Understanding University Success

A project of the Association of American Universities
and The Pew Charitable Trusts

Perspectives on Standards for Success

Intelligently conceived, comprehensive, meticulously researched, detailed and effectively organized, Standards for Success provides a major step forward in tightening the links between high schools and universities and thus increasing the chances for both academic achievement and personal satisfaction for our nation's students. Faculties, too, on both sides of the freshman class will profit from these thoughtful definitions of teaching and learning standards.

M. Gilbert Porter, Ph.D.
Associate Vice Provost Undergraduate Studies,
University of Missouri

As a parent of two high school boys, I applaud Standards for Success for providing realistic measurements in each area of study which will help me guide my sons toward a successful college experience.

Susan Franzella
High School Parent, Carlmont High School

I commend Standards for Success for a thoughtful and thought provoking document.

Dr. Jared L. Cohon, Ph.D.
President, Carnegie Mellon University

At Crescenta Valley High School, we believe our responsibility for a student's success extends beyond high school graduation. We welcome the Knowledge and Skills for University Success. We know that by studying the standards in English, math, science, social science and second languages—and aligning our curriculum—we will better prepare our students for the transition to college.

Linda Evans
Co-Principal, Crescenta Valley High School

We commend this effort to build bridges for students to cross safely and successfully from high school to college.

Virginia Sapiro
Associate Vice Chancellor for Teaching and Learning,
University of Wisconsin

I will make sure all school leaders in my district know about Standards for Success. It is important that elementary as well as secondary principals are aware of this resource. Just as reducing the dropout rate requires the energy and attention of all K-12 educators, so does ensuring the academic success of all our students. I will make sure school counselors, teachers and parents are familiar with this resource as well. Copies should be available at curriculum evenings, parent clubs, college information evenings, counseling centers and Back to School Nights.

Suzanne Cusick
Assistant Superintendent, Hillsboro School District

With over 90% of the students in our district going on to two- and four-year colleges, we know our primary job is making sure students have the knowledge and skills they need to earn college degrees. Unfortunately, we have never had the direction from colleges and universities we need to align our work with theirs. Standards for Success is a very welcome resource. I look forward to studying the work carefully with curriculum developers, principals, and teachers and using it extensively to guide our ongoing work. The K-16 movement is about to take a major step forward thanks to this publication.

Michael Riley
Superintendent, Bellevue School District

Understanding University Success

A report from Standards for Success
A project of the Association of American Universities
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David T. Conley, Ph.D.
Director

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Understanding University Success

This document is designed to answer one question: What must students know and be able to do in order to succeed in entry-level university courses? It is a difficult question because admissions requirements only hint at what is actually expected once students reach college. Traditional measures of high school achievement do not necessarily address this question very well either because they reflect each individual high school's notions of what constitutes college readiness. Even the best, brightest and most diligent high school students who easily meet admission requirements may find themselves struggling in entry-level courses. They may be eligible for admission and still not be prepared to succeed.

Knowledge and Skills for University Success, developed by Standards for Success (S4S), is the result of a two-year study in which more than 400 faculty and staff members from twenty research universities, all members of the Association of American Universities (AAU), participated in extensive meetings and reviews designed to identify what students must do to succeed in entry-level courses at their institutions. National academic content standards documents were analyzed and used for comparison. Multiple peer reviews were employed to hone the standards and ensure their validity, while consultants with expertise in standards development contributed suggestions for improvement. The resulting statements represent the most comprehensive and thoroughly grounded set of standards for college success yet developed.

The standards presented here are designed to create a new way to view college preparation. The standards, in combination with the accompanying CD-ROM and the S4S website, provide a road map of the content knowledge and habits of mind that are valued by leading research universities in the United States.

The faculty and staff members who participated in the process of developing these standards represent a wide range of academic viewpoints. One of the most dominant themes raised by participants is the importance of the habits of mind students develop in high school and bring with them to university studies. These habits are considered by many faculty members to be more important than specific content knowledge. The habits of mind include critical thinking, analytic thinking and problem solving; an inquisitive nature and interest in taking advantage of what a research university has to offer; the willingness to accept critical feedback and to adjust based on such feedback; openness to possible failures from time to time; and the ability and desire to cope with frustrating and ambiguous learning tasks. Other critical skills include the ability to express one's self in writing and orally in a clear and convincing fashion; to discern the relative importance and credibility of various sources of information; to draw inferences and reach conclusions independently; and to use technology as a tool to assist the learning process rather than as a crutch.

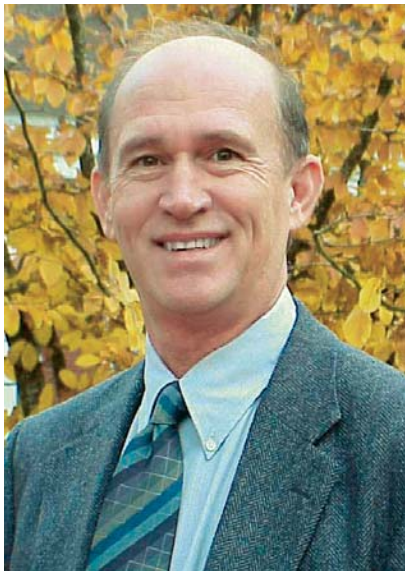
The specific content knowledge identified in this document should be considered in relation to these overarching attributes and skills. Understanding and mastery of the content knowledge specified here is achieved

through the exercise of broader cognitive skills. It is not enough simply to know something; the learner must possess the ability to do something with that knowledge, whether it is to solve a problem, reach a conclusion or present a point of view. This plexus of content knowledge and cognitive skills is what an education at an American research university (and many other institutions of higher education) seeks to develop.

"Success" as defined by these standards means the ability to do well enough in college entry-level core academic courses to meet general education requirements and to continue on to major in a particular area. These two levels of success are denoted here by identifying separate standards: those intended for all students versus those intended for students wishing to major in the particular area of study.

Success in a university is different from success in high school in another important way. Universities facilitate greater specialization than high schools. Therefore, some students may find that they are able to succeed in college even though their mastery in some areas of Knowledge and Skills for University Success is less well developed than in others. Students do not need to master all standards contained in this document at the same level. However, the more of the standards that a student has mastered, the more options the student will have and the more successful the student is likely to be during the all-important initial year of college.

This document comprises six sections, each representing an academic content area. English, mathematics and second languages capture a relatively clear and distinct set of attributes associated with each respective discipline. Natural sciences and social sciences reflect the complexity of these areas, each of which encompasses a series of distinct academic disciplines. The standards in these two content areas are grouped into the skills that cut across the disciplines within the area along with accompanying listings of the key knowledge attributes for a number of disciplines within the area.



David T. Conley, Ph.D.,
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The arts section adopts a unique approach, due to the fact that arts classes do not fit as easily into the model of entry-level classes. Arts courses may be experienced for the first time by students at any point in their academic careers, making it more difficult to identify courses associated with first-year students. Additionally, the arts are uniquely complex in a number of other ways. First, the arts can be divided initially into the performing arts, where one performs or creates an artistic product; and arts appreciation, where one learns to enjoy or understand the arts. Second, areas within the arts require distinctly different technical skills. Music, art, dance and theatre have more distinct skill sets and knowledge than do biology and chemistry, or geography and history. Therefore, the arts standards are organized by area based on abilities derived from national arts standards documents and the expressed values of arts faculty.

The knowledge and skills standards enumerated in this document are general statements of expectations. The level of challenge required to meet any particular standard may be somewhat unclear without further definition. The necessary skill level could be interpreted anywhere from an entering student to a college graduate. To help clarify the level of expectation, a companion document includes examples of the work students produce when they meet the standard. The university work sample document is available by order (see page 6

for details). The accompanying CD-ROM also contains a complete set of work samples spanning the standards. These illustrations help ground the standards' expectation level.

American research universities are complex, diverse environments. Not every faculty member will necessarily agree with every one of the Knowledge and Skills for University Success standards. In fact, spirited debate typifies American higher education. Therefore, the standards enumerated here should be considered a starting point for a continuing dialog about what is expected of entering students. This dialog will help shift the focus of discussion from course titles and grades to knowledge and skills. While perfect agreement may never be achieved, the process of seeking agreement will help clarify for students and teachers alike, at both the high school and postsecondary levels, what is expected and needed for success in college. To the degree that these materials further such a process, they will have achieved their goal.

As more and more states adopt academic content standards and accompanying assessment systems, the requirements for postsecondary success become increasingly important to understand. State high school standards and tests should have some relationship to university success, given that close to two-thirds of American high school graduates go on directly to some form of postsecondary education. Most importantly, the skills students develop to do well on state assessments should bear some relationship to the knowledge and skills for university success. The standards contained in this document are designed to help create a better connection between high school and university expectations.

Whether you are a student, parent, teacher or faculty member, I invite you to explore these materials in order to gain greater insight into what is required for university success. The accompanying CD-ROM contains specific recommendations and activities different audiences can pursue to put these standards into practice. I encourage you to make use of these materials in order to help improve the preparation and success of students as they move from high school to college.

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Listed below are participants in the National Conversation on Key Knowledge and Skills for University Success conducted at nine AAU universities between January, 2001 and June, 2002. This list was compiled based on the registration sheet received from each National Conversation host campus. Participants include both teaching and administrative faculty members with on-campus involvement in or responsibility for the education of entering students.

*= Additional thanks to the campus liaisons who gave many hours of their time organizing meetings of the National Conversation at their universities.

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English

Students need to engage texts critically and identify a theme or idea. They must be able to identify these before they can move on to any deeper analysis.

Faculty Viewpoint

Knowledge & Skills Foundations

Students who perform well and derive the greatest benefit from entry-level university English courses are students who are prepared for thoughtful study, students who are engaged in the material and the process of learning, students who are curious, persistent and realistic. The following discussion presents in greater detail the skills and attributes that help make these students successful.

Reading, Comprehension & Literature

Successful students connect reading to writing and thinking skills. Reading is an active process that, if done well, involves asking questions and noticing patterns along the way. Active reading includes making notes, summarizing and critiquing the material. Many students read in a mechanical manner—just following the words on the page—instead of using active reading strategies.

