



# IOWA BIOLOGICAL SCIENCES TRANSITION GUIDE

FOR A SUCCESSFUL TRANSFER EXPERIENCE FROM IOWA'S COMMUNITY COLLEGES  
TO PUBLIC UNIVERSITIES IN BIOLOGY

## Preamble

*Innovation in life science will be the major driver of meeting four major societal challenges: challenges of climate, challenges of food, challenges of energy, and challenges of health.<sup>1</sup>*

-Phillip Sharp, co-chair of the National Academy of Sciences New Biology for the 21st Century committee and professor of Biology, MIT

In the year 2010, 2,477 biology majors\*, prospective solvers of some of society's greatest challenges and mysteries, entered Iowa's public universities. Of that total, 72.1 percent (1,787) were incoming freshmen, and 27.9 percent (690) were transfer students who had already completed college coursework or degree programs - chiefly from Iowa's community colleges. The number of students transferring to Iowa's public universities to study in the biological sciences is on a steady annual increase, growing by 111 students from 2009 to 2010. Common preparatory pathways for transferring to university biology programs from community colleges continue to grow as well. For example, 1,000 more students were degreed in the health science cluster at Iowa community colleges in 2010 than in 2009.<sup>2</sup> Transfer students make up an increasing proportion of biology majors at Iowa's public universities. However, indicators suggest that incoming biology majors who are transfer students are more likely to encounter barriers to success than are students who enroll as freshmen at Iowa's public universities. The fact that a significant proportion of Iowa's potential life scientists are prone to struggle at the point of transfer is a rallying call for collaboration among community college and university faculty, advisors, mentors and all who impact student success to find solutions.

Besides our moral imperative to meet learner needs, the biological sciences hold an economic key to Iowa's and the nation's future. According to the 2011 report "Realizing Iowa's Bioscience Potential" prepared for Innovate Iowa by the Battelle Technology Partnership, jobs in Iowa's bioscience sector grew 26 percent between 2001 and 2008, outpacing the national growth rate of 15.8 percent. Iowa's bioscience industry sector directly employed about 14,500 professionals across 525 business establishments in 2008 and employment grew 4.5 percent during the recession period of 2007 and 2008. The average annual wage paid by the bioscience sector in Iowa was



\$60,833 in 2008, more than \$24,000 or 67 percent above the overall wage paid in the private sector.<sup>3</sup> This is a resilient, growing, quality employment sector for Iowa necessarily fueled by a continuous talent pipeline of newly-educated graduates in the biological sciences. But the pipeline leaks.



Our universities' two-year retention rates for entering freshmen are on average approximately 12.4 percent higher than the retention rate for transfer students majoring in biology (81.0 percent compared to 68.6 percent, 2004 data). The grade point average after first semester on campus is 0.29 higher on average for university freshmen versus transfer biology majors (2.95 to 2.66, 2010 data). And, the six-year graduation rate from the date of arrival on campus is 8 percent higher for university freshmen versus transfer biology majors (68.1 percent compared to 60.1 percent, 2004 data). Many variables contribute to these discrepancies, yet some barriers to success are clearly within the control of university and community college faculty, advisers, mentors and students themselves. This Biology Transition Guide, authored by and for community college and university instructors and advisers and their students, is intended as a tool to help each of those stakeholders to manage a successful transfer experience. Our students deserve it. Our state depends on it.

*\*Biology majors as defined in the Biology Transition Guide refers to majors requiring one or both courses of the Introductory Biology sequence at one of Iowa's public universities. A complete list of those majors appears in Section B.*

## ABOUT THIS GUIDE

**Section A** is an explanation of basic understandings and a representational list of key biological principles to be possessed by the transfer student upon arrival to the university, on page 3.

**Section B** is a listing of the life science majors available at Iowa's public universities, and the career areas to which those majors lead, on page 12.

**Section C** is a series of advisories for students and instructors to ensure a successful transfer experience, on page 15.

**Section D** is a "to do" list for the transfer student upon arrival at the university to help ensure a successful academic experience, on page 16.

**Information and Resources** directs the user to further background materials and individuals involved in this production, on page 18.

# SECTION A

## Foundational Understandings Expected after Successful Completion of the Introductory Biology Sequence

To the Student:

The primary aim of an Introductory Biology course sequence is not simply to expose students to many separate and disconnected terms and concepts. Although many “facts” are encountered in these courses, the primary goal of the introductory sequence is to develop comprehension and understanding of the general principles that shape properties of living systems. As a student studying Introductory Biology, you are expected to reach a level where you are able to demonstrate your understanding by using the facts and concepts that you learn to clearly explain these principles and properly apply them in relevant situations.

