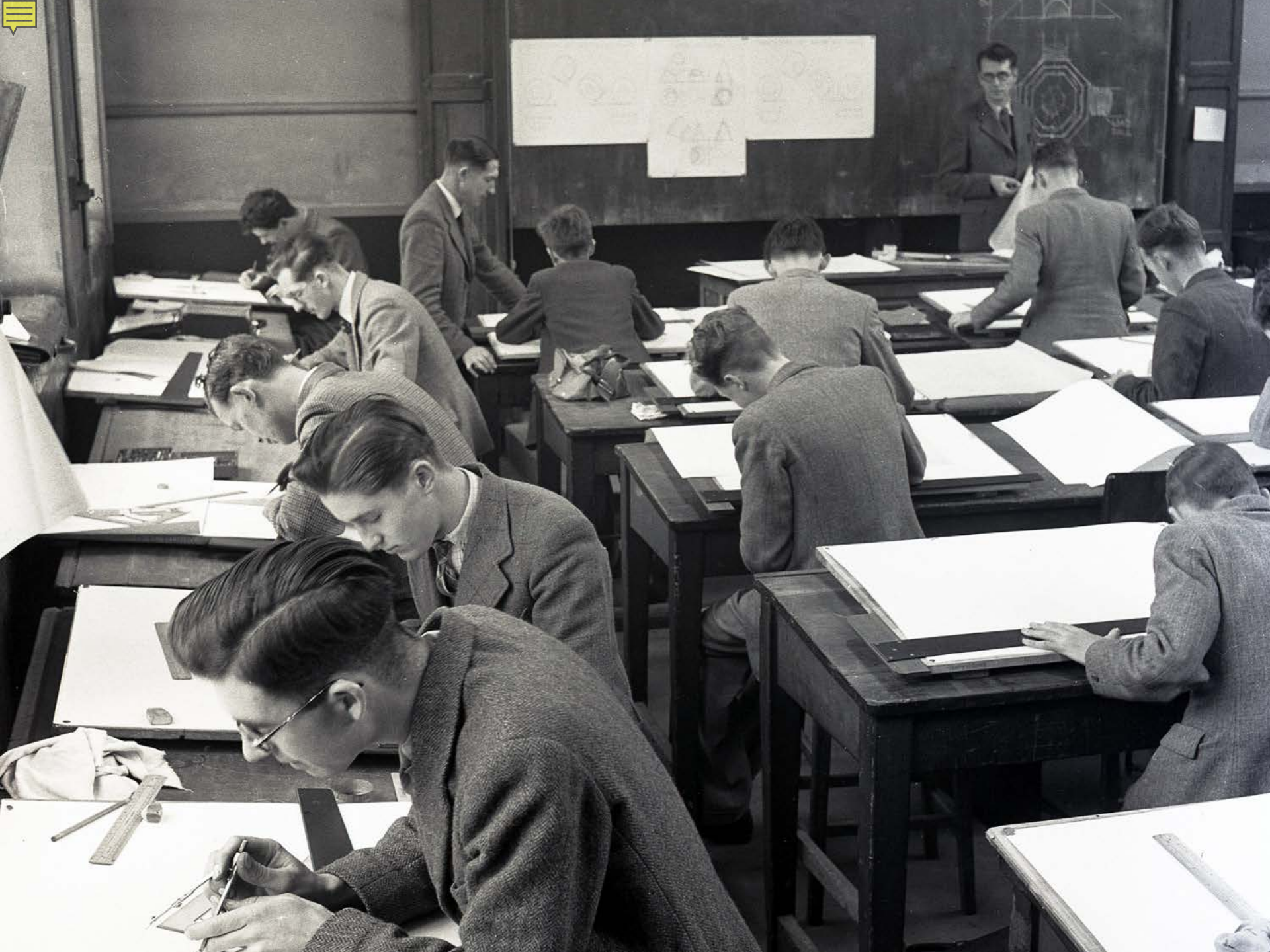
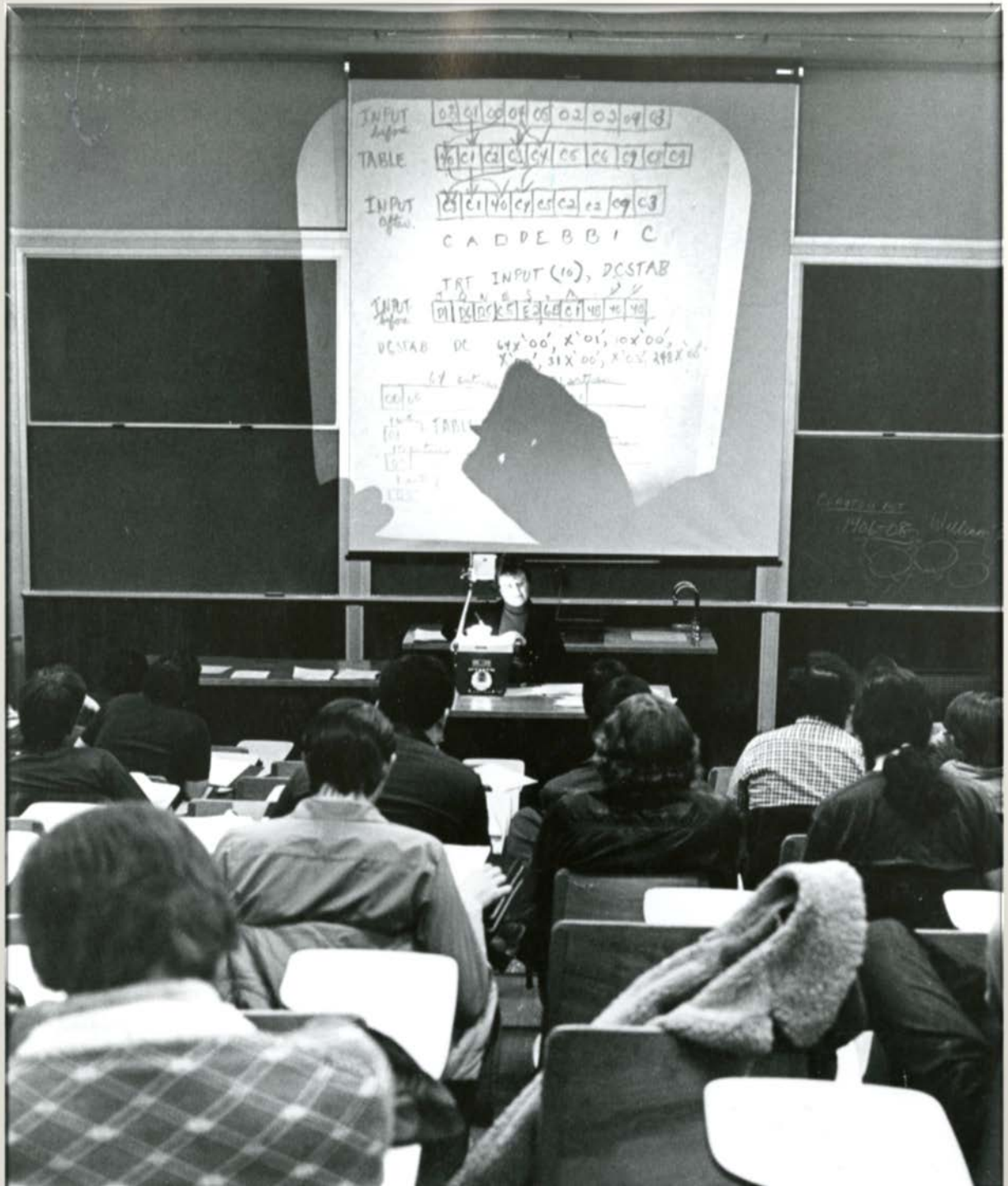
Long-Term Impacts of Project-Based Learning