Once students understand what it means to be active readers, their next step is to think critically about what they have read. Successful students recognize an effective thesis and how it is constructed. Reading is interactive and leads to experiential and literary connections. Successful students are prepared to answer questions such as, "How does this text make you feel?" and "What features of the text made you feel this way?"

It is important, too, to be able to take a position about the material and defend that position in a discussion. Students need to realize that one piece of writing can evoke a variety of interpretations and that subjectivity, including personal experience and opinion, influences possible reactions.

The ability to paraphrase reading assignments shows whether a student comprehends the material. Paraphrasing requires that students pay close attention to and understand both the literal meanings and connotations of words. While reading, successful students decide which pieces of information are important and relevant to the current assignment, noting the specific points that support the argument they plan to present.

Students who are ready for introductory literature courses come to the university familiar with a range of world literature. They are aware of major U.S. and British authors—both men and women—and representative literary works from a variety of cultural traditions. These students have had exposure to non-literary sources as well: documents such as the Magna Carta or the Declaration of Independence. With that exposure, students have a better understanding of the range of writing from which their literature courses will draw.

Awareness of cultural contexts is important, but students need to be familiar with literary forms and genres, as well. The ability to distinguish between different forms and genres of writing is crucial. Students should be able to recognize forms, such as a novel, poem, play, essay, short story, and be able to identify what makes a biography different from a novel, or a short story different from an essay. To understand the purposes and possibilities of various forms, students need to be able to tell the difference between genres: comedy, epic, tragedy, romance and others.

Writing & Editing

Grammar is the basis for good writing. Good writing demands that writers consistently use proper sentence structure. Students in college are expected to know how to diagram a sentence and recognize how this process helps them understand words and their functions within a sentence. It is also important to understand the specific ways correct grammar makes writing clearer and helps communicate more effectively.

Students should know basic grammatical terminology and the parts of speech. They should distinguish between clauses, phrases and complete sentences. The mechanics of writing is simply a subset of writing skills.

Faculty Viewpoint

All students can benefit from more attention to writing mechanics. A review of work samples from students in entry-level courses reveals a high level and array of grammatical errors. In order to succeed in and benefit from writing and literature courses, students must have a good grasp of writing conventions.

Good writers use language to express ideas, not simply to describe events. Student writing must be coherent, and students need to think rhetorically when they write, consider the audience, carefully select the evidence used to support ideas, cogently present the overall argument and understand the purposes of their writing. To achieve this, successful students write an outline before they start the larger piece, then use the outline as a tool to develop a detailed structure, as well as a guide while writing.

Successful students also understand how to support an argument well enough that a strong position emerges, while at the same time understand the consequences of taking a particular position. Defending a position requires an attuned knowledge of the material—which also tends to improve students' ability to think about what they write.

Writing is just the beginning. Editing is the most important part of the writing process. Going through several drafts of a particular paper is routine for a college-level assignment. Often, students rely too heavily on the computer spell-checker in place of references and careful revision. Students need to be able to proofread, check for mistakes on their own and appreciate the value of the revision and re-writing processes. These processes improve writing ability; they help students be better writers and improve grades on written assignments.

Information Gathering: Notes & Research

Students are expected to take useful notes during the many lectures they attend during their first year of college. To be useful, a set of notes should be more than just a transcript of what a professor has said. It is all too common for many new college students simply to fill up pages without sufficiently evaluating the relative quality and importance of the information delivered by the instructor. Students are expected to pay close attention and engage with presented materials, both written and verbal. This requires taking in information, analyzing it and recording that which is meaningful and useful.

A huge part of the information gathering process takes place outside of the classroom. Successful students know how to make a research plan and carry it out: What questions need to be asked, who has the knowledge and authority to answer them and what sources can be used to answer those questions? Also, students should have, or at least be able to develop quickly, the following skills:

1. The ability to identify a source. Students must understand what plagiarism is and understand the ethics of writing. It is essential to know what borrowing ideas from other authors means, how to paraphrase properly and how to cite sources.
2. The ability to distinguish the degree of quality and reliability of information. Many students often accept unreliable information from the Internet or other unverified sources.
3. The ability to connect information from sources to support an argument. Students need to know the difference between primary and secondary sources and ask themselves whether the evidence they have found is weak or strong, and how that evidence helps create a cogent argument.
4. The ability to be disciplined in doing research, regardless of what the field may be. The humanities use good research, just as the sciences do.

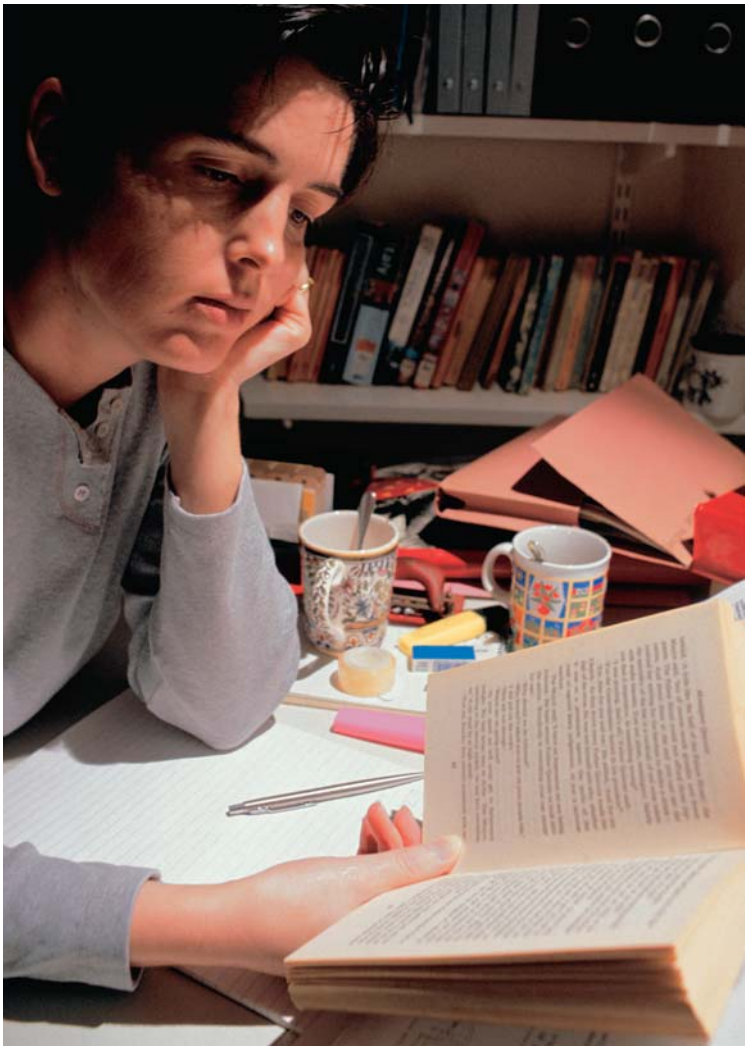
Students should have read English, American and world literatures and know many of the important authors and key works. They should be able to identify a literature's country of origin.

Faculty Viewpoint

Analysis, Critique & Connections

In addition to the ability to engage in reading and to present a solid structure and argument in writing, students need to think analytically about the information they collect. Students should be able to:

1. Categorize information thematically. Doing so allows students to see the larger constructs inherent in the information and see the relationships between ideas and attendant concepts and theories. Then, students can identify the main message and avoid becoming overwhelmed by details.
2. Go beyond facts presented in readings or lectures. Students must allow questions to emerge from the text, identify connections with other concepts they have learned and imagine alternatives to a text's final content message or conclusion.
3. Be aware of the difference(s) between summary and description, and interpretation and analysis.



4. Move between general and specific ideas when analyzing information.

5. Think comparatively and make connections across texts and points of view, enriching and expanding the understanding of the materials.

Once the information is gathered and the analysis process is underway, the most important skill to employ is critical reflection. Critical reflection goes beyond "I liked it," or "I didn't like it." When asked to evaluate a piece of writing, students are expected to answer questions that do not necessarily have right or wrong answers. This requires reflective and critical think-ing. It is crucial that students be able to discuss questions in depth and effectively defend a position based on their analysis of the material.

At the college level, students must also be able to accept constructive criticism of their own work without taking it personally. Many students are unable or unwilling to argue effectively, nor can they differentiate between criticism and critique. To succeed in discussion classes and written work, critical skills are essential.

Students need to be willing to receive a critique of their work without perceiving it as an attack on their integrity, intelligence or creativity. A good refutation of your argument is not a personal attack; it does not mean that you are talentless or a bad person.

Faculty Viewpoint

Successful students are able to integrate personal experiences and knowledge with the material they encounter in their coursework. Information comes from a variety of sources—whether it is from a different class or department, personal observation or public knowledge, students should be able to connect ideas and concepts across sources. Making such connections helps students understand the interdisciplinary nature of knowledge.

Successful students have opinions. They are able to assert their opinions and ask bold questions. By thinking out their opinions, students develop a consciousness and a distinct voice. At the same time, students need to understand that "I" statements are rarely acceptable in formal academic writing. Opinions may be a good thing, but they need to be substantiated and supported by empirical evidence.

Orientation Towards Learning

Time management is a key part of research, coursework and effective participation. College level study often takes more time than students are prepared to spend. Incoming students must learn how to set aside enough time for reading and study and to understand that some assignments take many hours. The ability to start early and to budget time effectively are essential skills.

Students who participate in public discourse—by reading newspapers, following the course of world events and considering how those events play out in the U.S.—are ready to participate in academic discussion. Such discussion requires give and take, and students should have ideas and questions to add to the conversation. It is necessary for students to ask questions and to understand why it is important to do so. To benefit from material presented in classes, students need to be engaged with their instructors and to ask questions that go beyond what is presented in class.

Young students are often quick to make broad generalizations. What they tend not to deal with are the specifics. They don't know that you're supposed to support positions with references. They can say the world is screwed up, but think they can leave it at that without being more specific.

Faculty Viewpoint

To be able to discuss a piece of literature, students must have a basic understanding of its place in history. Placing text in its historical context can help students understand where they themselves fit and how societal contexts influence writing and thinking.

The same applies to geography: To understand fully the impact of a piece of literature, students must be able to place it in a geographical context. Students must understand how that geographic setting influences the content of the work.