Measuring a person’s understanding poses a significant challenge - even to the person learning the subject. Recognition that you “understand” something is difficult, but also an important skill to possess. Tasks involving the application of knowledge can be used to monitor understanding of a subject, such as explaining a concept within an appropriate context, or applying a concept to a novel situation. Your ability to build upon the foundational knowledge acquired through the Introductory Biology course sequence will be critical to your success in future upper-level courses. As scientists, we continually question and challenge the current body of knowledge in order to advance the discipline of biology. The goal of higher education is to instill in you those scientific habits of mind.

Recognition that you “understand” something is difficult, but also an important skill to possess.



# Foundational Concepts



The Introductory Biology curriculum at Iowa's community colleges, private colleges and public universities varies in emphasis regarding themes, order and progression, and depth of coverage of topics. Such variation reflects the unique educational missions and strengths of each institution. Although there is broad consensus on the core topics of this Biology Transition Guide, an important variation for the student to be aware of is the distribution of topics into the first and second courses in the introductory sequence. **It is, therefore, strongly recommended that students complete an entire introductory course sequence at a single institution prior to transferring institutions, and that students meet with departmental advisors at the new institution prior to taking these courses, if possible, to discuss transfer of these course credits.**

The Introductory Biology curriculum generally covers seven core subject areas: Chemistry of Life, Cells, Genetics, Evolution, Biodiversity, Organism Form and Function, and Ecology. Moreover, the presentation of these subjects emphasizes, and laboratory exercises reinforce, scientific inquiry as the basis for acquiring knowledge in these subjects.

The Biology Transition Guide provides a list of examples of the type of knowledge and some potential applications expected of a student following completion of an Introductory Biology course sequence. While these examples span the breadth of subject areas in the Introductory Biology curriculum, this outline is only intended as a representation of the content of each area and should not be considered a comprehensive list of the content covered in an Introductory Biology curriculum.

## I. The Chemistry of Life: Organisms interact with their environments, exchanging matter and energy

**Concept:** Rules of chemistry apply to biomolecular interactions in cells.

**Application:** Explain the distinct roles of covalent and hydrogen bonding in the structure of the DNA helix.

**Concept:** Chemical interactions with water molecules influence the three-dimensional structures of macromolecules, macromolecular assemblies, and lipid membranes. **Application:** Explain how interactions with water influence the shape of a protein that is partially embedded in a plasma membrane.

**Concept:** The oxidation of carbon fuels is an important source of cellular energy. **Application:** Given a cellular redox reaction, diagram what happens to (a) the atoms and (b) the energy in chemical bonds.

## II. Cells: The organism's basic unit of structure and function is the cell

**Concept:** Common features are shared by a variety of cell types, while important differences distinguish unique cell types. **Application:** Identify similarities and differences between prokaryotic and eukaryotic cells, and between animal and plant cells.

**Concept:** Membranes maintain cell structure and intracellular organization, while facilitating molecular transport and intercellular communication.

**Application:** Distinguish between diffusion and osmosis across the cell membrane. Illustrate the subcellular compartmentalization in eukaryotic cells.

**Concept:** Chemiosmosis couples electron transport to ATP synthesis.

**Application:** Generate diagrams to compare and contrast the establishment of a chemiosmotic gradient in chloroplasts and in mitochondria for the production of ATP.

**Concept:** Photosynthesis converts light energy to chemical energy.

**Application:** Diagram the flow of energy through photosynthesis, from sunlight to the production of the first product of photosynthesis (a three-carbon sugar).



III. Genetics: Continuity of life is based on heritable information in the form of DNA



**Concept:** Genetic information is coded in DNA and expressed through transcription of RNA, which may be translated into proteins that accomplish much of the work in the cell.

**Application:** Explain how a mutation in a single tRNA anticodon would impact protein synthesis in a cell.

**Application:** Explain how a change in DNA sequence through mutation can cause a change in form (such as plant height) or a disease (such as cystic fibrosis).

**Concept:** Mendel's Laws of Heredity arise from chromosome behavior in meiosis and predict patterns of inheritance in sexual organisms as a function of dominant and recessive alleles. **Application:** Predict genotype and phenotype ratios in progeny of controlled crosses involving genes with two alleles. **Application:** Compute map distances between different genes based upon progeny of testcross.

**Concept:** In a multicellular organism, the cellular genome is replicated during cell division by mitosis, but individual cells can have dramatically different forms. **Application:** Explain in general terms how cells in the same organism can contain the same DNA sequence information but produce different proteins.