Paula Quinn and Rick Vaz
WPI Center for Project-Based Learning

#IPBL2017

WPI

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THE WORLD'S GREATEST NEWSPAPER
FRIDAY, APRIL 5, 1968
MARTIN LUTHER KING SL
KENNEDY IS DEAD
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THE WORLD'S GREATEST NEWSPAPER
MONDAY, MARCH 8, 1965
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MARINES LAND IN VIET NAM
"All the News That's Fit to Print"
The New York Times
NEW YORK, THURSDAY, APRIL 23, 1970
Millions Join Earth Day Observances Across the Nation
The New York Times
MEN WALK ON MOON
ASTRONAUTS LAND ON
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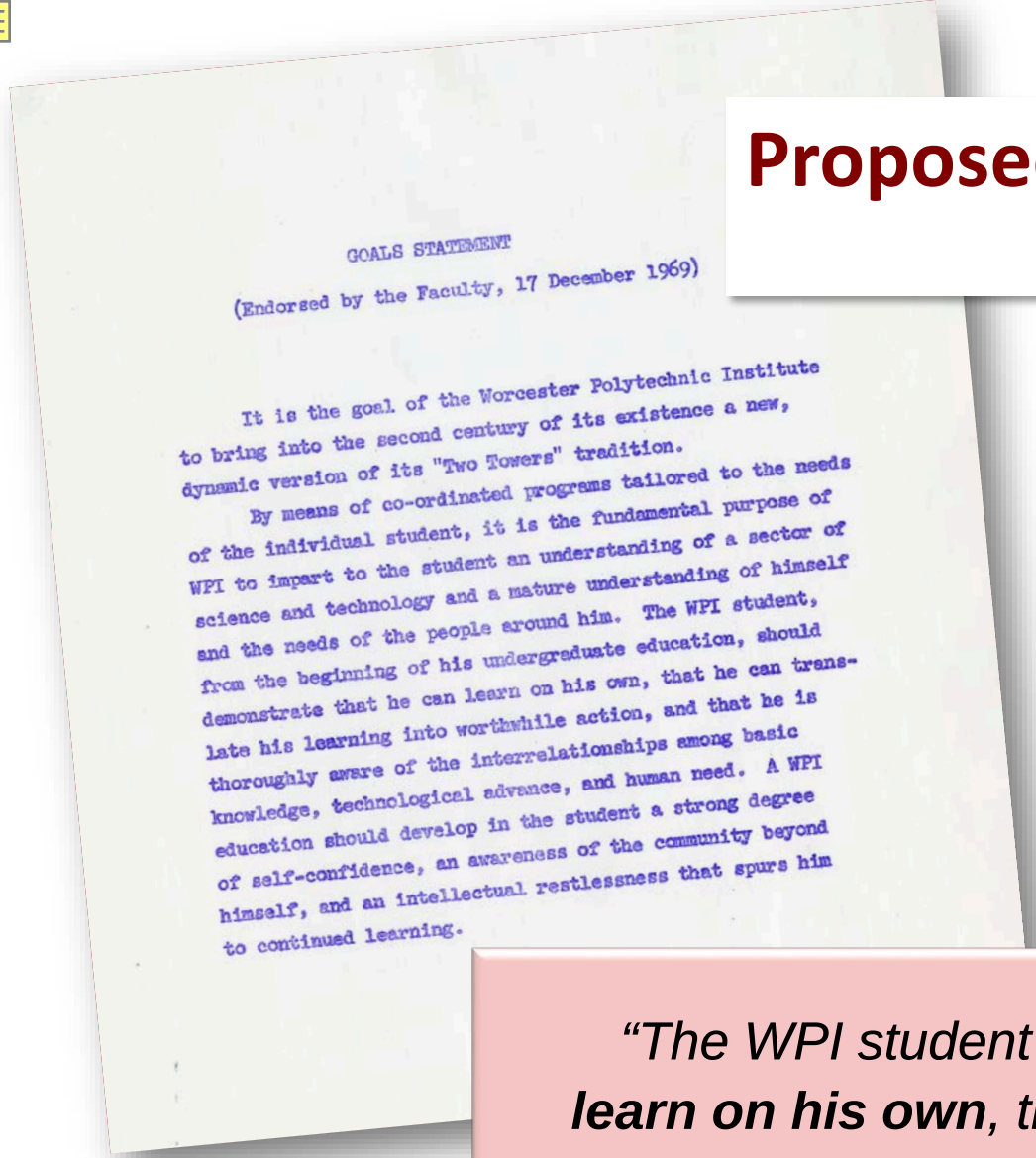
Proposed Educational Goals

December 17, 1969



GOALS STATEMENT

(Endorsed by the Faculty, 17 December 1969)

It is the goal of the Worcester Polytechnic Institute to bring into the second century of its existence a new, dynamic version of its "Two Towers" tradition.

By means of co-ordinated programs tailored to the needs of the individual student, it is the fundamental purpose of WPI to impart to the student an understanding of a sector of science and technology and a mature understanding of himself and the needs of the people around him. The WPI student, from the beginning of his undergraduate education, should demonstrate that he can learn on his own, that he can translate his learning into worthwhile action, and that he is thoroughly aware of the interrelationships among basic knowledge, technological advance, and human need. A WPI education should develop in the student a strong degree of self-confidence, an awareness of the community beyond himself, and an intellectual restlessness that spurs him to continued learning.

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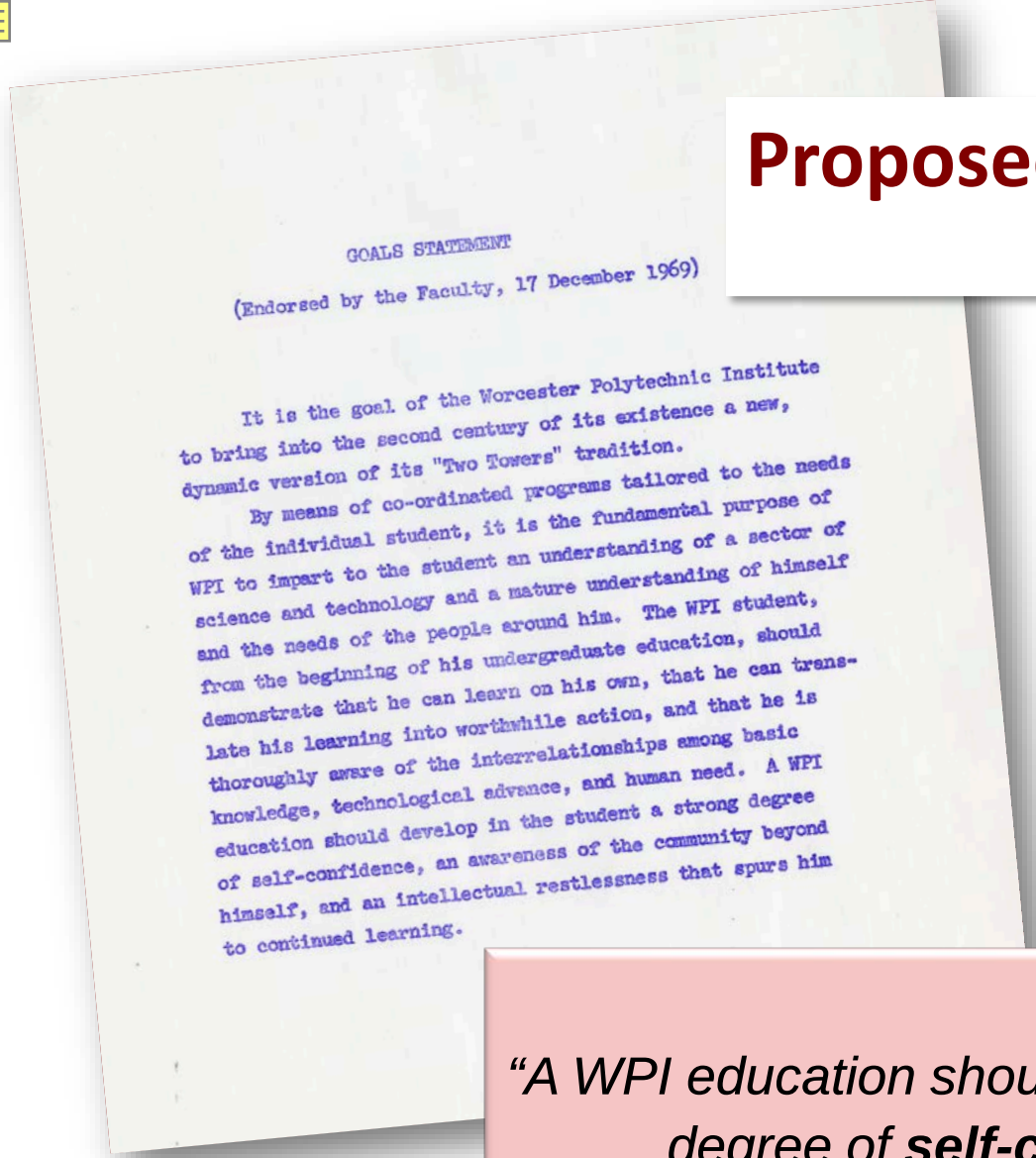