Students need to be open-minded and willing to consider a variety of viewpoints, texts and phenomena that may differ from what they may have learned before. Such open-mindedness helps students understand the ways in which knowledge is constructed. It broadens student perspectives and helps students deal with the novelty and ambiguity often found in new materials.

I wish students had a willingness to go deeper, to get beneath the surface of the text or the surface of the argument and discover what the substance is. I wish they were willing to try to do that more often.

Faculty Viewpoint

As tasks become more challenging, it is often difficult for new college students to maintain acceptable levels of attention and application. It is essential that students approach their work with an open mind and willingness to push forward. Students are almost always capable of following through; more often, they are simply unwilling to try and keep trying.

Students do well if they appreciate what college is—and what it is not. They must understand academic expectations and the realities of college life, including the need to apply themselves and work hard. College is a process of learning, not a series of obligatory hurdles towards a degree. The students who appreciate the need to persevere and think independently are in the best position to succeed.

English Standards

*= Items with an asterisk are those expected of students who plan to major in these fields of study (English, comparative literature, writing).

I. Reading & Comprehension

A. Successful students employ reading skills and strategies to understand literature. They:

A.1. engage in an analytic process to enhance comprehension and create personal meaning when reading text. This includes the ability to annotate, question, agree or disagree, summarize, critique and formulate a personal response.

A.2. make supported inferences and draw conclusions based on textual features, seeking such evidence in text, format, language use, expository structures and arguments used.

A.3. use reading skills and strategies to understand a variety of types of literature, such as epic pieces (for instance, the *Iliad*) and lyric poems, as well as narrative novels and philosophical pieces.

A.4. understand plot and character development in literature, including character motive, causes for actions and the credibility of events.

A.5.* identify basic beliefs, perspectives and philosophical assumptions underlying an author's work. This includes identifying points of view, attitudes and the values conveyed by specific use of language.

A.6.* exercise a variety of strategies to understand the origins and meanings of new words, including analysis of word roots and the determination of word derivations.

A.7.* recognize and comprehend narrative terminology and techniques, such as author versus narrator, stated versus implied author and historical versus present-day reader.

B. Successful students use reading skills and strategies to understand informational texts. They:

B.1. understand instructions for software, job descriptions, college applications, historical documents, government publications, newspapers and textbooks.

B.2. use monitoring and self-correction, as well as reading aloud, as means to ensure comprehension.

B.3. understand vocabulary and content, including subject-area terminology; connotative and denotative meanings; and idiomatic meanings.

B.4. exercise a variety of strategies to understand the origins and meanings of new words, including recognition of cognates and contextual clues.

C. Successful students are able to understand the defining characteristics of texts and to recognize a variety of literary forms and genres. They:

C.1. comprehend the salient characteristics of major types and genres of texts, such as novels, short stories, horror stories, science fiction, biographies, autobiographies, poems and plays.

C.2. understand the formal constraints of different types of texts and can distinguish between, for example, a Shakespearean sonnet and a poem written in free verse.

C.3. are able to discuss with understanding the effects of an

author's style and use of literary devices to influence the reader and evoke emotions. This includes devices such as imagery, characterization, choice of narrator, use of sound, formal and informal language, allusions, symbols, irony, voice, flashbacks, foreshadowing, time and sequence and mood.

C.4. are able to identify archetypes, such as universal destruction, journeys and tests and banishment, which appear across a variety of types of literature, including American literature, world literature, myths, propaganda and religious texts.

C.5. are able to discuss with understanding themes such as initiation, love and duty, heroism and death and rebirth that appear across a variety of literary works and genres.

C.6. use aesthetic qualities of style, such as diction or mood, as a basis to evaluate literature that contains ambiguities, subtleties or contradictions.

D. Successful students are familiar with a range of world literature. They:

D.1. demonstrate familiarity with major literary periods of English and American literature and their characteristic forms, subjects and authors.

D.2. demonstrate familiarity with authors from literary traditions beyond the English-speaking world.

D.3. demonstrate familiarity with major works of literature produced by American and British authors.

E. Successful students are able to discuss with understanding the relationships between literature and its historical and social contexts. They:

E.1. know major historical events that may be encountered in literature.

E.2. demonstrate familiarity with the concept that historical, social and economic contexts influence form, style and point of view; and that social influences affect an author's descriptions of character, plot and setting.

E.3. demonstrate familiarity with the concept of the relativity of all historical perspectives, including their own.

E.4. are able to discuss with understanding the relationships between literature and politics, including the political assumptions underlying an author's work and the impact of literature on political movements and events.

F. Successful students are able to read and interpret visual images, including charts and graphs. They:

F.1. identify the primary elements of the types of charts, graphs and visual media that occur most commonly in texts.

F.2. interpret accurately the content of charts, graphs and visual media that occur in texts.

II. Writing

A. Successful students apply basic grammar conventions in an effort to write clearly. They:

A.1. identify and use correctly and consistently parts of speech, including nouns, pronouns, verbs, adverbs, conjunctions, prepositions, adjectives and interjections.

A.2. use subject-verb agreement and verb tense consistently and correctly.

A.3. demonstrate consistent, correct and appropriate pronoun agreement and the use of different types of clauses and phrases, including adverb clauses, adjective clauses and adverb phrases.

B. Successful students know conventions of punctuation and capitalization. They:

B.1. use commas with nonrestrictive clauses and contrasting expressions.

B.2. use ellipses, colons, hyphens, semi-colons, apostrophes and quotation marks correctly.

B.3. capitalize sentences and proper nouns correctly.

B.4. consistently avoid run-on sentences and sentence fragments.

C. Successful students know conventions of spelling. They:

C.1. use a dictionary and other resources to spell new, unfamiliar or difficult words.

C.2. differentiate between commonly confused terms, such as "its" and "it's" or "affect" and "effect."

C.3. know how to use the spell-checker and grammar check function in word processing software while understanding the limitations of relying upon these tools.

D. Successful students use writing conventions to write clearly and coherently. They:

D.1. know and use several pre-writing strategies, including developing a focus; determining the purpose; planning a sequence of ideas; using structured overviews; and creating outlines.

D.2. use paragraph structure in writing as manifested by the ability to construct coherent paragraphs and arrange paragraphs in logical order.

D.3. use a variety of sentence structures appropriately in writing, including compound, complex, compound-complex, parallel, repetitive and analogous sentence structures.

D.4. present ideas to achieve overall coherence and logical flow in writing and use appropriate techniques such as transitions and repetition to maximize cohesion.

D.5. use words correctly; use words that mean what the writer intends to say; and use a varied vocabulary.

D.6.* demonstrate development of a controlled yet unique style and voice in writing where appropriate.

D.7.* use a style manual, such as the Modern Language Association (MLA) or the American Psychological Association (APA) to apply writing conventions and to create documentation formats in a manner consistent with the manual.

E. Successful students use writing to communicate ideas, concepts, emotions and descriptions to the reader. They:

E.1. know the difference between a topic and a thesis.

E.2. articulate a position through a thesis statement and advance it using evidence, examples and counterarguments that are relevant to the audience or issue at hand.

E.3. use a variety of methods to develop arguments, including compare-contrast reasoning; logical arguments (inductive-deductive); and alternation between general and specific (e.g., connections between public knowledge and personal observation and experience).

E.4. write to persuade the reader by anticipating and addressing counterarguments, by using rhetorical devices and by developing an accurate and expressive style of communication that moves beyond mechanics to add flair and elegance to writing.

E.5. use a variety of strategies to adapt writing for different audiences and purposes, such as including appropriate content and using appropriate language, style, tone and structure.

E.6. distinguish between formal and informal styles, for example, between academic essays and personal memos.

E.7. use appropriate strategies and formats to write personal and business correspondence, including appropriate organizational patterns, formal language and tone.

E.8.* use appropriate strategies to write expository essays that employ supporting evidence; use information from primary and secondary sources; incorporate charts, graphs, tables and illustrations where appropriate; anticipate and address readers' biases and expectations; and explain technical terms and notations.

E.9.* use strategies to write fictional, autobiographical, and biographical narratives that include a well-developed point of view and literary elements; present events in logical sequence; convey a unifying theme or tone; use concrete and sensory language; and pace action.

F. Successful students both use and prioritize a variety of strategies to revise and edit written work to achieve maximum improvement in the time available. They:

F.1. employ basic editing skills proficiently to identify obvious mechanical errors, clarify and improve the structure of the piece and sharpen language and meaning.

F.2. review ideas and structure in substantive ways to improve depth of information and logic of organization.

F.3. reassess appropriateness of writing in light of genre, purpose and audience.

F.4. use feedback from others to revise written work.

III. Research Skills

A. Successful students understand and use research methodologies. They:

A.1. formulate research questions, refine topics, develop a plan for research and organize what is known about the topic.

A.2. use research to support and develop their own opinions, as opposed to simply restating existing information or opinions.

A.3. identify claims in their writing that require outside support or verification.

A.4.* identify through research the major concerns and debates in a given community or field of inquiry and address these in their writing.

B. Successful students know how to find a variety of sources and use them properly. They:

B.1. collect information to develop a topic and support a thesis.

B.2. understand the difference between primary and secondary sources.

B.3. use a variety of print or electronic primary and secondary sources including books, magazines, newspapers, journals, periodicals and the Internet.

B.4. understand the concept of plagiarism and how (or why) to avoid it and understand rules for paraphrasing, summarizing and quoting, as well as conventions for incorporating information from Internet-based sources in particular.

B.5. evaluate sources of information located on the Internet in particular to ascertain their credibility, origin, potential bias, and overall quality.

B.6. select relevant sources when writing research papers and appropriately include

information from such sources; logically introduce and incorporate quotations; synthesize information in a logical sequence; identify different perspectives; identify complexities and discrepancies in information; and offer support for conclusions.

B.7.* evaluate sources critically, discerning the quality of the materials and qualifying the strength of the evidence and arguments, as well as determining credibility, identifying bias and perspective of the author and using prior knowledge of the source.

IV. Critical Thinking Skills

A. Successful students demonstrate connective intelligence. They:

A.1. are able to discuss with understanding how personal experiences and values affect reading comprehension and interpretation.

A.2.* demonstrate an ability to make connections between the component parts of a text and the larger theoretical structures, including presupposition, audience, purpose, writer's credibility or ethos, types of evidence or material being used and style.

