



HOLY FAMILY UNIVERSITY

**Center for Academic
Enhancement**

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**Manual for
Peer Tutors:
Natural Sciences**

Thank you for agreeing to work with us as a peer tutor in the Center for Academic Enhancement. You have been chosen from the applicant pool for many reasons. You have been recommended by your instructors, and, in some cases, also by your peers; you have exhibited outstanding scholarship; and, perhaps most importantly, you have shown that you understand the process of learning -- the challenges and the rewards. You will invest much, and, hopefully, will come away with much. In order for this process of learning and tutoring to be successful, you will need knowledge and imagination and patience. As Martina Horner, President of Radcliffe College, has said, "What is important is to keep learning, to enjoy challenge, and to tolerate ambiguity. In the end there are no certain answers." Remember: no manual can address all of the questions or predict each of the circumstances you will encounter; and so, we are there to help you. We are a team.

Angela Godshall, Director

P.S. Always retain your humor. And read on, lest we take ourselves too seriously! The following "scientifically inspired" quotes were selected by our current peer tutors to remind you to keep perspective and keep smiling!

"In essence, science is a perpetual search for an intelligent and integrated comprehension of the world we live in."

Cornelius Bernardus Van Neil (1897-) U. S. microbiologist.

"Happy is he who gets to know the reasons for things."

Virgil (70-19 BCE) Roman poet

"There is no adequate defense, except stupidity, against the impact of a new idea."

Percy Williams Bridgman (1882-1961) U. S. physicist, Nobel Prize, 1946

And finally,

"Shall I refuse my dinner because I do not fully understand the process of digestion?"

Oliver Heaviside (1850-1925) English physicist

Welcome to the Center for Academic Enhancement (CAE) at Holy Family University! You are about to embark on an experience that promises not only to address the educational needs of the academic community, but also to enhance your personal growth as well. It is assumed that all tutors at the Center are extremely knowledgeable in their field[s] of expertise. However, what separates the great tutors from the very good ones is not how much they know, but rather the way they communicate the subject matter to the students with whom they are working. Tutoring sessions at the Center are designed to promote collaborative learning – you will give assistance and confidence to the tutee; in turn, your own skills of communication and ability to interact meaningfully will strengthen and mature.

We will work with you in an orientation program and training sessions. Also, we will make available to you a copy of *The Bedford Guide for Writing Tutors*, which served as the underpinning for this manual. The general tenets of tutoring translate from one discipline to another, and so this guide for writing tutors served as a basis for all of the manuals we have produced. Our design is to make your tutoring experience as productive and rewarding as possible!

Contributors

The general procedural portions of this manual were researched and written by:

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Introductory Information

The CAE's Mission Statement

The Center for Academic Enhancement at Holy Family University is committed to providing a broad complement of diverse academic support services, addressing student needs at all levels. By strengthening the skills necessary for intellectual growth and scholarly achievement, the Center seeks to enrich the academic experience of each student, to instill in each student enthusiasm for life long learning, and to uphold the University commitment to maintaining standards of academic excellence.

Tutor Training Program

The Center provides a training program for peer tutors. The intention of the program is to offer support and instruction to the tutor. We emphasize the Center's approach of working as a team; we coach the tutor, focusing on teaching technique and practices, communication skills; we strive to reinforce the University commitment to cultural diversity by providing insight into the needs of the ESL student and instilling an awareness of the dynamics of the intercultural community. In sum, it is our intent to reinforce the tutor's awareness of, understanding of, and respect for the learning needs of the University students.

Natural Sciences: Discipline Objectives

(Quoted from the Holy Family University Cooperative Education and Internship Handbook)

Biology

- To introduce the biological, chemical, physical, and mathematical principles manifested in life at all levels of organization.
- To provide a broad background in cellular and molecular biology, organismic biology, and population biology.
- To offer training in basic laboratory techniques, including both theoretical and practical applications.
- To develop critical thinking skills, including the ability to analyze complex problems, gather appropriate information, formulate possible explanations for natural phenomena, identify and evaluate relevant experimental data, and distinguish among alternative models.
- To consider the broad issues of the nature of science, its historical development, and its relationship to technology and social and economic change.