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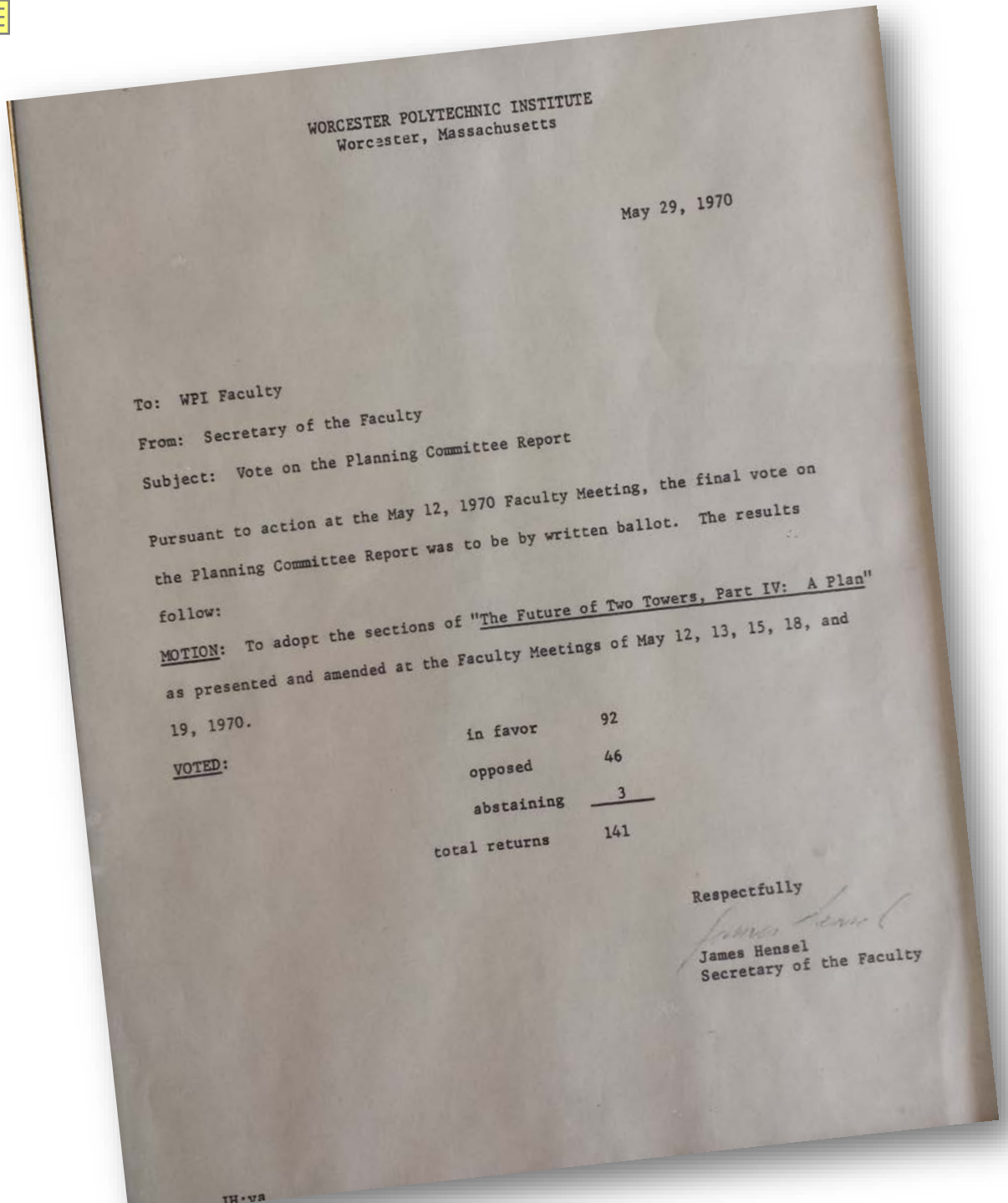


WORCESTER POLYTECHNIC INSTITUTE
Worcester, Massachusetts

May 29, 1970

To: WPI Faculty

From: Secretary of the Faculty

Subject: Vote on the Planning Committee Report

Pursuant to action at the May 12, 1970 Faculty Meeting, the final vote on the Planning Committee Report was to be by written ballot. The results follow:

MOTION: To adopt the sections of "The Future of Two Towers, Part IV: A Plan" as presented and amended at the Faculty Meetings of May 12, 13, 15, 18, and 19, 1970.

VOTED:

in favor	92
opposed	46
abstaining	3
total returns	141

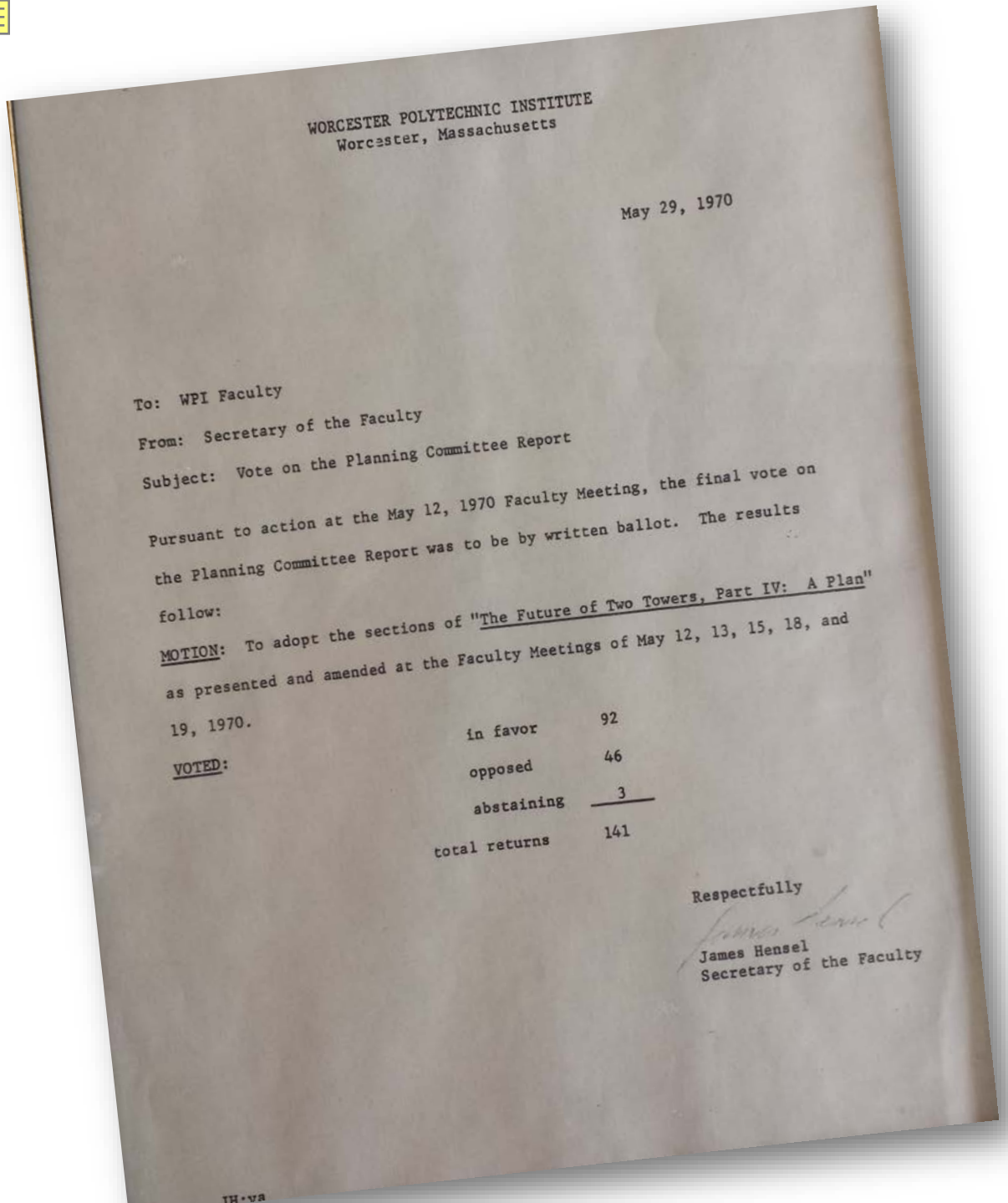
Respectfully

James Hensel

James Hensel
Secretary of the Faculty

JH:ya

The Vote
May 29, 1970



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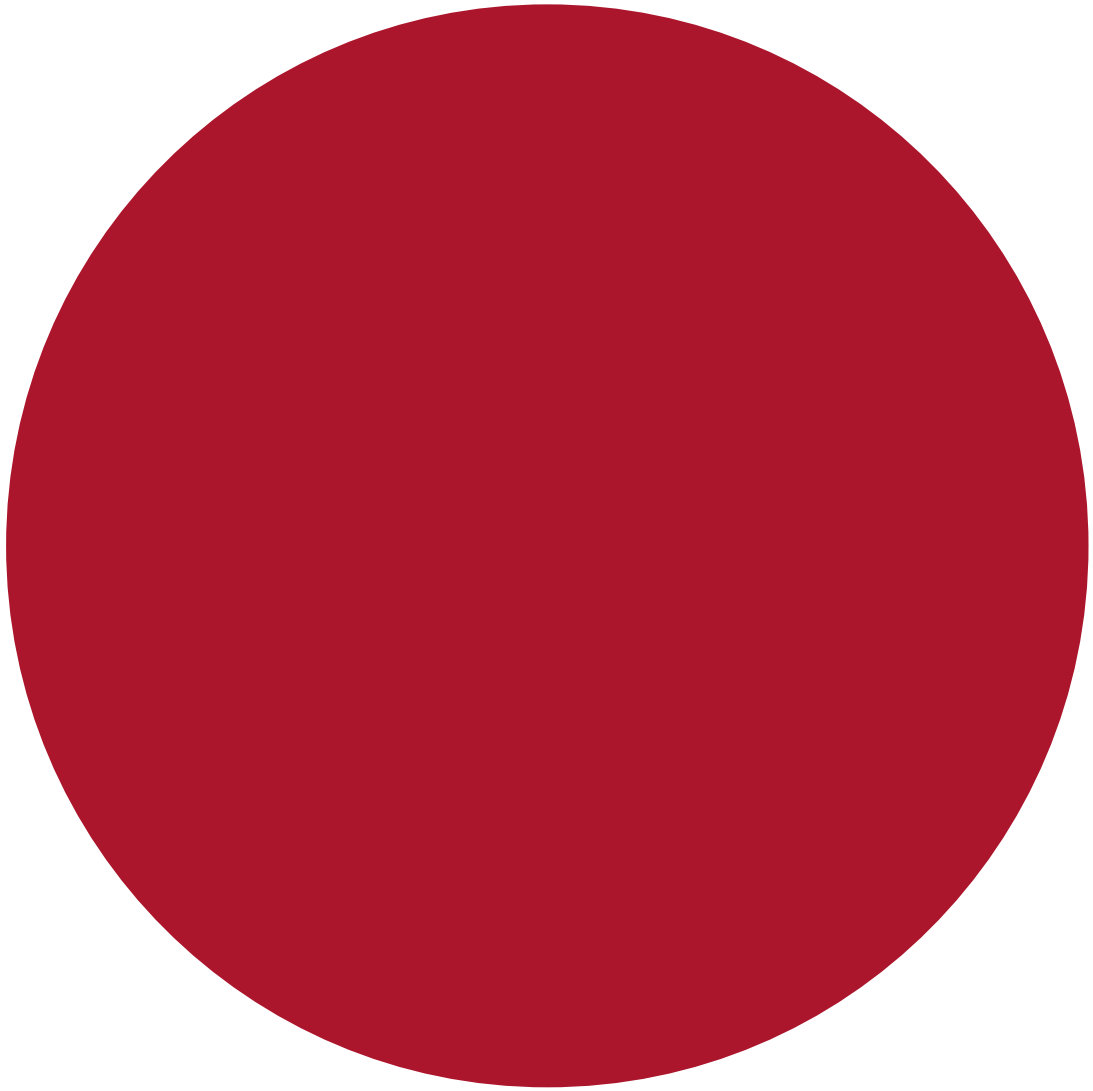

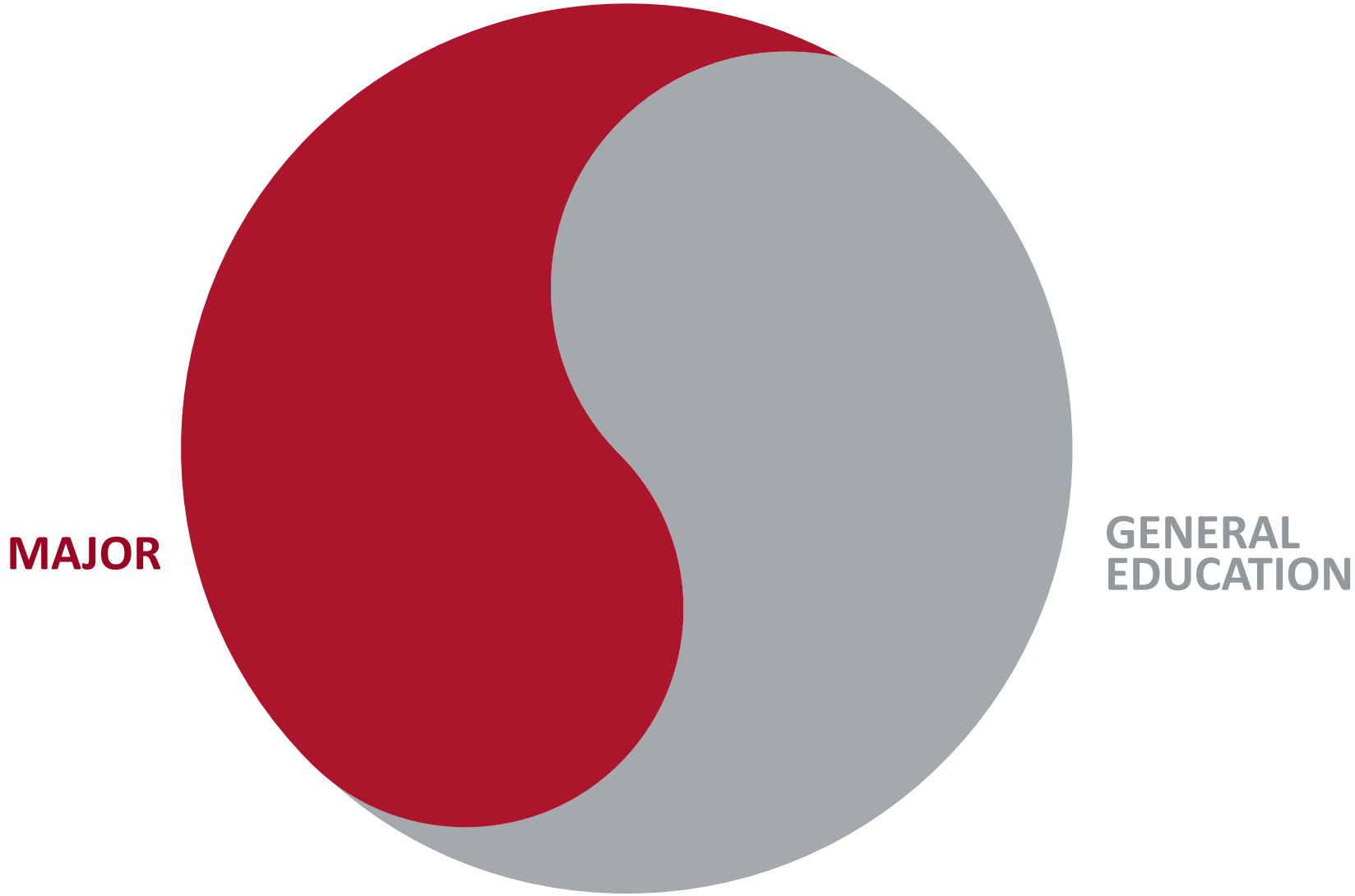
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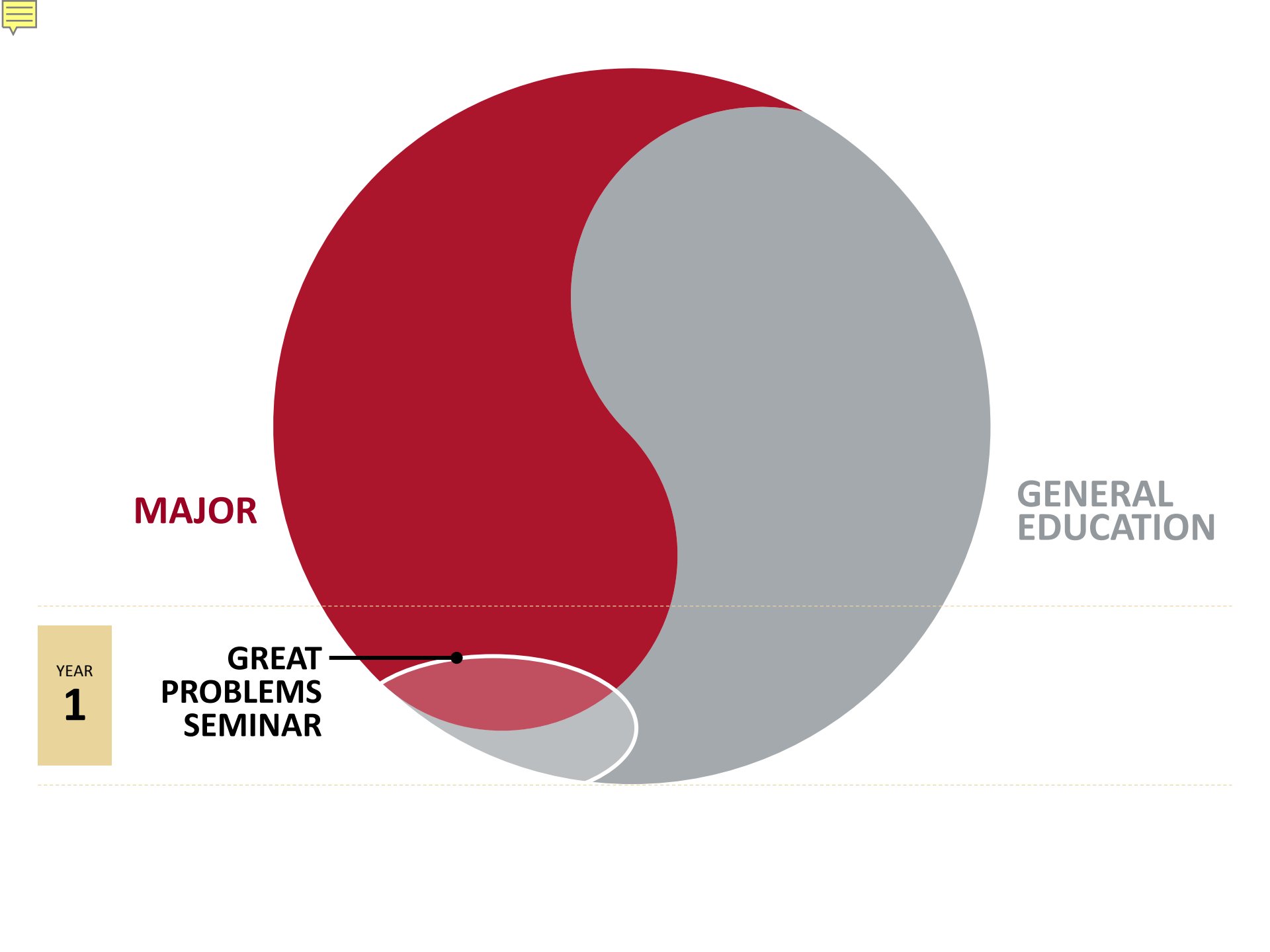
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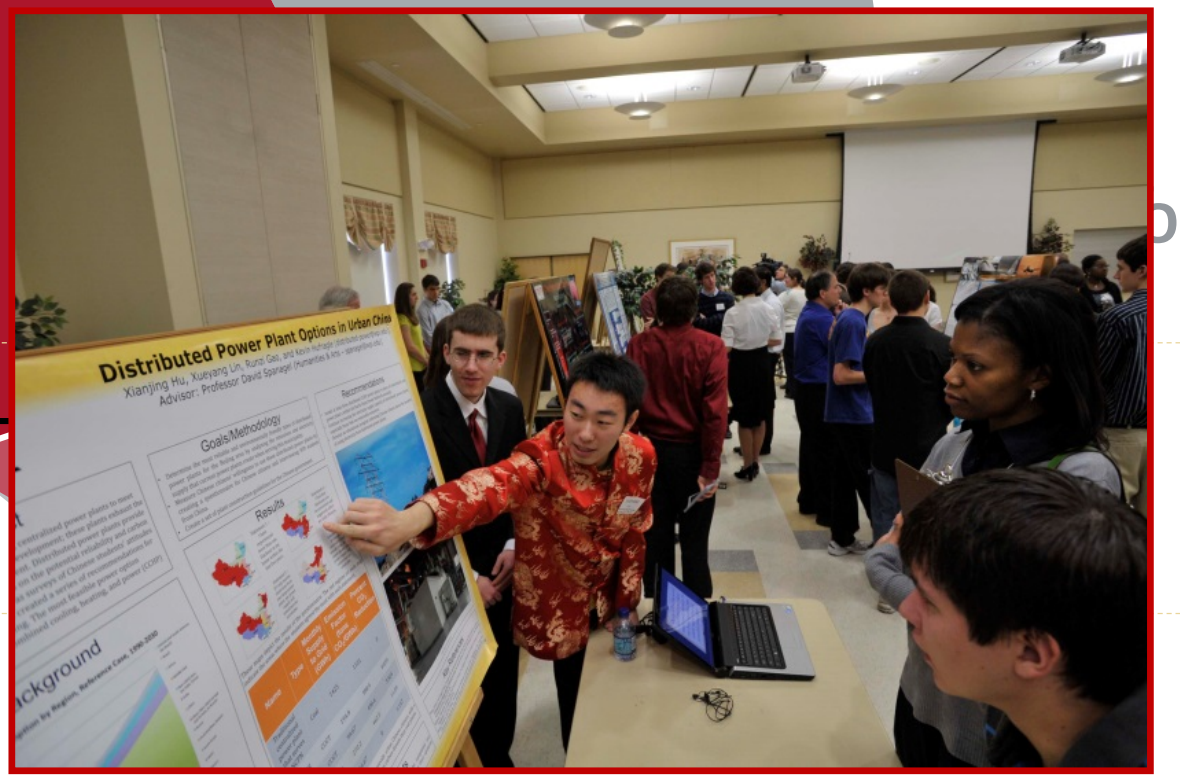