#### IV. Evolution: Mechanisms that generate the unity & diversity of life



**Concept:** An organism's phenotype influences its ability to survive and reproduce. **Application:** Contrast the process of artificial selection in domesticated animals and plants with the process of selection in nature.

**Concept:** Allele frequencies determine genotype frequencies in a population, and evolutionary forces (e.g., mutation, genetic drift and natural selection) change genetic composition of populations each generation. **Application:** Describe the patterns of change in frequencies of alleles, genotypes and phenotypes as a result of positive Darwinian selection favoring a new mutation in a population. Crop domestication or antibiotic resistance may be suitable examples.

**Concept:** Evolution requires genetic variation. Genetic variation arises from mutation and is shuffled by recombination of chromosomes during sexual reproduction. **Application:** Explain why genetic variation is necessary for the persistence of a species.

**Concept:** Homology reflects common ancestry; shared derived characteristics of homologous features reveal evolutionary relationships among organisms. **Application:** Interpret evolutionary relationships and patterns represented in a phylogram.



V. Evolutionary History of Biodiversity: Living groups of organisms diversified from common ancestors

**Concept:** Free-living organisms on earth are organized into three major domains (Bacteria, Archaea and Eukarya), which evolved from a single common ancestor. **Application:** Compare and contrast the major characteristics of Bacteria, Archaea and Eukarya.



**Concept:** Our understanding of the diversity of life is still incomplete. Previously undescribed species are discovered every year and the evolutionary relationships among groups of organisms are still under investigation. **Application:** Would you expect that more species of mammals or nematodes remain to be named? Why?

**Concept:** Endosymbiosis contributed to the subcellular complexity of the eukaryotic cell. **Application:** Contrast the evolutionary relationship between the chloroplast, the nucleus of a plant cell, and the cyanobacteria.



VI. Organism Form and Function: Systems coordinate homeostasis, defense, reproduction, development, and sensing the environment

**Concept:** Development involves progressive determination of parts, based on inductive interactions. **Application:** Contrast the concepts of “fate” and “determination” and describe experimental approaches that distinguish between the two. **Application:** Explain, using an example, how embryonic induction brings about determination.

**Concept:** Organ systems are responsible for gas exchange, water balance, nutrient and water transport, growth, reproduction, and response to changes in the internal and external environment. **Application:** Contrast the physiological and behavioral mechanisms that contribute to the maintenance of homeostasis in body temperature in mammals (endotherm) versus lizards (ectotherm). **Application:** In vertebrate animals, how does breathing contribute to cellular metabolic processes throughout the organism? The explanation should include the roles of the lungs, cardiovascular system, cellular mitochondria, and gas and nutrient transport across membranes.

**Concept:** Nerve impulses are based upon traveling waves of reversals of electrical potential across neuronal membranes. **Application:** Explain how sequential opening and closing of voltage gated sodium and potassium channels initiate and terminate action potentials.

**Concept:** The gastrula stage of animal development establishes three primary germ layers that each contribute to distinct structures in the adult. **Application:** Explain the role of fate mapping as a technique that is used to distinguish cell lineages. **Application:** Predict the results of a fate mapping experiment in which individual cells are labeled during gastrulation. What differentiated cell types might arise from cells of each germ layer?



**Concept:** Plant development is generally characterized by indeterminate growth, while animal organ systems and body plans are established during embryogenesis. **Application:** What cell type allows plants to continue to generate new organs? Explain how a dicot like a carrot can be regenerated from just a few differentiated root cells while cloning of a mammal requires the use of an egg cell.



**Concept:** Plant and animal hormones regulate development and responses to internal and external stimuli. **Application:** Compare and contrast the chemical properties and regulatory effects of the animal hormone estradiol with the plant hormone auxin.

## VII. Ecology: Organisms interact with and affect their environments

**Concept:** Spatial distribution of species, and individuals within species, reflect interactions with the abiotic environment in addition to positive/negative relationships within biotic communities. **Application:** Describe a biome of Iowa and identify major abiotic and biotic factors that influence species composition. Under the biotic factors, please include types of species interactions and how these affect spatial distribution of species.

**Concept:** Populations with a positive per capita rate of increase ( $r$ ) have the capacity for exponential growth, limited by carrying capacity ( $K$ ). **Application:** Describe potential constraints on population growth.

**Concept:** Our ecosystem is shaped by the diversity of life. **Application:** Predict changes to our ecosystem and to our agriculture that would occur if we eradicated all bacteria from our soil.

