Getting students to work together

- Instructors often lecture, encourage to perform tasks in a competitive individualistic environment
- Instructors often set up reward structures so that cooperation among students is discouraged

This doesn't represent the workplace

in which they will interact!

- ACSC addressed what industry looks for in new hires:
  - Team problem-solving
  - Comfortable working with a diversity of people inside and outside their organization

Cooperative Learning

- Cooperative learning activities provide an environment where students actively engage in the material by sharing insights and ideas, providing feedback, teaching each other

- Reviews have shown that cooperative learning leads to:
  - Higher achievement
  - Increased positive attitudes toward the subject area studied
  - Higher self-esteem
  - Greater acceptance of differences among peers
  - Enhanced conceptual development in wide range of settings and across content areas

Implementing cooperative learning

- Instructors often put students into groups, turn them loose, then expect to see positive outcomes

- Putting students into groups and telling them to work together is not enough. It invokes two fallacies:
  1) Students actually know how to work together
  2) Students who do know how to work together will actually do so

⇒Before implementing cooperative learning, ask the question

How do you get your students to work together?

Getting to know you

First day of class:

- Students fill out a getting-to-know-you questionnaire identifying intended career paths, previous cooperative learning experience, and attitudes towards group work

- Collect questionnaires, form students into heterogeneous groups based on responses, academic ability, and gender

- Assign homework with the following four questions:

1) List your responsibilities to the group
2) List the responsibilities the group has to each member
3) Describe advantages of working in a group or as a team
4) Describe disadvantages of working in a group or as a team

Individual and group responsibilities

Second day of class:

- Put students into assigned groups to compare and discuss their responses to the questions.
- Each group drafts “Group Covenant”, which delineate the individual group members’ responsibilities to the group and the group’s responsibilities to each member.
- Organize class discussion to compare what each group’s responses
- Ask students: “What does each one of these responsibilities look like and sound like?”
  - conveys that verbal and nonverbal behavior play a role in how people perceive them

How are we doing?

- Group processing

- Each team member answers the following:
  To operate as an effective team we need to…
  …continue to do the following things:
  …start doing the following things:
  …stop doing the following things:
  To carry out these actions here's what we are going to do.

"Building an effective group is not a static endeavor; it is a dynamic process, which requires vigilance and effort."[1]

Building classroom community

Cooperative learning builds community :

- Friendships evolve, students challenge and encourage each other to truly understand the material
- Students strive to understand different ways of explaining concepts and different perspectives on solving problem
- Creates more confidence to take on difficult tasks

- Building community and realizing potential require that the students know and trust one another

$\Rightarrow$ cooperative learning activities initially helps students learn how to work with each other

Critical-mindedness

Critical-mindedness

- Most college and university teachers advocate critical thinking as a fundamental goal of education. However, most classrooms are greatly lacking in critical thinking activity.
- Literature contains attempts to devise ways of teaching and assessing critical thinking.
- Goal: Review this work, and in so doing derive a clearer analysis of critical-mindedness. [2]
- Critical-mindedness: argued to depend on appropriate cognitive and affective inputs as well as critical thinking ability
- “Students’ thinking developed hierarchically from a position in which the world is seen in dualistic terms in which right answers exist for everything; to one in which a commitment is developed to a more qualified relativistic way of thinking”[3]

Skills and propensities

- Delineates four aspects of the goals of science education[4]:

  knowledge, skills, propensities, understanding

  Critical-mindedness promoted primarily through development of these

- Critical thinking seen as a general skill. Skills are not inborn but are developed through practice:
  - *Facilities*: skills capable of being reduced to a routine
  - *Critical skill*: require attention and thought to carry out and may be exercised with varying degrees of performance.
- *Propensities* are tendencies to behave in a certain way.