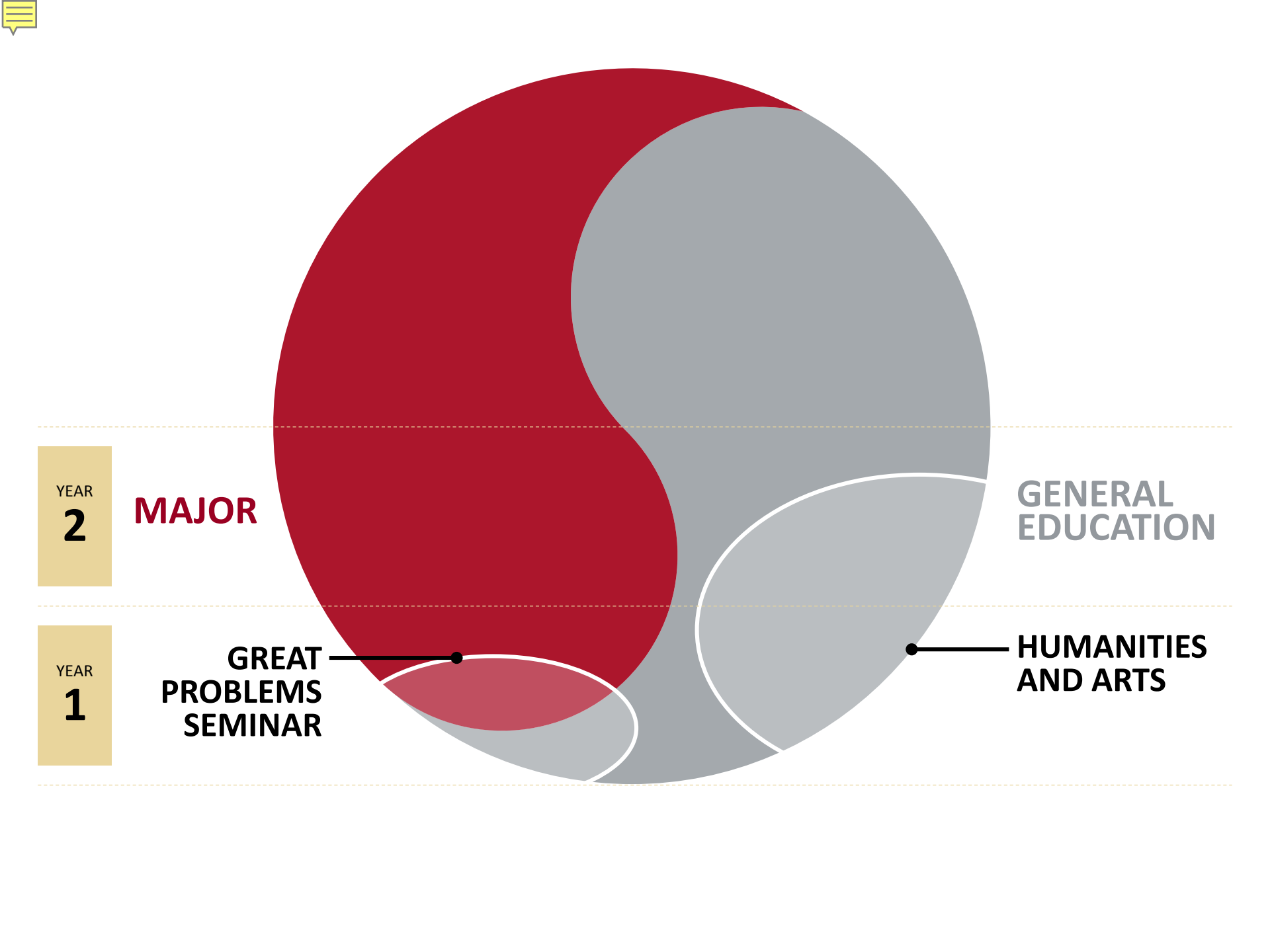
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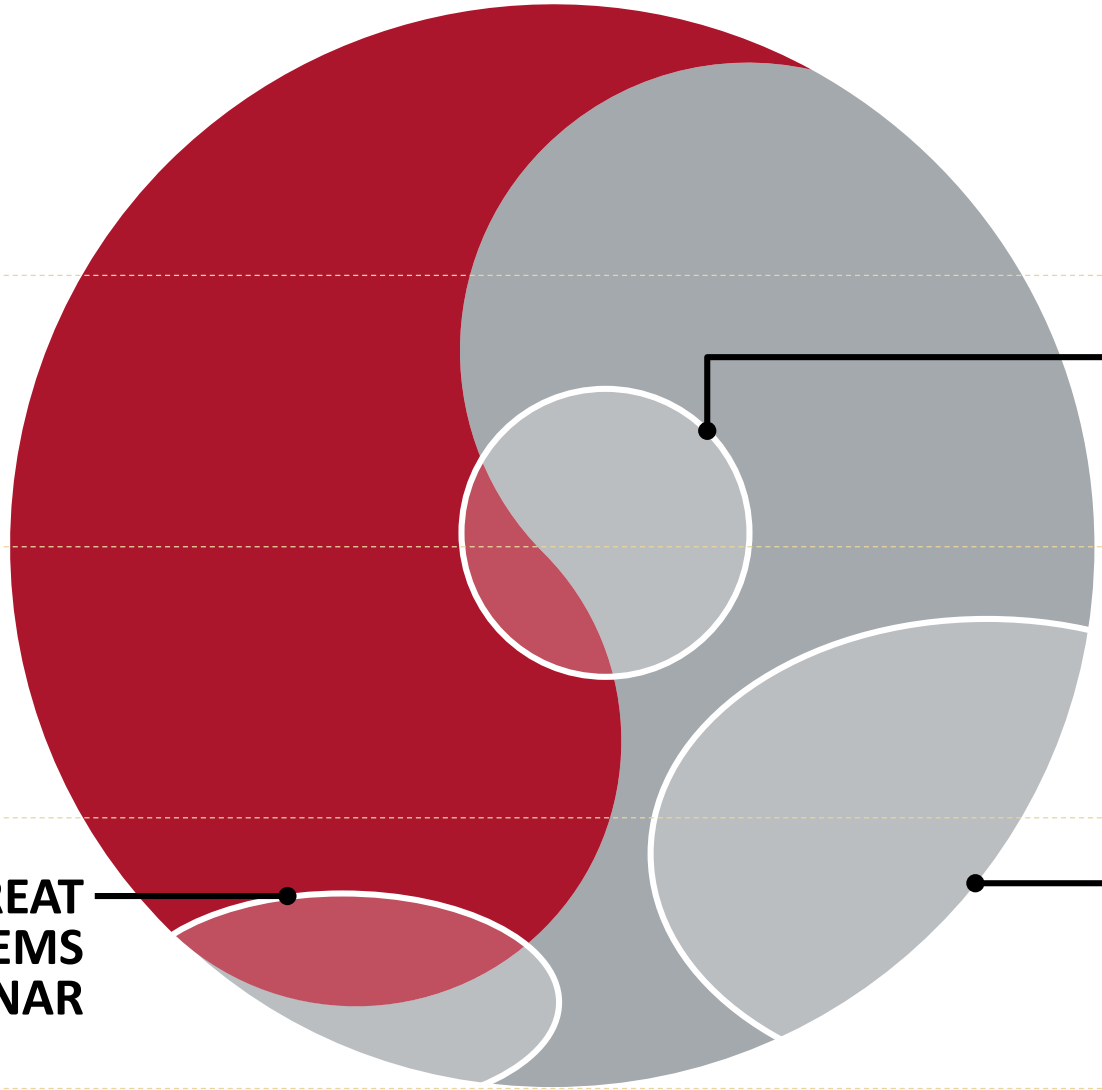