**Concept:** Energy flow and carbon/nitrogen cycles sustain ecosystems. **Application:** Compare and contrast the roles of trees and humans in the carbon cycle.

# Laboratory Skills in the Biological Sciences



Laboratory activities constitute a major component of the Introductory Biology courses at Iowa's public universities. These activities demonstrate experimental approaches to biological discovery while allowing students to gain hands-on experience with different tools and skills. Introductory Biology courses with on-line lab modules, or altogether without a lab, may not offer an equivalent experience. The list below describes skills, experiences and familiarities gained through laboratory

activities in Introductory Biology. These basic proficiencies are expected upon entering upper-level laboratory courses, or before pursuing individual research projects.

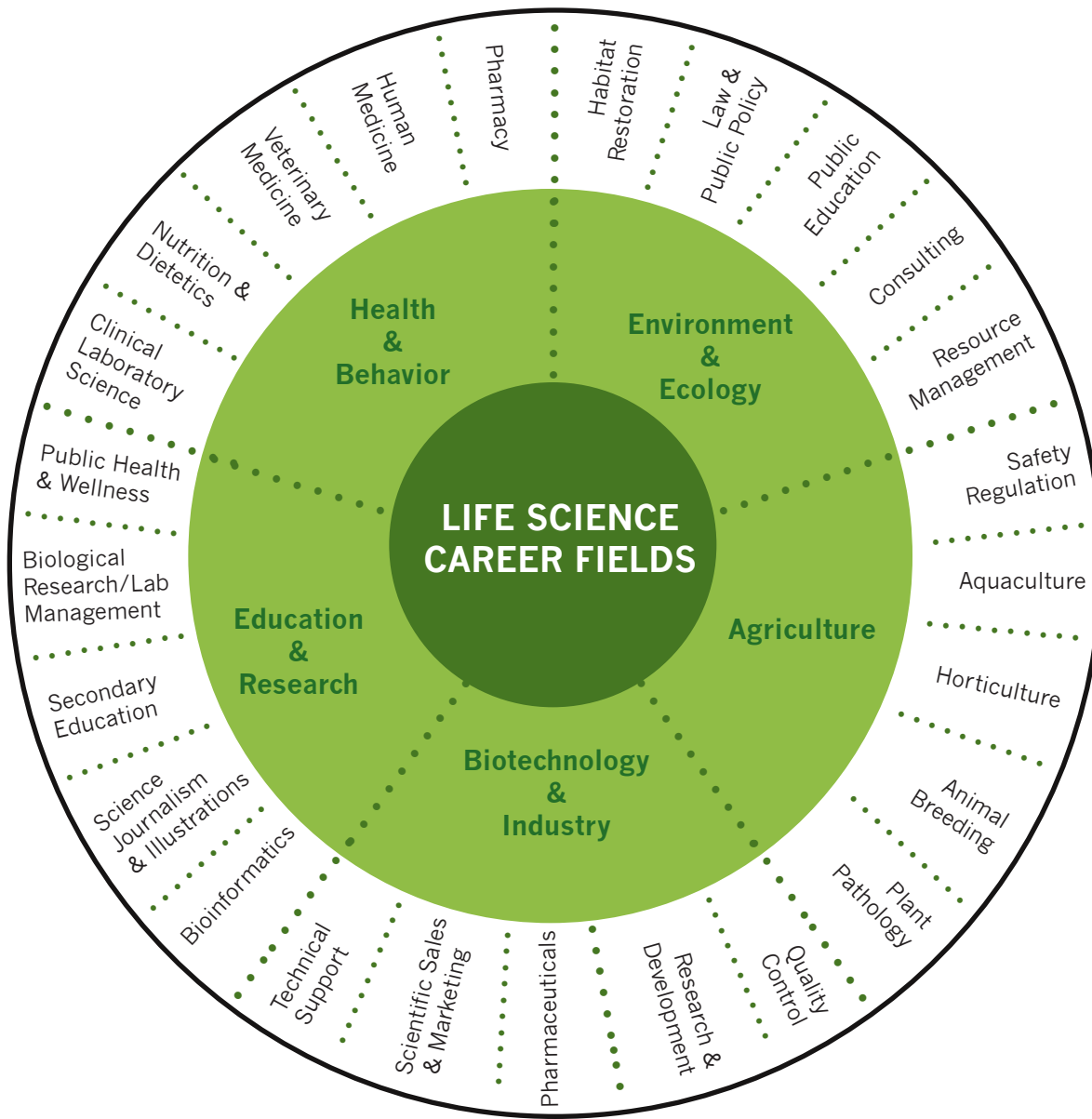
## Skills, experiences and familiarities gained in the Introductory Biology Laboratory:

1. Locate information relevant to experimental procedures.
2. Accurately record and describe data obtained.
3. Analyze, graph, and calculate simple statistics with data.
4. Identify possible sources of experimental error.
5. Evaluate the accuracy and precision of data.
6. Interpret the meaning of experimental results.
7. Be competent in the use of both compound and dissecting microscopes.
8. Properly use pipettes, balances and centrifuge.
9. Operate a micropipettor and load an electrophoresis gel.
10. Be competent in basic dissection skills.
11. Accurately convert different units of measurement, such as solutions and perform dilutions.
12. Understand the basic concept of sterile conditions.
13. Be familiar with procedures for handling biohazardous material and realize the potential dangers of improper disposal.
14. Understand the importance of standard safety precautions in the laboratory.
15. Familiarity with other tools of the modern biology laboratory is a plus, including centrifuge, spectrophotometer, dissolved oxygen meter, pH meter, conductivity meter, colorimeter, protein analyzer and thermocycler.

# SECTION B

## Biology-Related Majors and Career Fields

Career fields in the life sciences are vast and varied. Students should consider a career field they desire to pursue, then select a major that will prepare them for that field. Rarely does a specific major lead to one singular career option. Multiple fields of study may lead to similar career fields, and conversely, a single major may lead to multiple career options. Each major has core course requirements along with curriculum options to provide emphases in particular areas.



# Biology-Related Majors at Iowa's Public Universities

All majors for which one or both courses of the Introductory Biology sequence are required

## UNIVERSITY OF NORTHERN IOWA LIFE SCIENCE-RELATED MAJORS:

- Biochemistry  
[www.uni.edu/chemistry/majors-minors.html](http://www.uni.edu/chemistry/majors-minors.html)
- Bioinformatics  
[www.cs.uni.edu/overview\\_bioinformatics.php](http://www.cs.uni.edu/overview_bioinformatics.php)
- Biology  
[www.biology.uni.edu](http://www.biology.uni.edu)  
Biomedical emphasis  
Ecology & Systematics emphasis  
Microbiology emphasis  
Plant Bioscience emphasis  
Biotechnology emphasis
- Health Promotion: Environmental Health  
[www.uni.edu/catalog/environmental-health](http://www.uni.edu/catalog/environmental-health)
- Biology Teaching  
[www.science-ed.uni.edu/undergrad/maj-bio.htm](http://www.science-ed.uni.edu/undergrad/maj-bio.htm)
- All Science Teaching  
[www.science-ed.uni.edu/undergrad/maj-sci.htm#allsci](http://www.science-ed.uni.edu/undergrad/maj-sci.htm#allsci)
- Middle/Junior High Science Teaching  
[www.science-ed.uni.edu/undergrad/maj-sci.htm#middlejunior](http://www.science-ed.uni.edu/undergrad/maj-sci.htm#middlejunior)
- Biotechnology  
[www.uni.edu/catalog/biotechnology](http://www.uni.edu/catalog/biotechnology)

## UNIVERSITY OF IOWA LIFE SCIENCE-RELATED MAJORS:

- Applied Physics  
[www.physics.uiowa.edu/undergrad](http://www.physics.uiowa.edu/undergrad)
- Biochemistry  
[www.biochem.uiowa.edu](http://www.biochem.uiowa.edu)
- Biology  
[www.biology.uiowa.edu](http://www.biology.uiowa.edu)  
Cell & Developmental Track  
Comprehensive Track  
Evolutionary Biology Track  
Genetics & Biotechnology Track  
Neurobiology Track  
Plant Biology Track
- Biomedical Engineering  
[www.engineering.uiowa.edu/~bme](http://www.engineering.uiowa.edu/~bme)
- Clinical Laboratory Science  
[www.medicine.uiowa.edu/CLSP](http://www.medicine.uiowa.edu/CLSP)
- Environmental Sciences  
[www.uiowa.edu/~envsci](http://www.uiowa.edu/~envsci)  
Bioscience Track  
Geosciences Track  
Hydrosciences Track  
Chemical Science Track
- Human Physiology  
[www.uiowa.edu/~hhp](http://www.uiowa.edu/~hhp)
- Informatics  
[www.cs.uiowa.edu/Informatics/BioinformaticsCognate.html](http://www.cs.uiowa.edu/Informatics/BioinformaticsCognate.html)
- Microbiology  
[www.uiowa.edu/microbiology](http://www.uiowa.edu/microbiology)
- Science Education  
[www2.education.uiowa.edu/scied/default.aspx](http://www2.education.uiowa.edu/scied/default.aspx)