B. Successful students demonstrate the ability to think independently. They:

B.1. are comfortable formulating and expressing their own ideas.

B.2. support their arguments with logic and evidence relevant to their audience and that explicates their position as fully as possible.

B.3. understand fully the scope of their arguments and the claims underlying them.

B.4. reflect on and assess the strengths and weaknesses of their ideas and the expression of those ideas.

Mathematics

I would characterize having a good mathematical background as the ability to extract the problem from a context, use mathematics to solve the problem and then interpret the solution back into the context. This is an important skill.

Faculty Viewpoint

Knowledge & Skills Foundations

As in many other disciplines, incoming students in mathematics are expected to bring a combination of hands-on skills and conceptual understanding. Entering students need to know basic mathematical concepts—computation, algebra, trigonometry, geometry—so that they have the tools to work with increasingly complex conceptual mathematical and quantitative procedures and analyses in their college courses.

Understanding Mathematics

Successful students approach mathematical problems as they would an investigation. They ask questions, reflect and revisit their solutions with this idea in mind: It is important how one reaches a solution and why a solution works. Problem solving involves analytical processes and sets of skills. These skills include, among others, the following:

1. Thinking conceptually, not just procedurally, about mathematics. Successful students understand the relationships that exist between mathematical concepts and that formulas do not function in a vacuum. They perceive mathematics as a way of understanding, a thinking process and not a collection of detached procedures to be learned and applied separately.

2. Using logical reasoning and common sense to work on and find mathematical solutions. Successful students are able to provide supporting evidence to construct compelling arguments to explain processes and solutions. They check their solutions through visualization, so that they can see whether their findings make sense or not.

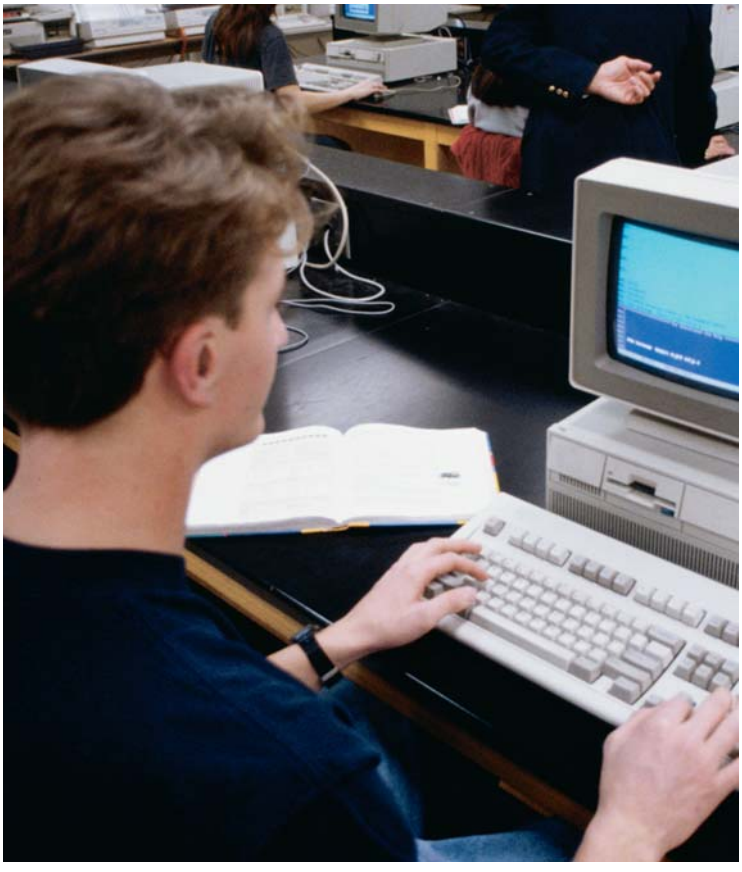
3. Using experimental thinking, inquisitiveness and a willingness to investigate the steps used to reach a solution. Successful students understand there can be multiple approaches to solving a problem.

4. Taking risks and accepting failure as part of the learning process. When students do not find the correct answer to a problem, it is an opportunity to revisit the procedures they used, try new ones and ask further questions. Finding a solution may be only vaguely logical. Verifying a solution should be rigorously logical.

5. The ability to use formulas and algorithms of computation. A lack of facility with computation and formulas encumbers the analytical process.

Problem Solving, Technology and Communication

Problem solving is central to the teaching and learning of mathematics. The step-by-step approach is the best way to solve math



problems and draw parallels and connections from various problems. Mathematical problem solving involves logical reasoning; it is important to explore the reasons why step two follows step one. Successful students understand the process of modifying, adapting and combining mathematical tools to find new ways to reach a solution. They also need to question results until they can explain their answers and defend them. Technology is important and relevant to the understanding of mathematics. However, students need to be aware of its limitations and recognize that calculators are tools that assist but do not replace the thinking process. A graphing calculator can be a tool to deepen understanding of functions and as a way to represent them visually. At the same time, successful students can identify whether the calculator's answers are reasonable in light of their own calculations.

Mathematics is the language of the sciences, and thus fluency in this language is a basic skill. Students prepared for college-level study are comfortable with mathematic terminology and use it appropriately. It is crucial to understand that formulas and symbols provide precise statements of often vaguely posed problems. Different interpretations of a problem may lead to different mathematical models and analyses. Students must pay attention to the wording of problems and move with ease between the symbolic representation of a problem and its verbal presentation.

Students need to understand that process is also important in mathematics. They tend to put too much emphasis on the answer.

Faculty Viewpoint

While mathematics is a type of language, the study of math also requires solid verbal skills. In mathematics, students are expected to write with clarity and cohesiveness. A poorly written solution is often an indication of confused thinking. While clarity in writing is the best way to convey information to others, it is also an important indication that one understands the problem.

Orientation Towards Learning

Relating mathematical abstractions to life outside of mathematics courses is a highly useful skill. Students who do well in mathematics classes are prepared to translate real situations into mathematical representation and, conversely, extract meaning from mathematical expression. They understand when mathematics generalizes and when it is specific, and recognize the importance of abstraction and generalization as they learn and do mathematics.

Often, college-level mathematics courses require that students work in groups. While it is important to be able to work effectively with peers, students must also develop the skills necessary to approach mathematical problems on their own; independent of classes, group projects and work environments. Doing so will help students get the most from group activities. Both situations are valuable—as are the skills to work within them.

Students often experience anxiety when confronted with a mathematical problem, even when encountering mathematical terminology. Persistence is invaluable in the quest for correct answers to a problem, and it is vital to tolerate ambiguity on the road to solution. Interestingly enough, some faculty expressed a concern about students being too confident in their perceived knowledge and skills. Students are sometimes naively confident, preventing themselves from engaging in the mathematical process, finding other solutions and estimating or questioning the viability of their results.

Mathematical problems rarely have instant or quick solutions and often require long periods of time before a solution can be found. Sustained inquiry—engaging in the process for more than a short time—is an important part of the process when solving a problem or writing an exam. Successful students understand that math is an academic activity that requires time, sustained engagement, patience and persistence.

When students practice multiplying and adding by hand for a long time, they get a feel for what numbers are. Now, by overusing the calculator, simple operations are gone. Mental calculations help develop a feel for math. Going to the calculator too soon is a problem.

Faculty Viewpoint

Mathematics Standards

*= Items with an asterisk are those expected of students who plan to major in these fields of study (mathematics, computer science, statistics).

I. Computation

A. Successful students know basic mathematical operations. They:

A.1. apply arithmetic operations with fractions and integers (e.g., add and subtract by finding a common denominator, multiply and divide, reduce and perform long division without a calculator).

A.2. use exponents and scientific notation.

A.3. use radicals correctly.

A.4. understand relative magnitude.

A.5. calculate using absolute value.

A.6. use the correct order of arithmetic operations, particularly demonstrating facility with the Distributive Law.

A.7.* know terminology for complex numbers, integers, rational numbers, irrational numbers and complex numbers.

B. Successful students know and carefully record symbolic manipulations. They:

B.1. understand the uses of mathematical symbols as well as the limitations on their appropriate uses (e.g., equal signs, parentheses, superscripts and subscripts).

C. Successful students know and demonstrate fluency with mathematical notation and computation. They:

C.1. correctly perform addition, subtraction, multiplication and division that includes variables.

C.2. perform appropriate basic operations on sets (e.g., union, intersection, elements of, subsets and complement).

C.3. use alternative symbolic expressions, particularly alternatives to x (e.g., letters of the Greek alphabet that do not already have specific scientific or mathematical meanings).

II. Algebra

A. Successful students know and apply basic algebraic concepts. They:

A.1. use the distributive property to multiply polynomials.

A.2. know how to compose and decompose functions and how to find inverses of basic functions.

A.3. simplify and perform basic operations on rational expressions, including finding common denominators (e.g., add, subtract, multiply and divide).

A.4. understand exponents, roots and their properties [e.g., $(x^2)(x^3)=x^5$ and $(\sqrt{x})^3 = x^{3/2}$)].

A.5. know basic theorems of exponents and roots.

A.6.* understand logarithms (to bases 2, 10 and e) and their properties.

A.7.* divide low degree polynomials (e.g., long division).

A.8.* know basic theorems of logarithms.

A.9.* factor polynomials (e.g., difference of squares, perfect square trinomials, difference of two cubes and trinomials such as $x^2 + 3x + 2$).

B. Successful students use various appropriate techniques to solve basic equations and inequalities. They:

B.1. solve linear equations and absolute value equations.

B.2. solve linear inequalities and absolute value inequalities.

B.3. solve systems of linear equations and inequalities using algebraic and graphical methods (e.g., substitution, elimination, addition and graphing).

B.4. solve quadratic equations using various appropriate methods while recognizing real solutions. This includes:

- B.4a. factoring.
- B.4b. completing the square.
- B.4c. the quadratic formula.

C. Successful students distinguish between and among expressions, formulas, equations and functions. They:

C.1. know when it is possible to simplify, solve, substitute or evaluate equations and expressions and when it is not possible. For example, expand, but do not solve, the expression $(x+3)(x+1)$; substitute $a = 3$, $b = 4$ into the formula $a^2 + b^2 = c^2$; solve the equation $0 = (x+3)(x+1)$; or evaluate the function $f(x) = (x+3)(x+1)$ at $x = -1$.