Chemistry

- To give the student an appreciation and a broad view of chemistry as part of a Liberal Arts Education.
- To provide the concentrator with a better understanding of the interrelation of chemistry with mathematics, physics, and Biology, thus opening more opportunities for personal growth and satisfaction.

- To prepare the concentrator for graduate or medical schools; for entry-level positions in industrial, governmental, and clinical laboratories; and for teacher certification in chemistry on the secondary level.
- To provide concentrators in Biology, Medical Technology, and Nursing with the chemistry background necessary for successful completion of their programs.

Office procedures for the CAE

For non-referred students:

- The student logs into the computer dedicated to this task with the date, her/his name, the subject to be tutored in, and the tutor's name.
- Student meets with her/his tutor.
- Student signs the Student Contract, and tutor places it in the student's folder.
- After tutoring session, the student fills out the Evaluation form on a periodic, but regular basis.
- Student signs out on computer log with the time the tutoring session ended.
- Tutor fills out the Student Summary Sheet, according to subject, noting the material that was covered and makes recommendations if applicable.
- Tutor files the Student Summary Sheet in the file cabinet in the student's folder.
- If the student is new and/or does not have a folder, the tutor makes a folder for the student and files it alphabetically.
- The student places the Evaluation form in the Evaluation Box. These evaluations are very important for the assessment of the Center, as they will be collected for the end-of-the-year summary.

For referred students:

- Tutor takes the Faculty Referral Form from the student or locates it from the appropriate tray if the form has been sent via mail.
- Follow the procedure above.
- Complete the Faculty Confirmation Form and forward it to the referring faculty member via campus mail after first session.
- File the Faculty Referral Form in the student's folder along with the Student Summary Sheet.

In all instances:

- Please check your mailbox and the appointment book daily.
- When a student makes an appointment, either over the telephone or in person, please be sure to get telephone number [preferably cell] where s/he can be reached in case there is a scheduling conflict. Also record the student's subject and/or tutor in the appointment book. Place your initials next to each appointment you make.
- Keep all CAE resources, for example, dictionaries and handbooks, in order; return all resources to their place after each use.
- Keep the CAE neat and orderly.

- Have respect for all students, without forming any preconceived notions based on any form of bias.
- Turn in your time sheet weekly.
- Suggest that the student be prepared with textbook, notebook, pencil, and questions.

Specifics for Natural Science appointments:

- All appointments are to be recorded on the “Other Subjects” page of the appointment log. Include the student’s name, phone number, tutor’s name, and specific subject (e.g. Anatomy & Physiology, Chemistry, General Science).
- Up to three students may be signed up for a single session; however, the session must entail a single focus.

Please complete ALL procedural steps daily: don’t let the paperwork build up!

CHAPTER 1: THE CENTER AS CREATED LEARNING SPACE

A tutor becomes a part of a large but special group who has empowered others, enabling them to attain knowledge and hone their skills. Tutoring can be a joyful task, full of excitement and challenge, but there are some basic regulations that must be followed at all times --- these are intended to establish a procedure that works to the benefit of both tutor and tutee.

- Treat all students courteously and respectfully.
- Maintain a respectful and serious attitude toward the student's work, yet be somewhat casual, informal, and relaxed. Do not put on airs or act superior to those you tutor [you may have more education or have better skills, but this does not of itself make you a better human being.]
- Be constructive and specific when evaluating the student's work. Don't leave the tutee hanging: give honest, but never nasty, feedback. Show the student exactly where s/he can improve her/his work.
- You must always work *with* the student; never do the work *for* the student. The best tutors are the ones who encourage the tutees to think on their own, not the ones who reel off facts and numbers and expect the student to memorize every little detail. **IT IS NEVER HELPFUL TO DO THE WORK FOR THE STUDENT!!!**
- Give substantial help at each session. The tutee must feel that s/he has benefited in some clear way from the session or s/he is not likely to return. Provide direction and feedback, yet encourage the student to ask as many questions as they want! There is no such thing as a dumb question, especially in science!
- Help the student interpret or better understand a concept, but the tutor must refrain from commenting negatively on the teacher, the assignment, or any comments the teacher has written on the student's work.
- To repeat: learn the procedures of the Center [listed above] and follow them. Fill out summary forms and other paperwork in a timely fashion. Don't let things slide, because you will forget later what you did with each student.