## IOWA STATE UNIVERSITY LIFE SCIENCE-RELATED MAJORS:

- Agricultural Studies  
[www.ageds.iastate.edu/undergrad/agstudies.htm](http://www.ageds.iastate.edu/undergrad/agstudies.htm)
- Agriculture & Life Sciences Education  
[www.ageds.iastate.edu/undergrad/agedcert.htm](http://www.ageds.iastate.edu/undergrad/agedcert.htm)
- Animal Ecology  
[www.nrem.iastate.edu/students/majors.php](http://www.nrem.iastate.edu/students/majors.php)
- Animal Science  
[www.ans.iastate.edu/stud/ugrad/index.php](http://www.ans.iastate.edu/stud/ugrad/index.php)
- Biochemistry  
[www.bbmb.iastate.edu/index.php](http://www.bbmb.iastate.edu/index.php)
- Bioinformatics and Computational Biology  
[www.las.iastate.edu/bcbio](http://www.las.iastate.edu/bcbio)
- Biological/Pre-Medical Illustration  
[www.bpmi.iastate.edu](http://www.bpmi.iastate.edu)
- Biology  
[www.biology.iastate.edu](http://www.biology.iastate.edu)
- Biophysics  
[www.bbmb.iastate.edu/index.php](http://www.bbmb.iastate.edu/index.php)
- Chemical and Biological Engineering  
[www.cbe.iastate.edu/academics/undergrad-major.html](http://www.cbe.iastate.edu/academics/undergrad-major.html)
- Culinary Science  
[www.fshn.hs.iastate.edu/ugrad/culinary.php](http://www.fshn.hs.iastate.edu/ugrad/culinary.php)
- Dairy Science  
[www.ans.iastate.edu/stud/ugrad/index.php](http://www.ans.iastate.edu/stud/ugrad/index.php)
- Diet & Exercise  
[www.hs.iastate.edu/dietandexercise](http://www.hs.iastate.edu/dietandexercise)
- Dietetics  
[www.fshn.hs.iastate.edu/ugrad/dietetics.php](http://www.fshn.hs.iastate.edu/ugrad/dietetics.php)
- Environmental Science  
[www.ensci.iastate.edu/undergrad/index.htm](http://www.ensci.iastate.edu/undergrad/index.htm)
- Food Science  
[www.fshn.hs.iastate.edu/ugrad/foodsci.php](http://www.fshn.hs.iastate.edu/ugrad/foodsci.php)
- Forestry  
[www.nrem.iastate.edu/students/majors.php](http://www.nrem.iastate.edu/students/majors.php)
- Genetics  
[www.public.iastate.edu/~ugradgen](http://www.public.iastate.edu/~ugradgen)
- Horticulture  
[www.hort.iastate.edu/programs/academic-programs.html](http://www.hort.iastate.edu/programs/academic-programs.html)
- Kinesiology  
[www.kin.hs.iastate.edu/undergrad](http://www.kin.hs.iastate.edu/undergrad)
- Microbiology  
[www.micro.iastate.edu/ugrad/ugrad.html](http://www.micro.iastate.edu/ugrad/ugrad.html)
- Nutritional Science  
[www.fshn.hs.iastate.edu/ugrad/nutritional.php](http://www.fshn.hs.iastate.edu/ugrad/nutritional.php)

### ***Special Advisory: Pre-Health Students***

Pre-health programs are not majors in and of themselves; they are a set of core courses that need to be completed before graduating with your Bachelor's degree. "Pre-health" is a designator for students who wish to apply to professional schools in the health sciences. These health sciences typically include pre-chiropractic, pre-dentistry, pre-medicine, pre-optometry, pre-physical therapy, pre-physician assistant, pre-podiatry, and pre-veterinary medicine. Pre-health core courses, required by the specific professional program, provide a foundation and preparation for the professional school curriculum. The majority of these core courses are naturally part of any science major, so most science majors will include many, if not all, of these pre-health core courses. See page 12 of the Biology Transition Guide for a listing of the different science areas. In terms of choosing a major, most health programs do not prefer any one major over another. Pre-health students should think about two different questions when deciding which major to complete as an undergraduate. The first question is "What subject do you like best?" Students tend to earn higher grades in subjects they are interested in. The second question students should answer is "What is your alternate plan if you decide to do something other than what you originally chose?" The answers to these questions will help you decide what major is best for you.

