate effectively to scientists & non-scientists	P
Readily solve problems, especially those requiring spatial and temporal (i.e. 3D and 4D) interpretations	M
Make inferences about Earth system from observations of natural world combined with experimentation and modeling	M
Work with uncertainty, non-uniqueness, incompleteness, ambiguity and indirect observations	M
Ability to access and integrate information from different sources and to continue to learn	M

- ❖ Employers Summit: lists of content topics
- ❖ Also what they expect students to be able to *do* with their content knowledge

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- ❖ Employers Summit: lists of content topics
- ❖ Also what they expect students to be able to *do* with their content knowledge
- ❖ What are the implications for course design?

Example related to natural hazards

- ❖ *As future geoscientists, students should be able to evaluate the geologic hazards in a region, make and defend an informed analysis about land use, assess the uncertainties, and communicate their analyses to both a professional and a citizen audience.*
- ❖ *Could be addressed in a variety of courses across the geo curriculum.*

Achieving competence

- ❖ Not effective (or fair) to teach students *about* topics during the semester and then expect them to pull it all together at the end
- ❖ Students need **practice** to build their abilities relative to the competency goal, not just their knowledge base
- ❖ Course design determines whether students just learn *about* topics or whether they become competent in using their knowledge to **do** something with what they have learned

What do students need practice in?

- ❖ Example: As future geoscientists, students should be able to evaluate the geologic hazards in a region, make and defend an informed analysis about land use, assess the uncertainties, and communicate their analyses to both a professional and a citizen audience.
 - ❖ Finding, evaluating, and teaching themselves new information; collecting and analyzing data
 - ❖ Applying what they know to make/defend informed analyses, assessing uncertainties, and communicating to different audiences
 - ❖ Reflecting on competence
 - ❖ Thinking ahead to the future
- ❖ Last two – can't just hope that students will do this on their own.....

Challenges in teaching to promote competence

“...able to evaluate the geologic hazards in a region, make/defend an informed analysis about land use, assess uncertainties, and communicate their analyses to professional and citizen audiences.”

- ❖ Focusing on content coverage isn't enough
 - ❖ Mastery of information doesn't confer ability to *use* that background
 - ❖ Content coverage does not confer competence
 - ❖ Assessing content mastery (comparatively easy) does not tell you whether students are able to ***use*** the content in ways that are important for their overall educational progress and future careers (more difficult)

Challenges in teaching to promote competence

“...able to evaluate the geologic hazards in a region, make/defend an informed analysis about land use, assess uncertainties, and communicate their analyses to professional and citizen audiences.”

- ❖ Just hearing/reading about how *others* engage in doing and interpreting (or how you as an instructor would engage) is not enough
 - ❖ Students need *personal* experience and practice
 - ❖ Personal practice changes thinking, allows students to grow, and prepares students for their professional futures

Challenges in teaching to promote competence

“...able to evaluate the geologic hazards in a region, make/defend an informed analysis about land use, assess uncertainties, and communicate their analyses to professional and citizen audiences.”

- ❖ Just having students doing things with what they know isn't enough
 - ❖ Students need to *consciously* engage and reflect on what they are doing
 - ❖ Students need to *know* that they are making progress toward the goal
 - ❖ Students need to reflect on how their thinking and abilities have changed and how their evolving abilities will influence their future geoscience careers

Critical aspects of designing *effective* courses to promote competence

- ❖ Think beyond having students “learn about” or “be exposed to” or “understand” or “develop a strong background” in a body of content
- ❖ Remember that competence is not just *what* your students know but what they learn to *do* with what they know
- ❖ Think beyond the end of the course - what do students need to be able to *do* as future professionals?
- ❖ Frame your course around what students need to be able to *do*. Content will come along as part of the package.

Critical aspects of designing *effective* courses to promote competence

- ❖ Personal practice by students is critical – thread practice throughout the course (not just one sidecar module or single culminating project) to help students make effective progress toward competence
- ❖ Reflection is critical - integrate opportunities for students to reflect on and evaluate progress in their abilities, including across courses
- ❖ Assess what you value (competence), not what is easily measured (content)



And from a departmental point of view..

Informal motto of the Puckered Penguins:

“One year of experience 24 years in a row....”

Don't be a Puckered Penguin....



Course design resources

Online, self-paced course design tutorial

[http://serc.carleton.edu/NAGTWorkshops/
coursedesign/index.html](http://serc.carleton.edu/NAGTWorkshops/coursedesign/index.html)

Course design workshops

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