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INTERACTIVE QUALIFYING PROJECT

GENERAL EDUCATION

HUMANITIES AND ARTS

GREAT PROBLEMS SEMINAR

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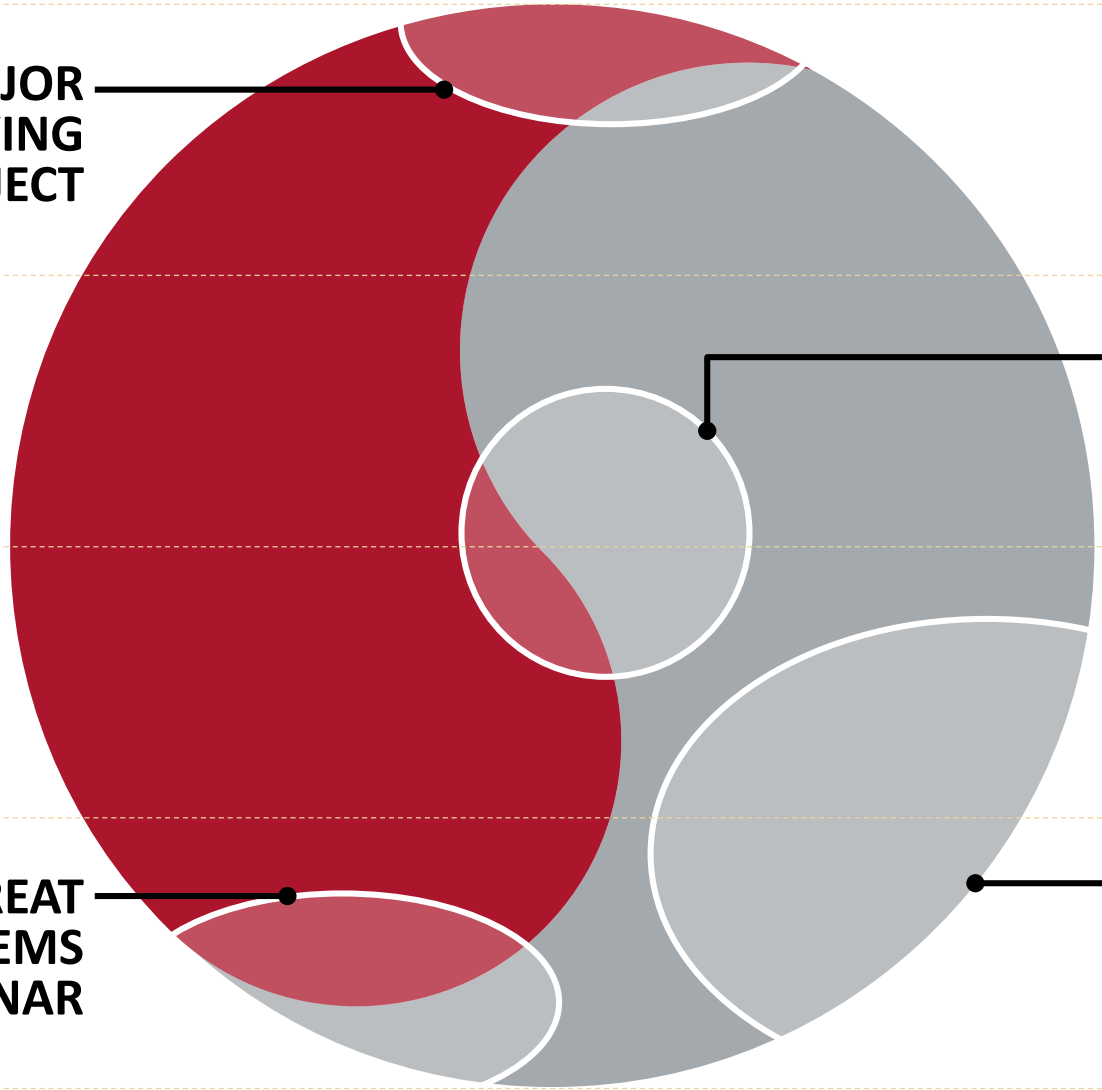