Developing propensity

- Ideas for developing a widely applied critical propensity in science students[4]:
  1) 'Harmonize' a chemistry course with the consumer studies aspects of a home economics course
  2) Relate a bio course to one in civics or social studies

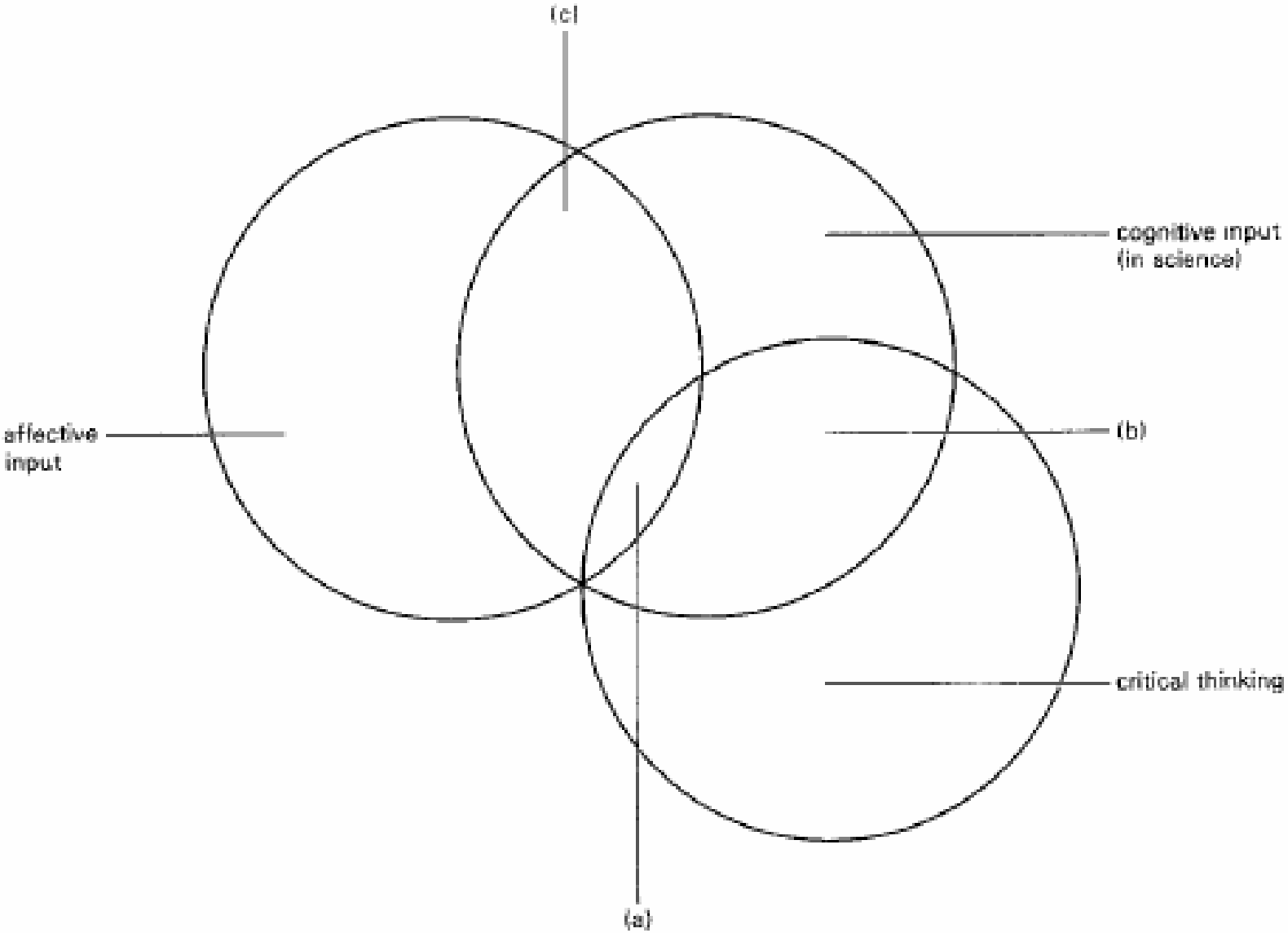
- Need to offer opportunities for students to think about science in the context of wider social, economic and applied problems

- Promote learning approaches which present science as not simply a series of right answers [5,6]

Conclusions

- Critical thinking involves more than possession and application of certain skills in logic
  - requires knowledge and understanding of content, skills and processes of the subject(s) under consideration
  - contextual or subject related skill
- Critical-mindedness involves not only critical thinking ability but also the propensity to exercise this widely
  - incorporates affective as well as cognitive component
- Students will learn to apply critical-mindedness more broadly through seeing science in the context of social, economic and applied problems.

Factors in scientific critical-mindedness



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