C.2. understand that the concept of a function has a specific definition beyond being a type of algebraic expression.

C.3. represent functions, patterns and relationships in different ways (e.g., statements, formulas and graphs).

C.4. understand the algebraic language and notation for functions (e.g., domain and range).

C.5. understand a variety of functions (e.g., polynomial, rational, exponential, logarithmic and trigonometric) and properties of each.

D. Successful students understand the relationship between equations and graphs. They:

D.1. understand basic forms of the equation of a straight line and how to graph the line without the aid of a calculator.

D.2. understand the basic shape of a quadratic function and the relationships between the roots of the quadratic and zeroes of the function.

D.3. know the basic shape of the graph of exponential and log functions, including exponential decay.

E. Successful students understand algebra well enough to apply it procedurally and conceptually to a range of common problems. They:

E.1. recognize which type of expression best fits the context of a basic application (e.g., linear equation to solve distance/time problems; quadratic equation to explain the motion of a falling object; or compound interest as an exponential function).

F. Successful students demonstrate the ability to work with formulas and symbols algebraically. They:

F.1.* know formal notation (e.g., sigma notation and factorial notation).

F.2.* know arithmetic and geometric progressions and series.

III. Trigonometry

A. Successful students know and understand basic trigonometric principles. They:

A.1. know the definitions of sine, cosine and tangent using right triangle geometry and similarity relations.

A.2. understand the relationship between a trigonometric function in standard form and its corresponding graph (e.g., domain, range, amplitude, period, phase shift and vertical shift).

A.3. understand periodicity and recognize graphs of periodic functions, especially the trigonometric functions.

A.4.* know and use identities for sum and difference of angles [e.g., sin (x ± y), cos (x ± y)] and use double and half angle formulas.

IV. Geometry

A. Successful students understand and use both basic plane and solid geometry. They:

A.1. know properties of similarity, congruence and parallel lines cut by a transversal.

A.2. know how to figure area and perimeter of basic figures.

A.3. understand the ideas behind simple geometric proofs and are able to develop and write simple geometric proofs (e.g., the Pythagorean theorem; that there are 180 degrees in a triangle; and that the area of a triangle is half the base times the height).

A.4. solve problems involving proofs through the use of geometric constructions.

A.5. use similar triangles to find unknown angle measurements and lengths of sides.

A.6. visualize solids and surfaces in three-dimensional space (e.g., recognize the shape of a box based on a two-dimensional representation of its surfaces; and recognize the shape of a cone based on a two-dimensional representation of its surface).

A.7. know basic formulas for volume and surface area for three-dimensional objects.

B. Successful students know analytic (i.e., coordinate) geometry. They:

B.1. know geometric properties of lines (e.g., slope and midpoint of a line segment).

B.2. know the formula for the distance between two points.

B.3. solve mathematical and real-world problems (e.g., ladders, shadows and poles) that involve the properties of special right triangles with the Pythagorean theorem and its converse.

B.4.* recognize geometric translations and transformations algebraically.

C. Successful students understand basic relationships between geometry and algebra. They:

C.1. know that geometric objects and figures can also be described algebraically (e.g., ax + by = c is the standard form of a line).

C.2. know the algebra and geometry of circles.

C.3.* know the algebra and geometry of parabolas and ellipses as a prerequisite to the study of calculus.

C.4.* use trigonometry for examples of the algebraic/geometric relationship, including Law of Sines/Cosines.

V. Mathematical Reasoning

A. Successful students know important definitions, why definitions are necessary and are able to use mathematical reasoning to solve problems. They:

A.1. use inductive reasoning in basic arguments.

A.2. use deductive reasoning in basic arguments.

A.3. use geometric and visual reasoning.

A.4. use multiple representations (e.g., analytic, numerical and geometric) to solve problems.

A.5. learn to solve multi-step problems.

A.6. use a variety of strategies to revise solution processes.

A.7. understand the uses of both proof and counterexample in problem solutions and are able to conduct simple proofs.

A.8. are familiar with the process of abstracting mathematical models from word problems, geometric problems and applications and are able to interpret solutions in the context of these source problems.

B. Successful students are able to work with mathematical notation to solve problems and to communicate solutions. They:

B.1. translate simple statements into equations (e.g., "Bill is twice as old as John" is expressed by the equation b=2j).

B.2. understand the role of written symbols in representing mathematical ideas and the precise use of special symbols of mathematics.

C. Successful students know a select list of mathematical facts and know how to build upon those facts (e.g., Pythagorean theorem; formulas for perimeter, area, volume; and quadratic formula).

D. Successful students know how to estimate. They:

D.1. are able to convert between decimal approximations and fractions.

D.2. know when to use an estimation or approximation in place of an exact answer.

D.3. recognize the accuracy of an estimation.

D.4. know how to make and use estimations.

E. Successful students understand the appropriate use as well as the limitation of calculators. They:

E.1. recognize when the results produced are unreasonable or represent misinformation.

E.2.* use calculators for systematic trial-and-error problem solving.

E.3.* plot useful graphs.

F. Successful students are able to generalize and to go from specific to abstract and back again. They:

F.1. determine the mathematical concept from the context of an external problem, solve the problem and interpret the mathematical solution in the context of the problem.

F.2. know how to use specific instances of general facts, as well as how to look for general results that extend particular results.

G. Successful students demonstrate active participation in the process of learning mathematics. They:

G.1. are willing to experiment with problems that have multiple solution methods.

G.2. demonstrate an understanding of the mathematical ideas behind the steps of a solution, as well as the solution.

G.3. show an understanding of how to modify patterns to obtain different results.

G.4. show an understanding of how to modify solution strategies to obtain different results.

G.5. recognize when a proposed solution does not work, analyze why and use the analysis to seek a valid solution.

H. Successful students recognize the broad range of applications of mathematical reasoning. They:

H.1. know that mathematical applications are used in other fields (e.g. carbon dating, exponential growth, amortization tables, predator/prey models, periodic motion and the interactions of waves).

H.2. know that mathematics has played (and continues to play) an important role in the evolution of disciplines as diverse as science, engineering, music and philosophy.

VI. Statistics**

A. Successful students apply concepts of statistics and data analysis in the social sciences and natural sciences. They:

A.1. represent data in a variety of ways (e.g., scatter plot, line graph and two-way table) and select the most appropriate.

A.2. understand and use statistical summaries data (e.g., standard deviation, range and mode).

A.3.* understand curve-fitting techniques (e.g., median-fit line and regression line) for various applications (e.g., making predictions).

** The majority of math participants indicated that knowledge of statistics is not necessarily a prerequisite for success in most entry-level university mathematics courses. However, participants in other disciplines identified knowledge of statistics as important to success in some entry-level courses in the social sciences (e.g., economics) and sciences (e.g., biology and ecology). Statistics is being included within mathematics for organizational convenience, but should not be interpreted as equivalent to the other five areas of mathematical knowledge and skill for university success in terms of its importance in entry-level college mathematics courses. Statistics standards also appear in the natural sciences and social sciences.

Natural Sciences

Those students who do well in my class aren't afraid to fail. They are willing to take risks. If they read a problem and they don't instantly know how to do it, they don't quit or feel embarrassed. They understand they're not failing the course as a result of a failed experiment.

Faculty Viewpoint

Knowledge & Skills Foundations

Science presents both technical and psychological challenges for incoming students. A number of subjects come together in this field, including math and statistics. Students who are prepared to study science at the college level are capable of integrating scientific methods and contextual understanding, critical thinking and hands-on skills.

Basic Knowledge

In the fields of physics, chemistry and biology, successful students are familiar with fundamental scientific concepts, including the significance of time; the range of light waves; the nature of force, velocity and acceleration; and the principles of evolution.

Entering students who are well-prepared for science courses have mathematical skills. They have knowledge of basic mathematical concepts and processes in arithmetic, algebra, trigonometry and geometry. They can translate and transform fairly simple word problems into mathematical equations and vice-versa. In the sciences, as in mathematics, students demonstrate a dependency on calculators. Technology can help students with scientific experiments but does not replace the thinking processes required to estimate, question and solve problems.

Thinking about Science

Beyond simple memorization of definitions or theories, successful students understand how scientific processes operate and how those processes relate to one another. Science is a process, and it requires certain skills.

First, students ready to get the most out of science courses have a measure of scientific common sense; an overall understanding of how scientific concepts, definitions and applications fit together. Second, these students are capable of experimental thinking. They have an understanding that experimentation is an inherent part of the scientific process. Incoming students will benefit greatly from an understanding of the interrelationships among scientific concepts and across the sciences. For instance, a biology student would do well to know about physics and chemistry, and the ways that those disciplines inform the study of biology.

Successful students use mathematical reasoning as they work with chemical formulas and as they try to solve and explain problems. Once a solution is reached, they can also defend why they chose each math process. Evaluating scientific issues in daily life and understanding the origins of scientific knowledge is important, as well. As they study, successful students address questions along the way, such as "Do I know for sure?" and "How do I know?"

The relationship between a chemical formula and its real-world application is worth thinking about, too. There is a formula behind the process of photosynthesis, and it is applied in plant life all around us. This type of conceptualization helps students to realize the position of humans within a global context and to gain an appreciation for everyday existence. Students who succeed in

the sciences employ critical thinking skills as they learn scientific concepts. Beyond mere curiosity, they inquire about their place in the universe and question their own scientific knowledge and beliefs.

Science, like any field of study, carries with it historical and social contexts. Incoming students need not be historians, but they benefit greatly from knowing about the central features of historical traditions and contemporary events that relate to and influence the development of scientific inquiry.

Solving Problems, Asking Questions

Incoming students are ready to benefit from science courses when they are prepared to solve scientific problems using the step-by-step approach known as the scientific method. Examples of scientific problem-solving skills include:

1. Drawing a picture to represent a situation described in a physics problem.
2. Identifying and organizing what is known and not known in a problem.
3. Identifying assumptions and relevant equations.
4. Testing equations for unknowns.
5. Checking units.
6. Checking that the answer is physically reasonable.

Successful students know how to design a testable scientific question, refine that question and conduct an experiment to find solutions. They are able to think creatively as they develop hypotheses and estimate potential results. They also show a willingness to question existing results, and then to generate and weigh new options and questions as a result of the inquiry they undertake.

