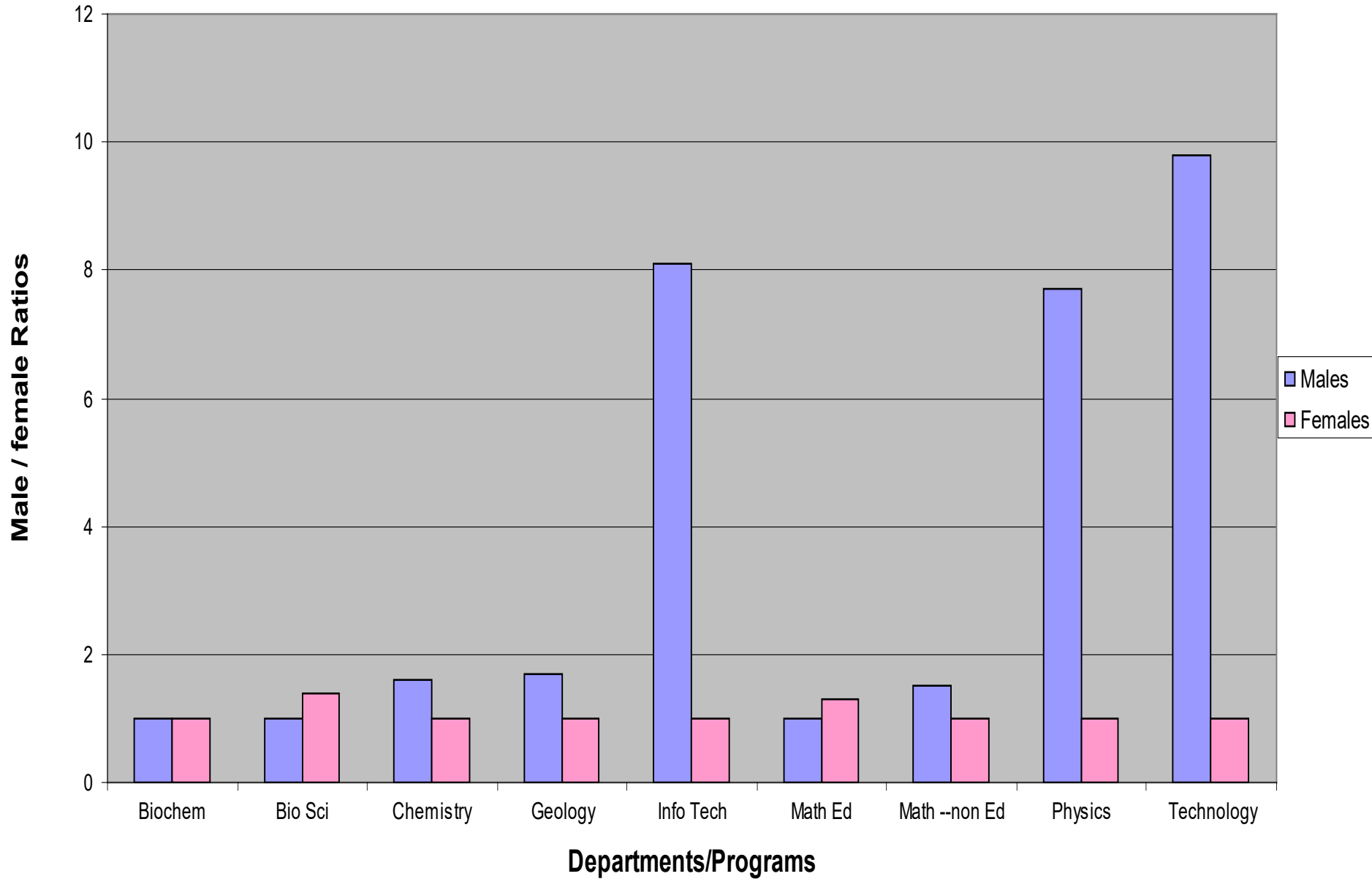
A woman with dark hair, wearing a white lab coat over a dark top, is looking upwards and to the left with a thoughtful expression. She is in a classroom or laboratory setting, with a chalkboard in the background containing some faint, colorful markings. The overall image has a soft, slightly blurred quality.