# SECTION C

## Advice for Instructors and Students

**To University Instructors:** Most transfer students from Iowa's community colleges will be well-prepared for success, having chosen the transfer pathway for a variety of reasons. These reasons include the desire to save money, to stay close to home, to start out with individualized instruction in smaller classes, and so on. Moreover, community college students are typically accustomed to instructors whose offices are easy to find and help is easily accessed. Transfer students may be a bit intimidated by the scale of the university and the relative detachment between students and faculty. They will benefit from explicit instructions as to how to access your time. Often, community college learning center facilities with faculty present are available for walk in appointments for tutoring in any subject. Transfer students (as with all students) should be informed as to the availability of tutors and/or learning centers on campus. Feedback on assignments and grade updates are often swift at community colleges due to small class sizes. Let students know when they should expect results of evaluations and where and how they can access that information.



**To Students:** There's always something you could and should be doing for a course -even if there's not a specific assignment due. For example, keep up with all reading assignments, or review material and summarize content following each lecture. Make sure and follow directives on the course website. Also, be pro-active in identifying areas of difficulty and seeking assistance to clarify misunderstandings; it will be assumed you are satisfied with your performance unless you speak up.

Keep in mind that university professors have research and other responsibilities and can be difficult to access outside of class and scheduled office hours. Sometimes it might be best to catch your professor immediately before and after class, or through e-mail, to ask clarifying questions or schedule a meeting. Be sure to make use of TAs and supplemental instruction. Seek the help you need to be successful. One great strategy for support is to connect with other students. Form a study group with students in your lab or discussion section. If you have problems identifying interested students, ask the instructor to make an announcement at the beginning or end of class to identify other students interested in forming a study group, e.g., ask interested students to stay after class and exchange e-mail addresses. When it comes to grades, it may be typical that the majority of the grade in a university biology class is determined by scores of only a few exams, making a poor test score difficult to overcome. Make every effort to prepare for each exam, and if factors outside your control (e.g., illness) influence your readiness for an exam, inform the instructor of the course.



# SECTION D

## Checklist for the Student upon Transferring to a University

Attend the **earliest possible Transfer Orientation session**. The longer you wait, the fewer course options you may have.

Ask advisor about:

- registration process
- your degree audit and transfer credits
- student clubs related to your dept/major/career interests
- research opportunities on campus and in the community
- transition courses and supplemental instruction services
- opportunities to join a peer group of students that have also transferred from community colleges

If you are employed during the semester try to work fewer hours. You will need to accomplish more out-of-class studying and participating in experiential opportunities.

Become familiar with the services available online:

- e-mail
- access to course material and grades
- course schedules
- degree requirements
- university calendar/deadlines

Find out how to sign up for a tutor even if you don't think you'll need one.

Write down all university academic deadlines in your student planner.

Learn where everything is located on campus

- buildings
- advisors
- classes
- tutoring centers
- health center
- computer labs

Create a binder or electronic folder to store all handouts and information relating to academic policies and advising.

Look over department, college and university policies. Inquire if you have any questions.

It is strongly recommended that students complete an entire introductory course sequence at a single institution

- 🍃 Look over materials from the science prerequisite courses for the course you will be taking at the university. Make sure you are comfortable with and knowledgeable of all the subject areas. If not, seek advice from advisors or the faculty in those courses about how you can bridge the gap.
- 🍃 **GO TO CLASS.** Even IF the instructor won't know if you are there, it makes a **DIFFERENCE**.
- 🍃 Get to know and exchange contact information with at least two people in every class that you are in.
- 🍃 Approach instructors and/or teaching assistants with questions on material you find difficult to understand.
- 🍃 Determine the office hours of each of your instructors and make a visit to each of them.
- 🍃 Visit your career services office.
- 🍃 Attend a department social event or research seminar.
- 🍃 Attend a career fair.
- 🍃 Keep in touch with your community college instructors. They may be good mentors and references even beyond your graduation.



# Information and Acknowledgments

## University of Northern Iowa (UNI)

- Academic Advising- <http://www.uni.edu/advising>
- Admissions- <http://www.uni.edu/admissions>
- Biology- <http://www.biology.uni.edu>
- Career Services- <http://www.uni.edu/careerservices>
- Center for Multicultural Education- <http://www.uni.edu/cme>
- Chemistry and Biochemistry- <http://www.uni.edu/chemistry>
- Department of Residence- <http://www.uni.edu/dor>
- Tutoring- [http://www.uni.edu/unialc/tutoring\\_services\\_at\\_uni.pdf](http://www.uni.edu/unialc/tutoring_services_at_uni.pdf)
- Transfers- <http://www.uni.edu/admissions/transfer>
- Science Education- <http://www.science-ed.uni.edu>