Reading, Writing & Communication

In the sciences, as in other disciplines, successful students write with clarity, cohesiveness and meaning. Good science writers have knowledge of scientific writings and the terminology used in such texts and know how to translate this knowledge into non-scientific language. As students write scientific analyses, they need to construct logical and coherent arguments that demonstrate an understanding of causation and of the various levels of abstraction involved in science. These are important tools that enable students to communicate understanding of a scientific process, particularly as they present and defend experiments to teachers and peers.

Basic math skills are, quite possibly, the most important set of skills for students to have mastered coming into a freshman science course. They need to understand why equations work and what each equation says about the physical world, for example, measuring the velocity of air. Mastery of algebraic equations allows students to make complicated measurements.

Faculty Viewpoint

Two specific reading skills are particularly necessary for success. First, successful students comprehend what they read. Second, they are familiar with publications that carry articles on scientific findings (for example, *Discover* magazine, and the *New York Times*) and understand both scientific terminology and experiments described in such publications. This comprehension of scientific literature with some technical language, content or concepts is useful when students try to explain processes used to test a scientific hypothesis. Also, as students read scientific literature they exercise scientific common

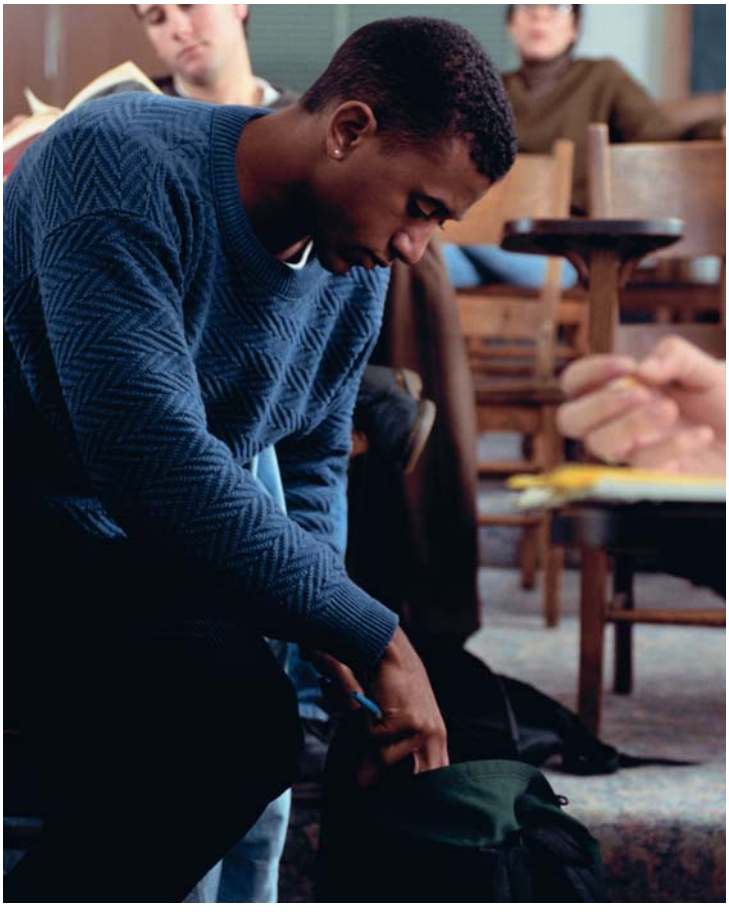
sense, or a healthy skepticism. This helps them assess the likely validity of the content of articles and continue to build independent judgment about the validity of scientific reports in general.

Orientation Towards Learning

Entry-level students often feel anxiety as they tackle a scientific experiment or try to explain a scientific concept. Persistence is vital in the quest for solutions, as is acceptance of failure and ambiguity as part of the experimentation process. Some scientifically well-prepared students have such a fear of failure that they are unwilling to approach new things. They often have trouble investigating alternative solutions to a problem, offering an estimate rather than a precise answer or questioning the credibility of their results. To develop a scientific knowledge base, successful students act on their curiosity and take risks to understand the intricacies and mysteries of science.

In addition to the willingness to try, successful students have the ability to conduct honest and sustained inquiry and to engage in the scientific process for long periods of time as hypotheses are tested over and over. They understand that scientific learning is ongoing. It is a scholarly activity that requires time, sustained engagement, reflective study skills, patience and persistence.

Beyond good study skills, successful entry-level students take responsibility for their own education. They structure and manage time according to course expectations. They know how and when to ask for help. Study in any field of science requires hard work, a focused curiosity and a willingness to dedicate the time necessary to follow through on a scientific inquiry.



Natural Sciences Standards

*= Items with an asterisk are those expected of students who plan to major in fields of the natural sciences such as environmental sciences, biology, chemistry and physics.

I. General Foundation Skills

A. Successful students understand the steps that make up the scientific method. These students are able to observe, hypothesize, test and revise, and they know the difference between a hypothesis and a theory. They:

A.1. design and conduct scientific investigations during which they formulate and test hypotheses (formulate and clarify the method; identify the controls and variables; collect, organize, display and analyze data; make revisions of hypotheses, methods and explanations; present the results; and seek critiques from others).

B. Successful students know basic mathematics conventions. They:

B.1. understand the real number system and its properties.

B.2. use exponents and scientific notation.

B.3. understand ratios, proportions and percents and how each is related to the other.

B.4. use proportional reasoning to solve problems (e.g., equivalent fractions, equal ratios, constant rate of change, proportions and percents).

B.5. add, subtract, multiply and divide with a high, consistent degree of accuracy.

B.6. simplify rational expressions.

C. Successful students are able to recognize and use basic algebraic forms. They:

C.1. know ways that variables can be used (e.g., as a placeholder for an unknown, such as $x + 2 = 9$, or to represent a range of values, such as $-3m - 8$).

C.2. know when it is possible to simplify, solve, substitute in or evaluate equations and expressions and when it is not. For example, expand, but not solve, the expression $(x +1)(x + 4)$; substitute $a = 2$, $b = 4$ into the formula $a^2 + b^2 = c^2$; solve the equation $0 = (x +3)(x+1)$; and evaluate the function $f(x)=(x+1)(x+4)$ at $x = -1$.

C.3. represent functions, patterns and mathematical relationships using a variety of models (e.g., statements, formulas, and graphs).

C.4.* understand various types of functions (e.g., direct and inverse variation, polynomial, radical, step and sinusoidal), and have a deep understanding of exponential and logarithmic functions.

D. Successful students demonstrate the ability to work algebraically with formulas and symbols. They:

D.1. are familiar with the concept of continuity.

D.2.* use formal notation to describe applications of sequences and series.

E. Successful students know and understand basic trigonometric principles. They:

E.1. know the definitions of sine, cosine and tangent in relation to right triangle geometry and similarity relations.

F. Successful students understand the relationships between geometry and algebra. They:

F.1. understand that a curve drawn in a certain location is fully equivalent to a set of algebraic equations.

F.2.* possess the ability to represent a geometrical figure (e.g., a triangle or a circle) on a plane using a set of equations, as in descriptive geometry.

F.3.* understand vectors and how they can be used (e.g., representing velocity and force).

F.4.* use operations on vectors (e.g., vector addition and scalar multiplication).

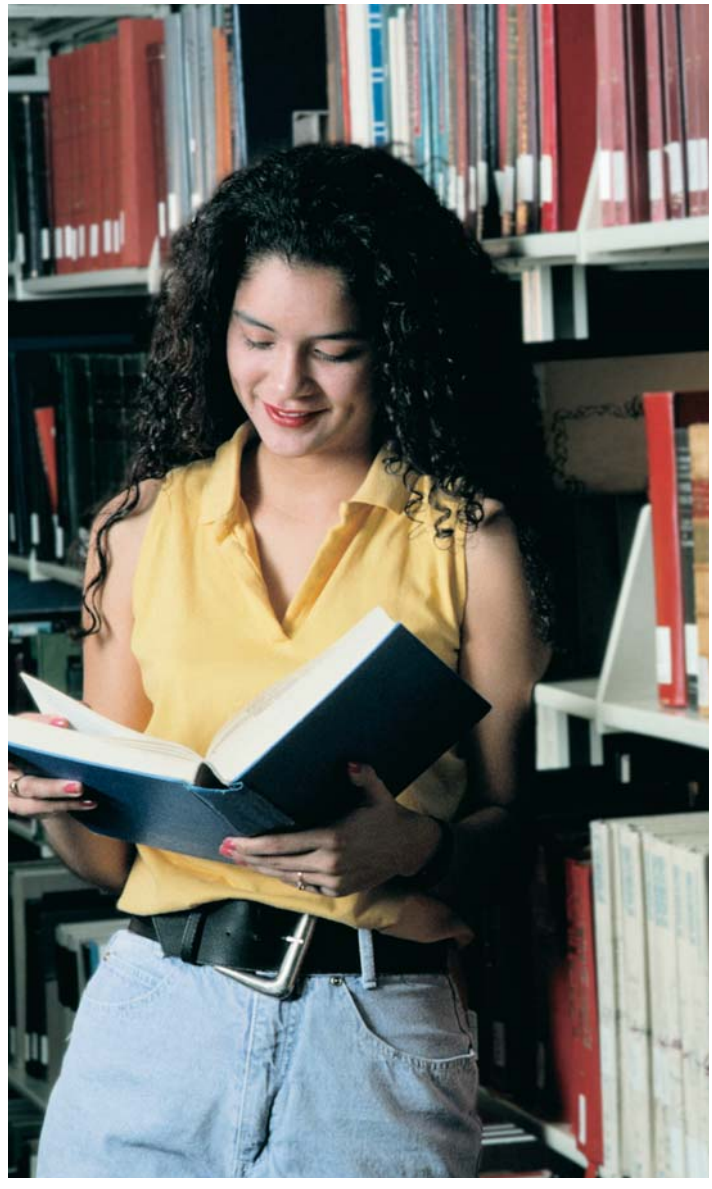
G. Successful students demonstrate an ability to problem-solve. They:

G.1. use various strategies to approach problem-solving situations and to revise solution processes.

H. Successful students understand that mathematics is a symbolic language, that fluency requires practice and that mathematics is the language of all scientific pursuit. They:

H.1. know the definition of a mathematical expression (a statement using numbers and symbols to represent mathematical ideas and real-world situations).