# Strategies for Maintaining Positive Student Attitudes toward Science and Technology – an Empirical Study

Kenton Machina  
(Philosophy, now; Andes  
Chair in Gen Ed at the time  
of the study)

Anu Gokhale (Technology)

Ratios of Undergrad Majors by Sex in ISU STEM Departments, Fall 06



# What do we know?

- In the early grades, male and female interest in science is about equal.
- During middle school through high school, a marked gender gap develops with respect to those fields of science and technology (S & T) that are male-dominated.
- But what happens in college freshmen? This study aimed to find out.

# Overview: Pathways Project at ISU

(Thanks to NSF. Your tax dollars at work.)

- Participants (Fall 2004)
  - 375 first-semester students enrolled in Foundations of Inquiry. 50-50 male/female ratio
  - 16 participating course sections, taught by 13 faculty. Every section focused on its own topics.
- Foundations of Inquiry (freshman seminar)
  - Section size = 30
  - Aims: develop critical thinking skills, information literacy skills, student engagement in college

# Overview: Pathways Project at ISU<sub>2</sub>

- Sections fall in three Groups (A, B, C)
- Group A
  - 5 sections, 102 students participating
  - Minimum of 4 weeks looking at arguments pertaining to a theme involving science and technology in human life
  - 7 informal show-and-tell sessions outside of class with S & T professionals talking about their work

# Overview: Pathways Project at ISU<sub>3</sub>

- Group B sections
  - 4 sections, 102 participants
  - Minimum of 4 weeks looking at arguments pertaining to a theme involving S & T in human life
  - No meetings with S & T professionals
- Group C sections (Control)
  - 7 sections, 171 participants
  - No special S & T emphasis. No meetings with S & T professionals.

# Pathways Project at ISU: Attitude Scale

- Created, tested, modified an attitude scale to be administered in class
  - Based on existing scales, adding items regarding female participation in S & T
  - 30 items using 5-point Likert scale
- Sample items
  - Science and technology courses make significant contributions to one's education.
  - Technological development creates an artificial and inhuman way of living.
  - Males tend to have more natural talent for science and technology than females have.

# Factor Analysis of the Scale

1. Interest in gaining knowledge about S & T  
(8 items in this factor) ( $\alpha = .71$ )
2. S & T is dangerous to humankind  
(4 items) ( $\alpha = .63$ )
3. S & T is beneficial to humankind  
(5 items) ( $\alpha = .75$ )
4. Female participation in S & T is appropriate  
(5 items) ( $\alpha = .75$ )
5. Males and females have equal opportunity in S & T fields  
(3 items) ( $\alpha = .67$ )

Lowest loading of any item on its Factor = .45; these 5 Factors accounted for approx. 2/3 of the variance. Factor analysis based on n of 535.



# Results:

## Significant Changes Pre- to Post (p<.05)

- Group A (Course content plus meetings)
  - No measurable attitude changes
- Group B (Course content only)
  - Negative change in FEMALES with respect to appropriateness of S & T for females (p<.0001)
  - No other measurable attitude changes

# Results<sub>2</sub>:

## Significant Changes Pre-to-Post

(where  $p < .05$ )

- Group C (No content; no meetings)
  - No measurable changes in attitudes of MALE students
  - Significant changes in FEMALE student attitudes
    - Loss of interest in gaining S & T knowledge ( $p < .02$ )
    - Growing sense that S & T is dangerous ( $p < .002$ )
    - Loss of sense that S & T is beneficial ( $p < .045$ )
    - Declining sense that S & T is appropriate for females ( $p < .042$ )
    - Declining perception of equal opportunity for females in S & T fields ( $p < .001$ )

# Conclusions

What do you make of all this?  
Do you find it disturbing?

If you are in the sciences, does this  
tell you something about what you  
should be doing in order to  
open up S & T opportunities  
for female students?

If you are not in the sciences,  
what does this mean to YOU?

Are there lessons here for your  
own work?