You will not always be busy, tutoring students. There are times when you will not have appointments. Tutors must take advantage of these down times, to invest effort in assessing and honing their knowledge and tutoring skills. This can be done in a variety of ways:

- Learn as much as you can about the tutoring strategies—how different students learn, and how you, as a tutor, can get the information across to different students.
- Get familiar with the computer software. They do come in handy when you are stuck with some problems.
- Become familiar with the textbooks that are available in the Center. It will be beneficial to know how to look things up quickly when you are in a bind. No one can remember everything, but all tutors should have handbooks and valuable websites within easy access.
- Become familiar with the software that is installed on each of the Center's computers --- the software is invaluable for self- paced tutorials.

- Between tutoring sessions, think about the things that seemed to go right, which seemed to work, and those that were less effective. Keep a journal so that you can remember and refer back to the most successful sessions.

Without a doubt, tutors are at different stages and levels of knowledge and ability. As you get students coming in on a regular basis, you will get to know them more and more. The common denominator among all tutors, regardless of their level of expertise and knowledge, is the love and enthusiasm for science, and the patience and willingness to transfer some of this knowledge and enthusiasm to the students they tutor.

CHAPTER 2: THE TUTORING SESSION

A common misconception students have about coming to a tutoring center is that only poor students need the kind of help that a center provides. A student with this kind of thinking will come feeling inferior. The CAE must make it a priority to change such a view. One excellent way of doing this is by training tutors to manifest behavior that does not label the student as being weak. The ideas that the student is always in control of her/his skills, and that practice and effort are rewarded, must always be reinforced.

The way in which the tutor interacts with the tutee will either encourage or discourage her/him. The following guidelines will help evoke a positive response from the students.

As You Begin the Tutoring Session

- Help make the student feel comfortable:
 1. Introduce yourself.
 2. Be friendly.
 3. Be interested.
- Sit next to the student, not across from her/him.
- Be enthusiastic and upbeat, have a positive tone of voice.
- Smile.
- Always be friendly, respectful, and patient.
- Create a comfortable environment for yourself and for the student.
- Most importantly, always remain calm and collected; as a tutor, you must always be a calming influence.

Pre-requisites for the student:

- Always have the student bring something to work with—a book, a paper, a handout, etc.
- Check if the tutee has a clear understanding of the assignments that he/she brings to you.
- Have her/him bring a syllabus for the particular class in which he/she is encountering difficulty.

During the Tutoring Session

- Try to limit sessions to a half hour or one hour, depending on the time needed. Going over this time period can often be too much for any student to absorb at one time, and can decrease the productivity of the session.
- Ask to see the requirements of the assignment.
- Ask if there are any particular questions the student has about the assignment.
- Establish two-way conversation; interaction between the tutor and student is ideal for tutoring sessions.
- Talk about experiences that the student can relate to.

- Actively listen and respond to the student.
 1. Use appropriate posture and eye contact.
 2. If something is confusing, ask the student to clarify what he/she is trying to say. Example: “Can you tell me more about...?”
 3. Use “I” statements to place the burden of understanding upon you rather than on the writer. Example: “I’m a little confused about...”
- If you, as a tutor, do not remember a definition that the tutee is learning, ask the student if s/he knows it before looking it up in the chapter.
- Let the student make his/her own corrections. Guide the student. Always have the student hold the pencil, and make all corrections.
- Try to identify problems in the student’s work and explain how to correct these problems —constructive criticism is a good thing!
- Always keep reference math books and handouts nearby.