H.2. understand the use of written symbols and the limitations on appropriate uses of such symbols (e.g., equal signs, parentheses and superscript).



I. Successful students understand and apply concepts of probability and statistics. They:

I.1. understand and use data represented in various ways (e.g., charts, tables, plots and graphs).

I.2. understand descriptive statistics (e.g., mean, median, mode and standard deviation).

I.3. understand that predictions based on sample data are inferential.

J. Successful students understand and apply concepts of measurement. They:

J.1. select and use appropriate units to express measurements for real-world problems.

J.2. know how to make estimates and approximations and when to use those approaches to solve problems.

J.3. use unit analysis in problem-solving.

J.4. understand the differences between the metric and the traditional U.S. measurement system and are able to perform simple conversions between the two.

J.5.* know the difference between accuracy and precision, as well as how to use significant digits appropriately.

II. Science and Society

A. Successful students understand the scientific enterprise. They:

A.1. understand that science and the theories of science are not absolute and should be questioned and challenged. This includes the ideas that:

- new theories will continue to replace current or older ones.
- scientific theories must stand up to the scrutiny of the entire scientific community.
- acceptable validation includes reproduction and internal consistency.

A.2. know ways in which science and society influence each other. For example, that:

- scientific methods and the knowledge they produce may influence how people think about themselves and their world.
- technology can contribute to the solution of an individual or community problem.
- social and economic forces strongly influence which science and technology programs are pursued, invested in and used.

A.3. understand that science involves different types of work in many different disciplines. For example:

- different disciplines of science approach investigations in different ways, such as using different questions, methods and evidence.
- contributions from different disciplines are often required to complete an investigation.
- when traditional disciplines meet, new branches of science are often formed, such as geophysics and molecular biology.

A.4. know that scientists throughout history have had many difficulties convincing their contemporaries to acknowledge what are now generally accepted scientific ideas.

A.5. understand that a host of perplexing new problems is generated by our society's new

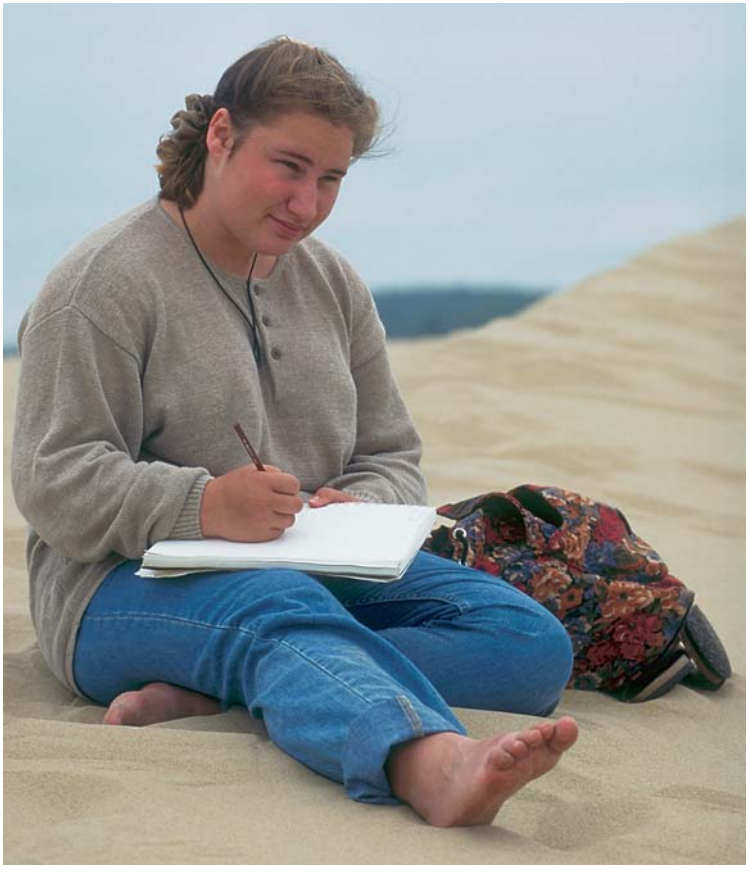
powers (e.g., population management, environmental protection and regulation of weapons of mass destruction).

A.6. know that technology is the systematic use of materials, energy, and information to design, build, maintain and operate devices, processes and systems with a goal of serving individual and societal human needs.

A.7. understand that interactions between science and technology have led to refined tools (e.g., precision instruments, measuring techniques, data processors, etc.), and the means for a safer, more comfortable life for more people (e.g., electricity, transportation, medical advances, etc.).

A.8.* know that investigations and public communication among scientists must meet certain criteria in order to result in new understanding and methods. For example:

- arguments must be logical and demonstrate consistency between natural phenomena revealed by investigations and the historical body of scientific evidence.
- the methods and procedures used to obtain evidence must be clearly reported and reproducible to enhance opportunities for further investigation.



III. Environmental Science

A. Successful students understand concepts related to environmental science. They:

A.1. know that the earth is a body in space whose environmental system (the atmosphere, lithosphere, cryosphere, hydrosphere and biosphere) depends largely on the sun for light and heat and that the current environment (e.g., geography and climate) is subject to change.

A.2.* are familiar with environmental processes (e.g., the carbon and nitrogen cycles) and their role in processing matter crucial for sustaining life.

A.3.* understand that relationships exist among the earth (geology and soil science), the water (hydrology and oceanography) and the atmosphere (meteorology and atmospherics), and that the relationship is best exemplified by the water cycle.

B. Successful students understand concepts related to geology. They:

B.1. are familiar with the history of the Earth.

B.2. are familiar with the history of the solar system.

B.3. understand the processes of volcanism and erosion.

C. Successful students understand the interaction of the environment and biota (including humans) and some of the consequences of that interaction. They:

C.1. understand the notion of habitats and their role in evolution.

IV. Biology

A. Successful students know the general structure and function of cells. They:

A.1. know that all living systems are composed of cells, which are the fundamental units of life, and that organisms may be unicellular or multicellular.

A.2. know the importance of both water and the element carbon to cells, and further understand that cells have four important types of macromolecules (carbohydrates, lipids, proteins and nucleic acids) that are each different in chemical properties and have specific functions in cells.

A.3. understand that both unity and diversity exist among cells.

A.4. know that while all cells share basic features (e.g., a plasma membrane and genetic material in the form of DNA), there are

different types of cells (prokaryotic and eukaryotic).

A.5. know that within multicellular organisms there are different types of cells and that these cells perform different functions for the organism.

A.6. know that different types of organisms (plants versus animals) have different cellular specializations suited for the organism's lifestyle.

A.7. understand the processes of cell division (mitosis and meiosis), particularly as those processes relate to production of new cells and to passing on genetic information between generations.

A.8. know that in eukaryotic cells, the organization of DNA into chromosomes is key to both duplication and distribution of the genetic information to new cells or organisms.

A.9. know that in order to be alive, cells must exchange materials with their environment or with other cells.

A.10. know that cells transform energy (ultimately obtained from the sun) from one form to another through the processes of photosynthesis and respiration.

A.11.* know that these processes lead to the production of ATP, which all cells absolutely require for cell work.

A.12.* understand the chemical reactions involved in cell functions (e.g., food molecules taken into cells are broken down to provide the energy and chemical constituents needed to synthesize other molecules, and that enzymes facilitate the breakdown and synthesis of molecules).

A.13.* know that such exchanges involve a variety of mechanisms for transporting materials across a membrane, including diffusion, osmosis, and transport involving specialized membrane proteins.

B. Successful students understand genetic principles that guide the inheritance of biological traits. They:

B.1. understand Mendel's laws of heredity (e.g., genes and alleles; genotype versus phenotype; segregation and independent assortment; and dominant versus recessive traits). Understand how Mendel's laws relate to the movement of chromosomes to gametes during meiosis and understand the chromosomal basis of sex determination.

B.2.* know the chemical and structural properties of DNA in heredity and protein synthesis (e.g., DNA synthesis, transcription, translation; mRNA and the genetic code; and effects of mutations).

B.3.* understand how recombinant DNA technology allows scientists to analyze the structure and function of genes.

C. Successful students understand the organization and classification of living systems. They:

C.1. know that multicellular organisms have a variety of specialized cells, tissues, organs, and organ systems that each perform specialized functions (e.g., digestion, respiration, circulation, excretion, movement, control and coordination, protection from disease and reproduction). Understand that the different organ systems are integrated to make a functional organism.

C.2. know ways in which living things can be classified based on each organism's internal and external structure, their development, and relatedness of DNA sequence.

D. Successful students understand concepts of biological change and the evolution of species. They:

D.1. know how DNA and protein sequences are used to infer evolutionary relationships among organisms.

D.2. understand the concept of natural selection (differential survival and reproduction of chance inherited variants, depending upon environmental conditions).

D.3. understand the theory of evolution (e.g., the Earth's present-day life forms evolved from earlier, distinctly different species). Know that genetic change among individuals of populations is the raw material for evolution of new forms.

V. Chemistry

A. Successful students understand the nature of the physical and chemical properties of matter (e.g., classifications of matter such as compounds, mixtures and solutions, as well as composition of matter such as atoms and molecules). They:

A.1. understand that atoms, molecules and ions have a set of physical and chemical properties that control their behaviors in a range of states.

A.2. know that states of matter depend on molecular arrangement and freedom of motion. For example:

- in the solid state, molecules are packed tightly together with their motion restricted to vibrations.
- in the liquid state, molecules have higher energy and are more loosely packed, sliding freely past each other.
- in the gaseous state, molecules are less restricted and move freely.

A.3. understand the structure of the Periodic Table. For example that:

- elements are arranged in sequence by increasing atomic number.
- the similar properties that arise periodically in this arrangement motivate the grouping of elements into columns that share common properties.
- this arrangement is useful for predicting the properties of elements and compounds.

A.4.* understand acid and base chemistry.

A.5.* understand principles of ideal gas behavior.

B. Successful students know principles of atomic structure and bonding. They:

B.1. know the structure of an atom. For example:

- that negative electrons occupy most of the space in the atom.
- that neutrons and positive protons make up the nucleus of the atom.
- that protons and neutrons are almost two thousand times heavier than an electron.
- that the electric force between the nucleus and electrons holds the atom together.

