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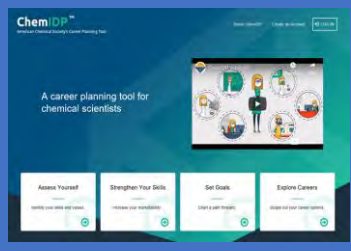

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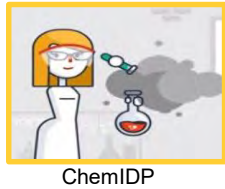
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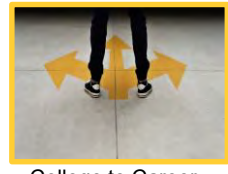
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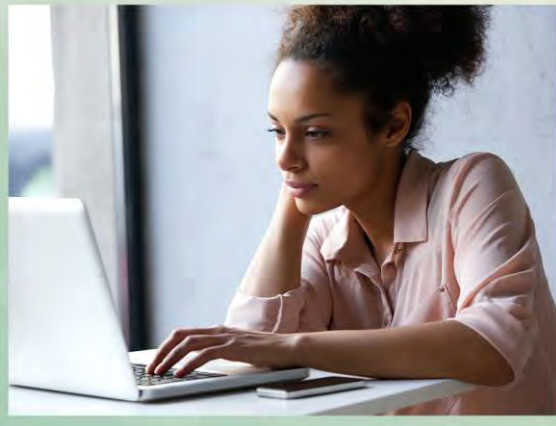

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A Career Planning Tool For Chemical Scientists

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Moderator: Matt Grandbois, DuPont Electronics & Industrial

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Preparing Students for Collaborative Work Beyond Graduation

ANNE KONDO
Chair, Madia Department of Chemistry, Indiana University Pennsylvania

JORDAN HARSHMAN
Assistant Professor, Chemistry and Biochemistry, Auburn University

MARIAN GINDY
Executive Director, Formulation Sciences, Pharmaceutical Sciences, Merck

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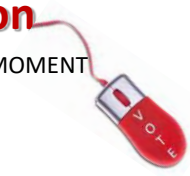
Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



What is the highest degree offered at your institution?

- Associate's degree
- Bachelor's degree
- Master's degree
- Doctoral degree
- Not applicable

** If your answer differs greatly from the choices above tell us in the chat!*

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PREPARING STUDENTS FOR COLLABORATIVE WORK BEYOND GRADUATION

ANNE KONDO
Chair, Madia Department of Chemistry, Indiana University Pennsylvania

JORDAN HARSHMAN
Assistant Professor, Chemistry and Biochemistry, Auburn University

MARIAN GINDY
Executive Director, Formulation Sciences, Pharmaceutical Sciences, Merck

WHAT YOU WILL LEARN

- What collaborative work involves
- What collaborative and teamwork skills employers expect
- How these skills are acquired

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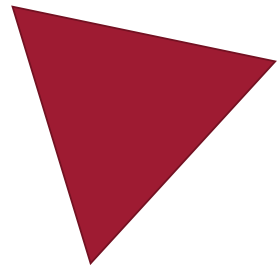
What are teamwork skills, exactly?

Cognitive Domain
Information and Communications Technology, Literacy, Critical Thinking, Analysis, Decision Making, Problem Solving, Reasoning/Argumentation, Adaptive Learning, Career Orientation



Intrapersonal Domain
Self-Evaluation, Monitoring, Flexibility, adaptability, professional Ethics, Appreciation of Diversity, Productivity, Perseverance, Initiative, Personal/Social Responsibility, Intellectual Interest, Physical and Mental Health

Interpersonal Domain
Nonverbal Communication, Active Listening, Oral and Written Communication, Empathy, Trust, Assertive Communication, Coordination, Collaboration, Conflict Resolution, Negotiation, Team Monitoring and Evaluation, Situational Leadership

NRC. 2012. *Education for Life and Work.* Washington, DC: The National Academies Press.

Fair, et al., J. Chem. Educ. **2014**, *91*, 2084-2092 *J. Chem. Educ.* **2017**, *94*, 304-310

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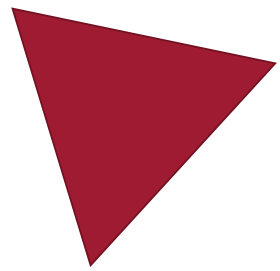
What students are/should be learning in college



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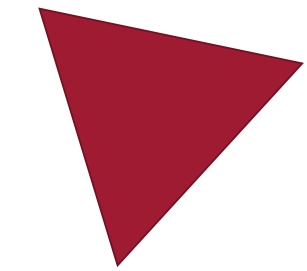

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Character traits and interest in developing

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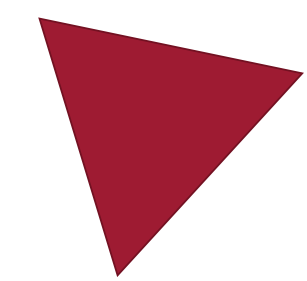