Things to avoid when tutoring:

- *Never* discuss grades or criticize the student’s professor(s).
- Try not to evaluate the student’s work; this is the teacher’s job.
- **This can’t be repeated enough: don’t do the work for the student.**

At the End of the Tutoring Session

If the tutoring time is almost over, or if another appointment is scheduled immediately following the session, let the student know when there is only five or ten minutes left. This way, the remaining time can be used to end the session beneficially, and not hurriedly. Some possibilities include:

- Allow the student to finish what he/she is currently working on.
- Discuss what the student may do next or what may take place during the next session.
- Answer any last questions the student may have.
- Have the student fill out an evaluation form.

After the Tutoring Session

- Fill out the Student Summary Sheet.
- Make a folder for the student if one is not already on file. Place the Student Summary Sheet in this folder.

You may find the links on the CAE website useful during your tutoring experience.

CHAPTER 3: NATURAL SCIENCE COURSES ADDRESSED IN THE CENTER

Tutoring can be requested in any of the following Biology, Chemistry, or General Science courses; for assistance in science courses other than these, the student will typically be referred to the instructor.

*Note: the course descriptions are taken from the University catalog; courses indicated with an * are major level courses and are typically handled by the professional tutors.*

BIOL 120, 120L; 121, 121L Biological Principles I, II (4, 4)

Fundamental principles and laws governing biological systems. Structure, origin, and function of the cell serving as basis for study of multicellular organisms and populations.

***BIOL 206, 206L Microbiology (4)**

Survey of the microbial world with emphasis on microbes of medical importance, pathogenesis of disease, and immunology. Application of techniques for culturing, study, and identification of bacteria and related microbial forms in lab.

***BIOL 207, 207L; 208, 208L Anatomy and Physiology I, II (4, 4)**

Mammalian morphology and physiology at the cellular and systemic level with emphasis on the human body. Lab includes gross anatomy of a representative vertebrate and use of classical physiological techniques.

***BIOL 209 Cell Biology (3)**

Detailed study of the morphology and physiology of cells. Special emphasis on the relationship between molecular structure and cell function.

***BIOL 210, 210L Introduction to Scientific Techniques (3)**

Introduction to biological and biochemical techniques that form the basis of research practice. Explores the theoretical basis and practical applications of culture techniques, potentiometric measurement, microscopy, centrifugation, spectroscopy, and electrophoresis.

***BIOL 304 Principles of Genetics (3)**

Basic principles of heredity and genetic analysis in prokaryotes, eukaryotes, and viruses. Includes topics in classical genetics, genetic analysis of chromosome structure, gene expression, population genetics, and basic biochemical principles of heredity.

***BIOL 312 Cell-Cell Interaction (3)**

Detailed study of the mechanisms and implications of intercellular interaction and communication in multicellular organisms. Emphasis on the role of the cell surface in signaling, the physiology and Biochemistry of hormonal and neuronal signaling, and the nature and importance of intercellular communication in developing organisms.

***BIOL 325 Seminar: Scientific Literature (2)**

Introduction to the general principles of scientific research and to the literature that documents its development. Includes basic research methodology, training in the use and interpretation of information dissemination sources, including machine-readable bibliographic databases, and the analysis of selected primary research papers.

***BIOL 326 Seminar: Inorganic, Organic, and Cultural Evolution (2)**

Study of evolutionary processes. Traces the evolution of the universe, as well as organic evolution, culminating with the evolution of man, both at the biological and cultural levels. Particular emphasis on the history of scientific thought.

***BIOL 330 General Immunology (3)**

A comprehensive examination of the evolution, structure, and function of the immune system. Emphasis on immunogenetics and histology, humoral, and cell-mediated response mechanisms, and regulatory interactions. Selected examples of the beneficial and pathological consequences of the immune response considered.

***BIOL 331 Botany, the Biosphere, and Ecosystems (3)**

Introduction to plant biology and ecology. Basic plant morphology, physiology, reproduction, taxonomy, and evolution. Principles of ecology with an emphasis on ecological modeling and problem-solving.

