# Critical Thinking Goals, Outcomes, and Pedagogy in Senior Capstone Courses

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# Overview

- Montana State University – Bozeman (MSU) saw a recent increase in capstone courses

- Students should "*creatively analyze, synthesize, and evaluate learned knowledge … and communicate the results of the project effectively …*"
  - This corresponds to common critical thinking definitions

- Faculty at MSU have developed courses alone
- Until this study (2001), there had been no assessment of learning outcome

1) **Determine importance of critical thinking goals in senior capstone courses**
2) **Determine effective pedagogies to achieve critical thinking goals**

# Overview

1) How do faculty assess the importance of critical thinking goals?

2) What pedagogies are used to teach critical thinking and how effective are they?

3) How do students rate their learning of critical thinking after the course?

# Methodology

- Faculty teaching capstone classes were sent an electronic survey asking:
  1) Determine the importance of critical thinking goals in major capstone courses
     - 1-4 scale (no importance – major importance)

  2) Identify instructional methods used to teach critical thinking in capstone courses and rate their effectiveness
     - 1-5 scale (not effective – very effective)

- Graduating seniors were sent a survey to rate the extent that their capstone courses enhanced learning of the 12 critical thinking skills
  - Scale from 1-4 (no enhancement – major enhancement)

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7) Use complex knowledge in making decisions and judgements

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9) Make discriminating moral and ethical choices with an awareness of the immediate and long-term effects on the world

10) Develop critical appreciation of the ways in which knowledge and understanding of the universe, society, and ourselves is gained and applied

11) Understand the experimental methods of the sciences as well as the creative approaches of the arts

12) Develop an appreciation of other cultures and an understanding of global issues

# Methodology

- Instructional methods associated with increased critical thinking in Tsui's study[1] served as a guide for this study:

    1) Paper critiqued by instructor
    2) Independent research project
    3) Group project
    4) Class presentation
    5) Essay exam
    6) Multiple choice exam

Faculty given opportunity to specify additional methods

1. Tsui, Lisa. "Courses and instruction affecting critical thinking." *Research in higher education* 40.2 (1999): 185-200.

# Results

### Table 1
Comparison of faculty desired critical thinking goals and student reported outcomes

| Critical Thinking Goal/Skill | % Faculty rating as major importance | % Students rating course as major enhancement |
|---|---|---|
| Think Effectively | 91% | 31% |
| Use complex knowledge in Making decisions and judgments | 82% | 31% |
| Exercise and expand intellectual curiosity | 67% | 34% |
| Develop skills so that students will be lifelong learners | 64% | 22% |
| Write effectively | 53% | 21% |
| Think across areas of specialization and integrate ideas from variety of disciplines | 53% | 23% |

Note: all other goals were given lower ratings by faculty and students.

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- Student learning and faculty rating have roughly the same ranking

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- Large difference between student's achievement and faculty goals

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Use and Effectiveness of Instructional Methods

| Method | Level | of | Effectiveness | | | |
|---|---|---|---|---|---|---|
| | Very Effec. | Mod. Effec. | Effec. | Mod. Not Effec. | Not Effec. | % Used |
| Independent research project | 88% | 12% | 0 | 0 | 0 | 72% |
| Group project | 47% | 53% | 0 | 0 | 0 | 42% |
| Paper critiqued by instructor | 40% | 40% | 17% | 3% | 0% | 88% |
| Class presentation | 38% | 48% | 14% | 0 | 0 | 85% |
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**Why?**

- Traditional methods are more comfortable.
- Using independent research and group projects requires instructors to **yield control**.

- Evaluating performance is less straight-forward

- Keeping students on track requires routine, direct interaction with students

- Faculty may not believe they have time to learn new methods

- Little support from department

- Effective at critical thinking != effective for learning

# Discussion

- How should critical thinking be approached in a class?
  - Explicit or implicit goal?
  - Does this differ based on the type of class?
  - Responsibility of *all* teachers?


- Does critical thinking improvement always lead to better understanding?

# Conclusion

- 35 Faculty and 139 seniors at MSU reported data about critical thinking

- Faculty reported that the most important critical thinking goals were:
  - **Thinking effectively**
  - **Use complex knowledge in making decisions and judgements**

- Faculty reported that the most effective methods for critical thinking education are:
  - **Independent research projects**
  - **Group Projects**

- However, the data suggests that faculty don't always use the best methods in the classroom