Process of Science

Scientific Thinking	1. Explain how scientists use inference and evidence-based reasoning to generate knowledge and understanding
	2. Describe the iterative nature of science and how new evidence can lead to the revision of scientific knowledge and explanations
Question Formulation	3. Develop questions to investigate based on observations made by the student or other students
Study Design	4. Engage in **study** design, such as in the development of simple controlled experiments, and make predictions
	5. Accurately record measurements and observations
Data Interpretation and Evaluation	6. Analyze data, summarize resulting patterns, and draw appropriate conclusions
	7. Make evidence-based claims/arguments using one's own and/or other's research
Model Application	8. Build and use simplified representations (e.g., models/concept maps) to describe a biological system and its components, explore a problem/concept, communicate ideas, and make predictions

Quantitative Reasoning

Numeracy	9. Use simple mathematical calculations, such as percentages and means
	10. Create and interpret simple representations of data such as graphs, tables, and charts
Quantitative & Computational Data Analysis	11. Describe how quantitative reasoning helps us understand and communicate about the natural world

Communication and Collaboration

Communication	12. Be able to communicate scientific concepts, data, and methods effectively using language appropriate to a targeted audience (e.g., the public, fellow students, life science experts, and collaborators in other disciplines)
	13. Use a variety of modes to communicate science (e.g., oral, written, visual)
Collaboration	14. Work with teammates to establish and periodically update group plans and expectations (e.g., team goals, project timeline, rules for group interactions, individual and collaborative tasks)
	15. Elicit, listen to, and incorporate ideas from teammates with different perspectives and backgrounds
Collegial Review	16. Evaluate feedback from others and revise work or behavior appropriately
	17. Critique others' work and ideas constructively and respectfully

PROJECT GELS

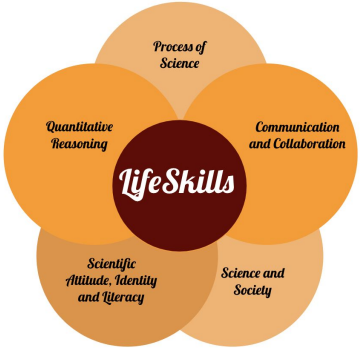
Science and Society

Problem Solving	18. Describe examples of real-world problems that are too complex to be solved by applying life science approaches alone
	19. Suggest how collaborators in STEM & non-STEM disciplines could contribute to solutions of real-world problems
Ethics	20. Identify ethical concerns & considerations of a given research study
	21. Critique how ethical controversies in life science research have been and can continue to be addressed by the scientific community
	22. Evaluate and use best practices for responsible research conduct (e.g., lab safety, record keeping, proper citation of sources)
Societal Influences	23.Describe examples of how scientists' backgrounds & biases can influence science and how science is enhanced through diversity
	24. Identify and describe how systemic factors (e.g., socioeconomic, political) can affect how and by whom science is conducted
Science's Impact on Society	25. Identify how evidence-based reasoning and life science knowledge is useful in daily life (e.g., purchasing products, reading claims from popular media, engaging in the solution of civic issues)
	26. Use examples to describe the relevance of science in everyday experiences of people
	27. Relate science content presented in class to current, real world, local or global issues
	28. Identify and describe the broader societal impacts of biological research on different stakeholders
	29. Describe the roles and responsibilities scientists have in facilitating public understanding of the process and products of science

Students' Scientific Attitude, Identity, and Literacy	
Attitude and Identity	30. Recognize the importance of one's own openness to alternative ideas to solve a science problem or answer research questions
	31. Critically assess one's own contributions to a team's scientific work
	32. Identify an area of personal interest in the sciences
	33. Identify possible roles that one could undertake in science or science-related careers
	34. Evaluate one's own personal growth in understanding and ability in science
Scientific Literacy and Critical Thinking	35. Explain how scientific thinking is used daily to resolve personal or societal problems
	36. Evaluate personal understanding of scientific information and concepts by explaining scientific concepts in the student's own words
	37. Find and evaluate credible scientific information from a variety of sources
	38. Evaluate claims in scientific papers and social media and from non-scientists and scientific experts using evidence-based reasoning
	39. Recognize misuse of scientific information, including cherry-picking of data, use of anecdotal information, and/or pseudoscience

Project website
https://projectigels.org/

LifeSkills Resources:
https://docs.google.com/spreadsheets/d/1nQ5kSlBCl0US2Aem2Td1WNznbYsJ_XPWLrx5HkiW6ug/edit?usp=sharing



IGELS Steering Committee
Karla Fuller
Tamar Goulet
Heather Rissler
Davida Smyth
Gordon Uno, PI
Dayna Defeo
Bryan Dewsbury
Sam Donovan
Gabriela Hamerlinck
Elizabeth Harrison
Melanie Lenahan
John Moore
Jaclyn Reeves-Pepin

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The IGELS LifeSkills Guide

The LifeSkills guide comprises course-level learning outcomes focused on the skills we consider as critical for all students taking an undergraduate general education life science class. Building on the six core competencies of Vision and Change, and inspired by the original BioSkills guide, these outcomes were developed by the Project IGELS team and tested by AP Biology Teachers and college biology educators from a range of biology subdisciplines and institution types.