***BIOL 407 Molecular Genetics (3)**

Examination of the biochemical basis for heredity. Emphasis on conceptual and experimental approaches that have been influential in shaping current views of the structure and function of the gene. Topics include the molecular aspects of nucleic acid replication, transcription, translation, regulation of gene expression, recombination, DNA repair, and RNA processing.

***BIOL 408, 408L Cell and Molecular Techniques (3)**

Explores the theoretical background for techniques commonly employed in cell and molecular research. Practical experience in cell culture, cellular immunology, cell fractionation, genetic analysis, and recombinant DNA techniques.

***BIOL 411 Microtechniques (4)**

Study of the correlation between structure and function of the various plant and animal tissues, organ systems, and individual cells within these systems. Theory and practice of histotechnology, standard and specialized techniques in microscopic tissue preparation and study.

***BIOL 415, 416 Modern Concepts in Biochemistry I, II (3, 3)**

Principal concepts of the chemistry of cellular constituents. Structure and function of carbohydrates, lipids, amino acids, proteins, and nucleic acids. Special emphasis on regulation of intermediary metabolism.

CHEM 120, 120L; 121, 121L Chemistry Principles I, II (4, 4)

Fundamental concepts of inorganic chemistry for Chemistry, Biology, and Medical Technology concentrators. Includes: atomic structure, chemical bonding, stoichiometry, chemical equilibria, electrochemistry, thermodynamics, and acid-base theory. Lab includes basic chemistry techniques and experiments illustrating fundamental concepts.

***CHEM 207, 207L; 208, 208L Organic Chemistry I, II (4, 4)**

Fundamental principles including the relationship between the structure and reactivity of organic compounds. Basic lab techniques investigate selected organic reactions.

GSCI 104 Biology and the Natural World (3)

This course provides an introduction to Biology for the non-science major, focusing on the common connections of all living things in Biochemistry, structure and function of cells, and genetics. The process of scientific discovery serves as a backdrop for the inquiry-based lab experiences. The responsibility of humans for all things living on earth will also be addressed through the lecture/discussions.

GSCI 105 Living in the Environment (3)

This course provides the non-science major with the basic knowledge of the principles of ecology. The topics include populations, communities, and species interactions. Pollution of both the air and water are related to effects on human health, on food production, and on the biosphere.

GSCI 106 Chemistry and the Environment (3)

Designed for the non-science major, this course addresses basic chemical principles in the context of environmental issues. In modular form, students explore a series of topics including air pollution, ozone depletion, global warming, and water quality. Each module enhances the students' understanding of the chemical aspects of each issue as well as the interconnection between chemical principles and social, political, and economic realities.

GSCI 107 Fundamental Concepts in Biology and Chemistry (3)

Biology for the non-science major but RECOMMENDED for Nursing and Allied Health. This course emphasizes the commonalities of all living things in their Biochemistry, cellular structure and function, genetics, and gene expression.

GSCI 108 The Environment of Planet Earth (3)

Earth Science for non-science majors. This course focuses on the dynamic nature of the interactions of the physical factors of the Earth and Space; Physical Geology, Historical Geology, Oceanography, Meteorology, and Astronomy. Emphasis will be placed upon the environment of the earth, and human responsibility of stewardship for the resources that are found within this environment.

GSCI-110 The Science of Physics (3)

This is a course in basic Physics for the non-science student. In this course, some of the topics discussed are: The Metric System, Density, Motion both linear and non-linear, Energy and Energy Transductions, Temperature and Heat, Light, and Specific heat. The laboratory experience reinforces lecture concepts and is algebra based. Laboratories are hands-on, inquiry based exercises.

CHAPTER 4: THE DIFFERENT LEARNERS

Tutors work with many different kinds of learners, from traditional freshmen to returning older students, from very competent students to those who need help at every stage of the process. A tutor will inevitably face some students who will challenge her/his skills and abilities. The following are some of the most common:

- *Anxious students*
- *Academically under-prepared students*
- *ESL students*

Anxious Students

This group can be broken up into two main types: the procrastinator and the perfectionist.