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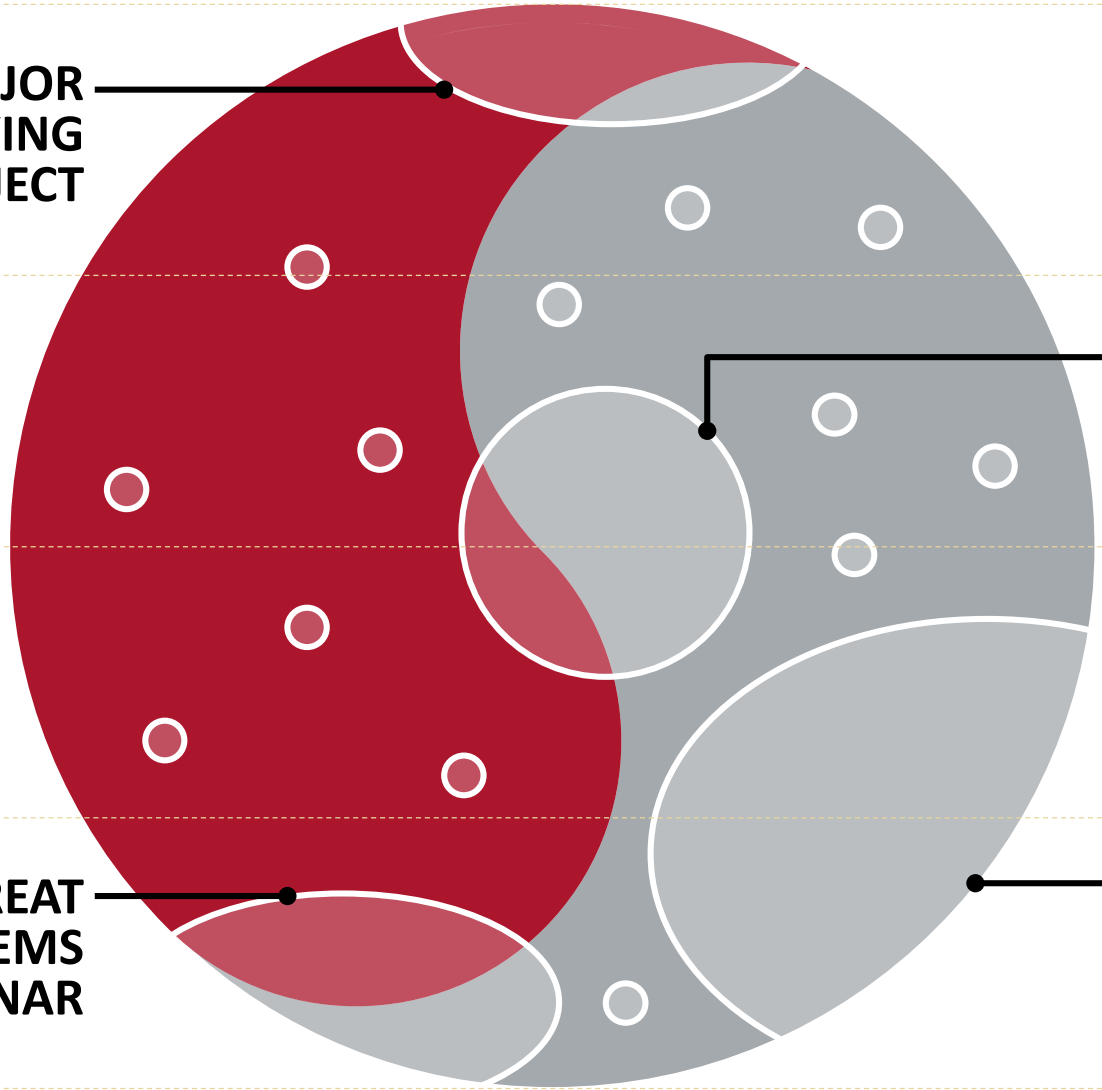

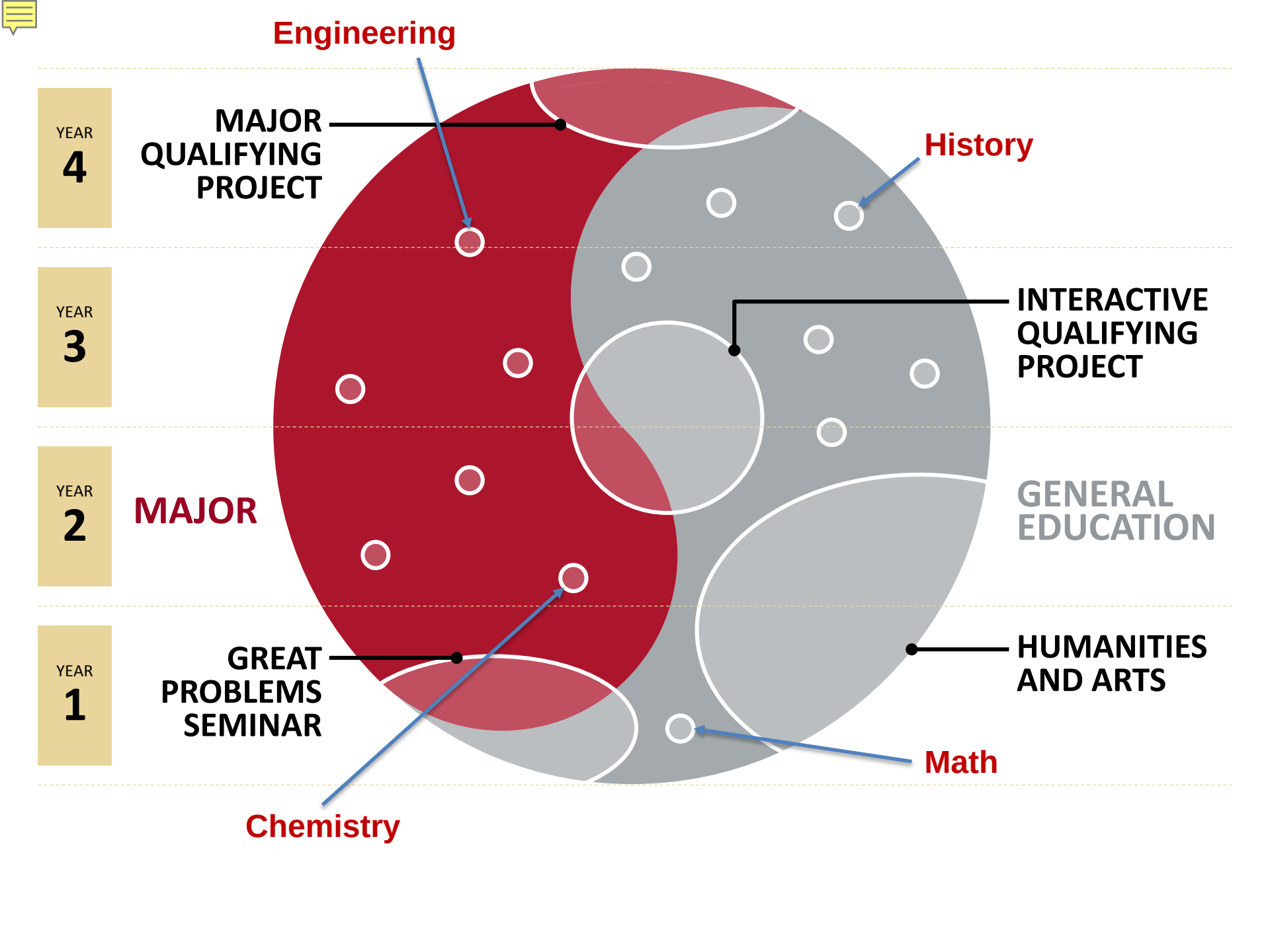
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INTERACTIVE QUALIFYING PROJECT
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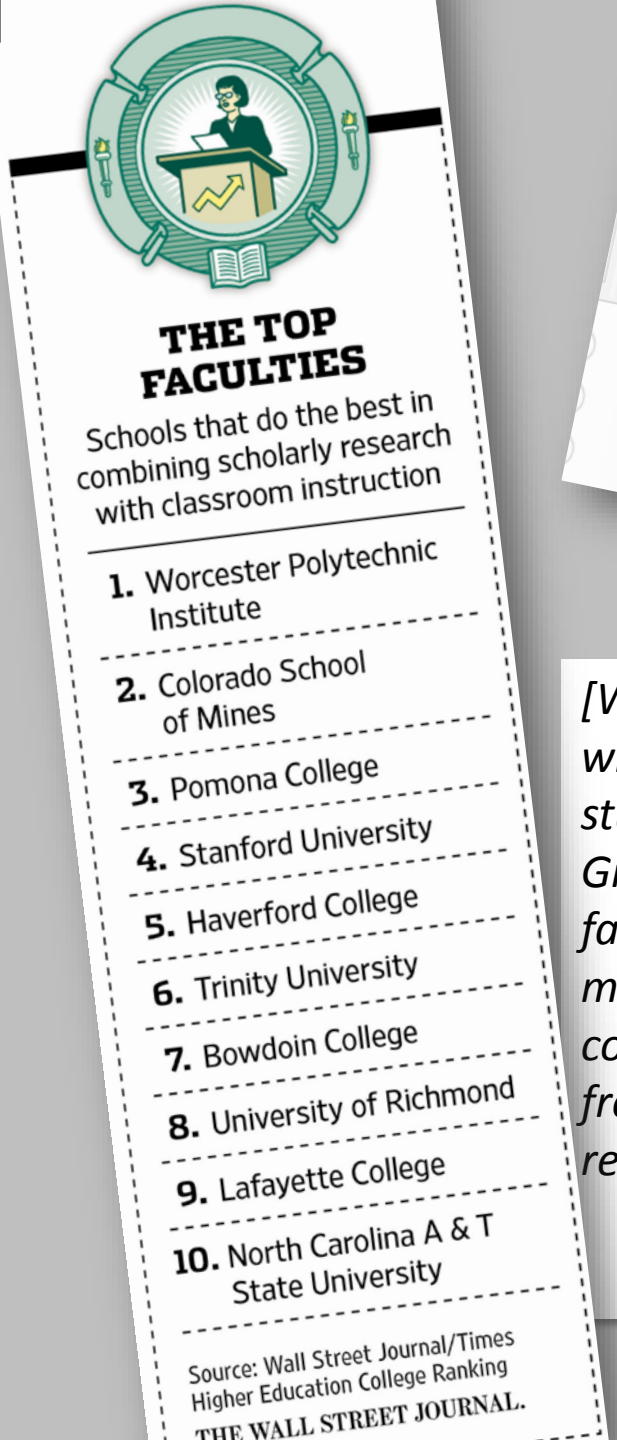