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Trust, Assertiv… …ination,
Collaboration, Conflict… …on,
Team Monitoring and Evaluati… …l
Leadership

"Able to work well with others," (DEIR)

90% of chemical employers believe these teamwork skills are equally or more important than technical skills

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Fair, et al., J. Chem. Educ. **2014**, *91*, 2084-2092 *J. Chem. Educ.* **2017**, *94*, 304-310

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Undergraduate students acquire teamwork skills from completing labs with partners

- True
- False

** If your answer differs greatly from the choices above tell us in the chat!*

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Groupwork

https://vibrance.wordpress.com/2007/05/22/dont-push-the-bus/

Teamwork

https://surgery.med.ufl.edu/

22

True or False: undergraduate students acquire teamwork skills from completing labs with partners.

Group work	Teamwork
- everybody possesses cognitive skills to solve task	- Different team members possess different cognitive skills, requiring interdependence
- efficiency permits tasks to be equally divided	- project is divided by expertise
- conflict typically arises from group members not pulling their weight	- conflict is good (if handled) because can lead to a better product.
	- requires better communication skills from everyone

IUP

23

How we teach these teamwork skills at IUP

- We use Liberal Studies (General Education) courses to teach and have the students reflect on the interpersonal and intrapersonal skills that contribute to teamwork.
- We have the students **practice** and reflect on their teamwork skills by taking a "T-course" (a course within their major that is paired with another course, where related projects must be completed)
  - requires instructors to set up interdisciplinary Teamwork tasks
  - students complete a teamwork-based research project
- In a capstone course, students reflect about what they've learned.

IUP

24

"...better-designed opportunities should exist for the development of critical professional skills... to offer specific activities that would enhance students' ability to:

- Communicate complex topics to both technical and nontechnical audiences...
- Collaborate on global teams..."

American Chemical Society (2012) "Advancing Graduate Education in the Chemical Sciences"

"Students would be encouraged to create their own project-based learning opportunities—ideally as a member of a team—as a means of developing transferable professional skills such as communication, collaboration, management, and entrepreneurship.

National Academy of Science (2018) "Graduate STEM Education for the 21st Century"

How do students acquire these "soft skills" in their professional growth?

25

Socialization: Process of developing a professional self, attitudes, values, and skills

1. Anticipatory
Students will become aware of expected behaviors and attitudes in their classroom and research experiences.

2. Formal
Students learn and adopt the "explicit" curriculum and expectations; shape identity and value based on things explicitly communicated to them.

3. Informal
Students learn and adopt the "hidden" curriculum and expectations; shape identity and value based on things implicitly communicated to them.

4. Personal
Students internalize new roles and integrate these with existing identity; shift from student to colleague and define own expectations.

Merton, 1957; Merton, Reader, and Kendall, 1957; Thornton and Nardi, 1975; Weidman, Twale, and Stein, 2001; Austin & McDaniel, 2006; Gardner, 2007

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We tend to focus on our formal components of education…

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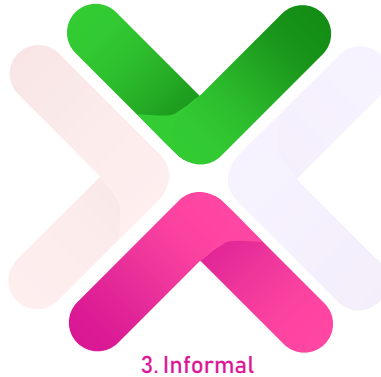

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But a growing evidence base suggest significant growth in soft skills occurs outside of these components.

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Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

In your experiences as an undergrad and grad student, **how big of a role was teamwork in your primary research project?**

- Truly collaborative project; teamwork was huge
- "Divide and Conquer:" everyone had their own piece
- Worked with others only when they or I needed help
- I worked mostly independently
- Not applicable

** If your answer differs greatly from the choices above tell us in the chat!*

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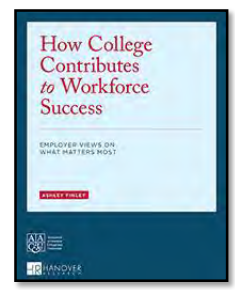
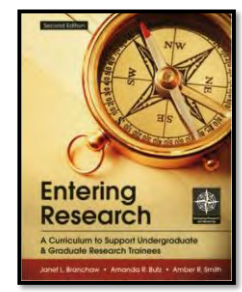
RELATED RESOURCES:

Employment Information:
How College Contributes to Workforce Success
https://www.aacu.org/new-report-employer-views-higher-education



Training Materials:
Entering Research Curriculum: https://wiscience.wisc.edu/program/entering-research



Rubrics to Assess Collaborative and Professional Skills:
Enhancing Learning by Improving Process Skills in STEM (ELIPSS):
https://elipss.com/index.html

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