- Procrastinators:

These students will leave their work until the last possible minute, and then somehow hope that by an act of God or some other miracle, the work will get done. They will show up at the Center two hours before an assignment is due, with nothing, not even the assignment or pencil, in hand, and will nevertheless expect or hope to leave with a finished product to submit. BE PATIENT!

- Perfectionists:

Such students are in many ways the opposite of procrastinators: they usually get their work done well ahead of the due date—but then they agonize over every detail. These students are good to work with since their work is usually finished with almost no errors. However, sometimes their perfectionism can be taxing on the tutor since the constant questioning and second guessing may challenge every bit of knowledge and patience within the tutor's reach. BE PATIENT!

Academically Under-prepared Students:

Another type of student is the academically under-prepared student. This student comes to the Center with an array of learning challenges, and often other related issues such as poor time management skills, weak study skills, family and work-related problems, etc. There is no one answer for best planning to help the underprepared learner; each student and situation needs individualized assessing.

This student's work will not be "fixed" in one or two sessions. Therefore, an honest appraisal is the best in this situation.

ESL Students

ESL students can be classified according to their fluency and knowledge of the English language into beginning, low intermediate, intermediate, and proficient. Many of the same problems that occur with the under-prepared native student can be seen in the ESL student.

- In addition to language usage issues, there can also be some cultural issues that can cause difficulties in communication and understanding. As usual, the tutor needs to provide assistance and be kind and helpful without doing the work for the student.
- With ESL students, it is important for the tutor to remember that some writing and language problems, although persistent, may not be all that serious. Yet many of these students are extremely intelligent and quite articulate in English in most other ways. Therefore, the tutor should try to get the material across to the student as best as possible.

CHAPTER 5: THE USE OF TECHNOLOGY IN TUTORING

Technology has changed academia in so many different aspects. Computers have made learning easier. Cable TV has allowed some universities to maintain their own TV stations. Online libraries and data-bases have allowed easier access to information. Works can now be turned in and correspondences exchanged through email. Classes are given online. The way a tutoring center conducts its business has also been affected; computers and online tutoring are changing the way tutorials are being conducted.

Some pointers for computer-based tutoring:

- Keep the student in control of the computer and the problems. Sit behind the student as he/she sits in front of the keyboard and monitor. You may not enter any data.
- Use the bold, underline, and font color commands in highlighting problematic/weak sections.
- Point out weaknesses, errors, inconsistencies with an explanation of why they are better revised. But never make corrections for the student.
- Have some scrap paper available, so the students can write the work down to help them better understand the process and the answer.

Using internet sources:

The internet has become the primary research tool for a number of students; and many math students will be writing abstracts/papers using this resource. Indeed, it is a very rich source of information because it is very easy to upload data. However, this ease has resulted in some problems, since just about anyone can upload any information without the information [statistics, facts, figures, etc.] being checked for integrity. It has become the responsibility of the internet user to evaluate the source s/he comes across, and see if it is a credible and accurate source. The following questions may serve as guides on how to evaluate internet sources.

- Website owners/sponsors
 1. Is the author's name provided?
 2. Is s/he an authority in the field?
 3. Do other sources say good things about her/him?
 4. Does s/he appear to be knowledgeable on the topic?
- Determine the organization which owns the website
 1. Does this group have the authority to talk on this topic?
 2. Is it respected in its field?
- URL (To a certain degree, the web address reveals some information on the site's credibility)
 1. .edu – educational institution
 2. .gov – government agency
 3. .mil – military
 4. .org – non-profit organization
 5. .com & .net – commercial establishment
- Determine how often updates are implemented.

- Accuracy and Bias
 1. Does the source include its bibliography and does it offer links to the entries?
 2. Can you verify information through another source?
 3. Does the site offer factual information for opposing views?
 4. Is the author known to be a staunch supporter of a cause?
 5. Does s/he allow her/his emotions to become entangled with logic?
 6. Does the site include the date of publication, posting, or the last update?

Some good science websites to visit!

- biology.about.com
- science.nhmccd.edu/biol/bio1int.htm (Interactive biology tutorials)
- biology-online.org/directory (An online directory to great science sites)
- biologycorner.com (A biology teaching resource)

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