THE TOP FACULTIES

Schools that do the best in combining scholarly research with classroom instruction

1. Worcester Polytechnic Institute
2. Colorado School of Mines
3. Pomona College
4. Stanford University
5. Haverford College
6. Trinity University
7. Bowdoin College
8. University of Richmond
9. Lafayette College
10. North Carolina A & T State University

Source: Wall Street Journal/Times Higher Education College Ranking

THE WALL STREET JOURNAL.

[WPI]had long prided itself on the accessibility of its faculty but when a national engagement survey showed that first-year students didn't share that sentiment…the school created the Great Problems Seminar, a project-based class taught by senior faculty that challenges students to solve some of the world's most daunting challenges, like energy production or water contamination. Students are organized in teams with members from across disciplines, and their final product is tested in the real world.

Wall Street Journal
September 28, 2016

High Impact Practices *(Kuh, AAC&U, et al.)*

- First-Year Seminars and Experiences
- Common Intellectual Experiences
- Learning Communities
- Writing-Intensive Courses
- Collaborative Assignments and Projects
- Undergraduate Research
- Diversity/Global Learning
- Service Learning/Community-Based Learning
- Internships
- Capstone Courses and Projects

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Most Important College Learning Outcomes, According to US Employers

- Ability to communicate orally
- Ability to work effectively with others
- Ability to communicate in writing
- Ethical judgment and decision-making
- Critical thinking and analytical reasoning
- Ability to apply knowledge and skills to real-world settings

91% of employers agree that these abilities are more important than the student's major area of study to achieve success in their careers

Source: Hart Research Associates, 2015

Long-term impacts of projects?
Preparation for career and life?
Experience of different groups?

Methods

- Participants
  - WPI project-based curriculum graduates ('74-'11)
  - Non-alumni employers of WPI graduates
- Survey: Demographics + 39 Likert-scale items on project impacts
  - Professional skills and abilities
  - World views
  - Personal impacts
- Interview protocols: Semi-structured

Findings

- Formal project work conveys *many* positive impacts
  - A wide range of professional abilities and skills
  - Broader world views and personal growth
- Some alumni groups report especially positive impacts from project work
  - Women
  - Engineering majors
  - Those who completed off-campus projects
- Interviews reveal compelling stories of growth and transformation

In which area did alumni experience the strongest professional impacts?

Effectively manage a project

Succeed in business or industry

Solve problems

Develop ideas

Effective professional interactions

Responsibility for own learning

Write clearly and effectively

Be an effective leader

Speak clearly and effectively

Function effectively on a team

Professional Impacts	% Positive Responses
Responsibility for own learning	**89**
Develop ideas	**89**
Solve problems	88
Effective professional interactions	87
Function effectively on a team	86
Effectively manage a project	86
Write clearly and effectively	83
Succeed in business or industry	78
Be an effective leader	78
Speak clearly and effectively	76

Alumni Voices: Preparation for Work

"For me, when I started to work … every project I got involved with … was like [one of my big WPI projects] … I just felt … 'I've done this before.'"

"[Project work] is really a problem-solving and project management education, and that's something I use constantly at work."

"It's close … to what I do now. … I can't think of another school that would have been suitable for me to be doing what I do now … life is projects."

Alumni Voices: Professional Skills

"You gain so many skills working with other people and you learn to value other people and what they bring."

"I think the [projects] just really mimic, at a very early age—a formative age … in your learning process— … how to work, how to be successful."

"You've got to get used to speaking … and answering questions and being confident, and that was invaluable."

"[Project work] teaches you a great deal about how to present yourself … and present your ideas effectively."

In which area did alumni experience the strongest personal impact?

Desire to stay connected to WPI

Feeling able to make a difference

Feeling own ideas are important

Feeling connected to WPI

Enriched personal life

Achieving work/life balance

Stronger personal character

Personal Impacts	% Positive Responses
Stronger personal character	**87**
Feeling own ideas are important	79
Feeling able to make a difference	66
Enriched personal life	64
Feeling connected to WPI	62
Achieving work/life balance	53
Desire to stay connected to WPI	47

Personal Impacts	% Positive Responses
Stronger personal character	**87**
Feeling own ideas are important	79
Feeling able to make a difference	66
Enriched personal life	64
Feeling connected to WPI	62
Achieving work/life balance	53
Desire to stay connected to WPI	47

"…taking pride in your work, operating according to a strong work ethic, persevering through adversity, being self-motivated, feeling self-confident, feeling self-aware, and operating according to a well-defined code of personal values"

Alumni Voices: Personal Impacts

"[The projects]… give you the opportunity to become independent, work on your own, find … solutions…. It just gave me the opportunity to develop my character and drive."

"To have something that really takes you out of your comfort zone … where you can't predict exactly what's going to happen … helped me to become a stronger person as I headed out of college."

"The projects gave me an enhanced confidence level, that I could achieve—and it sounds almost cocky—but I could achieve almost anything."

Benefits of Off-Campus Projects

- About 40% of respondents had done at least one project away from campus
- Alumni who did off-campus projects reported more positive impact in **33/39** areas
- Consistent with research indicating that "study away" experiences convey similar benefits to study abroad

"I don't think it really mattered where I went … my entire experience after the [project] was different than before…. Somehow, something changed. I felt like a different person when I came back. … I saw the reason why I went to college, because I saw something taken to completion in the real world."

Benefits to Women

- Female alumni reported more positive impact in 36/39 areas
- Research shows women are more motivated than men by context, application, and collaboration

"For the longest time, [I] didn't want to be an engineer because … I thought that … it was just sitting behind a desk doing calculations…. These projects really allowed me to see the impacts on society that engineering can have, and it made it fun, it made it interesting and relatable, and it really stimulated my interest in staying with engineering."

Additional Findings

- “Real world” aspect highly motivational
- Adversity in projects viewed as an asset
- Unpredictability of projects promoted learning, growth, and confidence
- Projects viewed as a “safe environment” to develop professional skills

A Few More Voices

“I still tell people about [my project] all the time … [it’s] a cornerstone of how I work.”

“Both projects definitely had a lasting impact. To this day I talk about those more than … any other academic thing I did.”

“One of my fondest memories … in my whole life.”

Reinforcement from Employers

- Employers who knew WPI had project-based learning overtly stated that project-based learning **was responsible** for creating individuals who were well-prepared for the workplace
- Employers see particular value in projects with certain characteristics
  - Long-term, non-trivial in scope
  - Substantive, involve working with industry, focused on solving problems that truly exist in the world
  - Authentic, not merely exercises, require students to be self-directed

Employer Voices

"[When] they're doing those project-based … courses … with teams, they end up … being able to communicate and to articulate … their point of view and what they think is appropriate, having to work through the compromises, all of that. I think … as a result of that type of class work and preparation, they're … better … prepared…"

Employer Voices

"[The projects] are always discussed at our interviews, and we kind of delve deeper into what [the students'] experiences were … what kind of problems they've had … how their trouble-shooting was, how … was their team dynamics … were they the leader, were they the background … how did they work out any problems. So we get very, very concrete examples…"

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