## Iowa State University (ISU)

- Academic Advising- <http://www.iastate.edu/students/acadhelp.shtml>
- Admissions- <http://www.admissions.iastate.edu/transfer>
- Agriculture and Life Sciences- <http://www.ag.iastate.edu>
- Biology - <http://www.biology.iastate.edu>
- Career Services- <http://www.career.iastate.edu>
- College of Engineering - <http://www.engineering.iastate.edu>
- Department of Residence- <http://housing.iastate.edu>
- Human Sciences- <http://www.hs.iastate.edu>
- Liberal Arts and Sciences- <http://www.las.iastate.edu>
- Transfer Information- <https://transit.iastate.edu>
- Tutoring- <http://www.dso.iastate.edu/asc/tutoring>

## University of Iowa (UI)

- Academic Advising- <http://www.uiowa.edu/web/advisingcenter>
- Admissions- <http://www.uiowa.edu/admissions/undergrad/transfer/index.html>
- Biochemistry- <http://www.biochem.uiowa.edu>
- Biology- <http://www.biology.uiowa.edu>
- Biomedical Engineering- <http://www.engineering.uiowa.edu/~bme>
- Environmental Sciences- <http://www.uiowa.edu/~envsci>
- Health and Human Physiology- <http://www.uiowa.edu/~hph>
- Microbiology- <http://www.uiowa.edu/microbiology>
- Pomerantz Career Center- <http://www.careers.uiowa.edu>
- Residence Halls- [http://housing.uiowa.edu/departments/reslife/academic\\_initiatives.html](http://housing.uiowa.edu/departments/reslife/academic_initiatives.html)
- Science Education- <http://www2.education.uiowa.edu/teach/scied/default.aspx>
- Tutoring- <http://imu.uiowa.edu/tutor-referral-service>

## Iowa Community Colleges

- Northeast Iowa Community College - <http://www.nicc.edu>
- North Iowa Area Community College - <http://www.niacc.edu>
- Iowa Lakes Community College - <http://www.iowalakes.edu>
- Northwest Iowa Community College - <http://www.nwicc.edu>
- Iowa Central Community College - <http://www.iccc.cc.ia.us>
- Iowa Valley Community College - <http://www.iavalley.edu>
- Hawkeye Community College - <http://www.hawkeyecollege.edu>
- Eastern Iowa Community College - <http://www.eicc.edu>
- Kirkwood Community College - <http://www.kirkwood.edu>
- Des Moines Area Community College - <http://www.dmacc.edu>
- Western Iowa Tech Community College - <http://www.witcc.edu>
- Iowa Western Community College - <http://www.iwcc.edu>
- Southwestern Community College - <http://www.swccowa.edu>
- Indian Hills Community College - <http://www.indianhills.edu>
- Southeastern Community College - <http://www.scciowa.edu>

## Committee

### Iowa State University

- Jim Colbert, Associate Professor, Dept. of Ecology, Evolution & Organismal Biology
- Denise Hix, Academic Advisor, Biology Program
- Jim Holtz, Academic Advisor, Biology Program

### University of Iowa

- Lori Adams, Honors Advisor, Department of Biology
- Amy Korthank, Academic Advisor, Dept. of Biology
- Mark Holbrook, Lecturer, Department of Biology
- Bryant McAllister, Associate Professor, Dept. of Biology

### University of Northern Iowa

- Peter Berendzen, Associate Professor, Dept. of Biology
- Jeff Weld, Associate Professor, Dept. of Biology

### Des Moines Area

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- Curtis Eckerman, Science Group Chair/Arts & Sciences, Biology Department

#### Iowa Western

#### Community College

- Brian Berthelsen, Assistant Professor, Biological Sciences

#### Kirkwood Community College

- Jill Scott, Professor, Biological Sciences/Genetics

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#### Community College

- Jason Friday, Division Chair, Natural Sciences
- Carol Schutte, Biology Instructor, Natural Sciences

### Northeast Iowa

#### Community College

- Linnae Scheffel, Life Sciences Instructor

## References

1. Vision and Change: A Call to Action (2009). A summary of recommendations made at the national conference organized by the American Association for the Advancement of Science with support from the National Science Foundation, July 15-17, 2009, Washington, DC. [www.visionandchange.org](http://www.visionandchange.org).
2. Iowa Department of Education (2010). The Annual Condition of Iowa's Community Colleges, 2010.
3. Battelle Technology Partnership (2011), Realizing Iowa's Bioscience Potential, <http://innovateiowa.org/content/Iowa-Bioscience-Plan.pdf>



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