B.2. understand that molecules are composed of atoms in unique and consistent arrangements, and that atoms or molecules may form solids by building up repeating patterns (e.g., crystal structures or polymers).

B.3. understand how the electronic configuration of atoms governs the chemical properties of an element. For example that:

- elements with similar electronic configurations have similar properties.
- elements interact with one another on the atomic level by transferring or sharing the outermost electrons to form covalent, ionic or metallic bonds.

C. Successful students understand and apply principles that explain chemical reactions. They:

C.1. know that substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristics and properties.

C.2.* understand the meaning and uses of chemical equations and employ such equations to quantify relationships between products and reactants. Examples of the meaning and use of a chemical equation include:

- mass balance.
- molar or molecular quantities.
- conservation of mass and atoms.

C.3.* understand the mole concept and its applications. For example:

- moles in chemical equations and formulas.
- molar mass, relative mass, molar volume and Avagadro's number.

VI. Physics

A. Successful students understand concepts of energy. They:

A.1. understand the relationship between heat and temperature, for example:

- that heat energy consists of the random motion and vibrations of atoms, molecules and ions.
- the higher the temperature, the greater the atomic or molecular motion.

A.2. understand the conservation of energy and the First Law of Thermodynamics (i.e., energy cannot be created or destroyed but only changed from one form to another) and understand that energy must be transferred via work or heat.

A.3. understand the concept of entropy and the Second Law of

Thermodynamics (i.e., why engines and refrigerators are not 100 percent efficient, as well as the concept that disorder, in general, increases as some energy is always lost into non-usable forms).

A.4. understand the distinction between kinetic (thermal, translational and vibrational) and potential (gravitational and electrostatic) energy.

A.5. understand how energy can be transferred from one form to another.

A.6. understand basic principles of optics.

A.7. understand basic principles of electricity and magnetism.

A.8. understand series and parallel circuits.

B. Successful students understand motion and the principles that explain motion. They:

B.1. understand Newton's laws as a classical description of motion, for example that:

- a force is required to alter an object's motion.
- in the absence of force, or when forces are balanced, no change in motion is observed.
- forces are additive and the motion of an object is determined by the cumulative effect.

B.2. know the characteristic properties of sound, and electromagnetic waves; that these waves have energy; that such waves can transfer energy when they interact with matter; and that characteristic properties include:

- wavelength, frequency, amplitude, speed, absorption, reflection and refraction.

B.3. know the range of the electromagnetic spectrum, for example:

- radio waves, microwaves, infrared radiation, visible light, ultraviolet radiation, x-rays and gamma rays.

B.4. know that electromagnetic waves result when a charged object is accelerated and that the energy of electromagnetic waves is carried in wave packets whose energy is inversely proportional to the wavelength.

C. Successful students know the kinds of forces that exist between objects. They:

C.1. understand general concepts related to gravitational force (e.g., every object exerts gravitational force on every other object, and this force depends on the mass of the objects and their distance from one another).

C.2. know that materials that contain equal amounts of positive and negative charges are electrically neutral, but that a very small excess or deficit of negative charges in a material produces noticeable electrical forces.

C.3.* understand magnetic and electric fields and the relationship between those fields, and that these fields can be thought of as different aspects of a single electro-magnetic field (moving electric charges produce magnetic fields and moving magnets produce electric fields).

D. Successful students understand concepts related to modern physics. They:

D.1. understand the general concepts related to the theory of special relativity. For example:

- in contrast to moving objects, the speed of light is the same for all observers, no matter how they or the light source happen to be moving.
- that nothing can travel faster than the speed of light.

D.2. know the constituent particles that make up atoms (i.e., protons, neutrons and electrons) and have a general understanding of physical locations of each (i.e., protons and neutrons in the core nucleus and electrons in a cloud "far" away from the nucleus).

E. Successful students understand concepts related to matter and its properties. They:

E.1. know what mass is and how it differs from weight and inertia.

E.2. know the meaning of density.

E.3. know that the physical properties of matter and waves are scalar or vector quantities.

E.4.* understand specific heat, thermal and electrical conductivity.

F. Successful students understand basic laws. They:

F.1 know conservation laws of energy (and the conversion of energy from one form to another), mass and momentum.

F.2 understand the laws governing electrical and magnetic forces.

F.3 understand the relationship between electrical currents and magnetic fields.

Students need to be able to translate instructions into actions and translate actions into descriptions. They must describe the work they have done using simple declarative sentences and paragraphs.

Faculty Viewpoint

Social Sciences

Students need to have a curiosity about the questions we raise in the class, and a desire to want to explore the complexity of the social and moral issues we address. Then you can give them the tools. If they are disengaged from education, then it is a lot harder.

Faculty Viewpoint

Knowledge & Skills Foundations

In the social sciences, incoming students succeed when they are armed with specific knowledge and skills—but above all, when they are ready to embrace the learning process.

Basic Knowledge & Skills

Students who are ready for entry-level courses are familiar with the fundamental concepts of social sciences such as history, economics, geography, political science, sociology.

In geography, well-prepared students know how to read, interpret and locate places on a global map. They are familiar with worldwide immigration and migration patterns.

In economics courses, successful students come prepared with foundational mathematical skills and an understanding of basic concepts such as demand, supply, scarcity, opportunity and tradeoffs.

In political science, a basic civic knowledge is necessary for success. Such basic knowledge includes a sense of how the U.S. government works; an awareness of the system of legislative, executive and judiciary checks and balances; and how an amendment is ratified. In addition, successful students have a basic knowledge of, and can distinguish between, economic and political systems. They can describe the differences between capitalism and socialism and between democracy and oligarchy.

In history, students who are ready for college-level study know important events and documents that have shaped the course of U.S. history; the U.S. Constitution, Federal Indian Policy and the Civil Rights movement, to name a few. A clear knowledge of significant periods in western and non-western world history is crucial, including, for example, the origins of Judaism, the rise and fall of Ancient Greece, the influence of Christianity and the Crusades on European culture and society, the Aztec civilization, the French and Russian Revolution, and the rise to independence in the post-colonial period of countries in South America, Africa and Asia, in particular.

In sociology, successful students understand and are able to discuss the implications of changes in U.S. demographics leading to increasing diversity. They understand the major issues in gender equity and are aware of contemporary social, political and cultural movements in U.S. society and around the world, and the major theories that underlie such movements.

Beyond the basic facts, students entering social science courses need certain skills. Just as in the natural sciences, second languages, mathematics and English, successful students know the mechanics of writing and basic grammar and comunicate their ideas with clarity and coherence. Familiarity with the terminologies and definitions that pertain to each discipline is also important. Basic mathematical and statistical knowledge (arithmetic and algebra, means and correlations) helps students read and understand graphs in economics and analyze and interpret statistical data in sociological, historical and geographical reports.

General Sense of History & Geography

Beyond the memorization of dates and events that have marked and shaped the world in general (and the U.S. in particular) successful students have a sense of history. An understanding of chronological sequence and causation across time is vital. Students should possess factual knowledge, be accurate when discussing historical dates and understand how historical sequencing and events influence one another. Students should be able to describe how their current place in time is influenced by the past and informs their future.

Students need to have a sense of the fundamentals of capitalism, how and why it is different from other forms of economic systems and the types of governments and societies associated with it.

Faculty Viewpoint

Successful students are aware of the diversity and relativity of historical perspectives and interpretations. As they learn about world events, memorize dates and understand various historical periods, they realize how people in various regions of the world have experienced similar events in different ways. Local experience adds to comprehension of a historical phenomenon. Students who have the ability to make interdisciplinary connections have a broader and deeper sense of history. When students see the relevance of economics, culture, geography and politics in the shaping and unfolding of historical events, they gain more from college-level social science courses.

In addition to a sense of history, social science students benefit greatly from a sense of place. Successful students know how to read maps. They approach geography from cultural, economic and political perspectives. Armed with these skills, students better realize how geographical contexts often contribute to the development of a society. They also recognize how contexts influence the ways in which people see the world; it is more useful, for example, to know how water use affects society than to memorize the exact borders of all the countries in Africa.

Reading, Research & Analysis

Reading—and reading well—is a very important part of the learning process. Successful college-level students comprehend assigned reading material and read closely, with attention to nuance. Close reading leads students to infer and extend meaning by identifying main points and distinguishing supportive statements from illustrative details. Successful students can gauge their own comprehension of the material and know what to do when they encounter reading that is difficult. Social sciences are related and are not simply a gathering of facts. To understand these

relationships, successful students are familiar with the scientific method. They ask questions such as, "What do we know?" and "How do we know it?" The scientific method in the context of the social sciences encompasses a number of skills and abilities:

1. The capacity to recognize hypotheses within texts and understand when evidence is being presented. This is a critical reading skill that helps a student evaluate the quality and relevance of materials used to build and support an argument.
2. A familiarity with theory building, with what a theory is, how a theory is developed and how a theory can be tested, debated and applied. Successful students can differentiate theory from opinion in a text.
3. The ability to find information—information literacy—from a variety of sources, including the library and Internet. Part of this skill is the ability to assess the quality and reliability of information, especially if the source is found online. Successful students ask themselves questions such as, "Where does this information come from?", "Is it well supported?" and "Is this information relevant or irrelevant to the support of my thesis?"
4. The ability to generalize while at the same time recognizing their own biases and identifying fallacies in materials they read. Faculty members expect students to voice opinions, to speculate and to relate personal experiences within assignments, but only if they also generalize to principles discussed in class or connect personal knowledge to the material covered.
5. An awareness of various research methodologies, including quantitative and qualitative traditions of data analysis.

Students need to understand that a theory is a way of organizing information to help enhance our understanding of behavior.

Faculty Viewpoint

In addition to reading and research, note-taking is an important part of college-level study. Entry-level courses are typically lectures where students are expected to take notes diligently, to identify key components of the lecture and to appreciate how notes are essential to understanding the content of a course. To make all of this work, students need to know that taking notes is a learning process in itself. Successful students decide whether a piece of information is important or relevant before they write it down. They think about how they will use the notes after the lecture is over. They know how to prepare an outline with coherent sections and subsections and understand how this exercise relates to organizing the information they collect, either from lectures or other sources.

Orientation Towards Learning

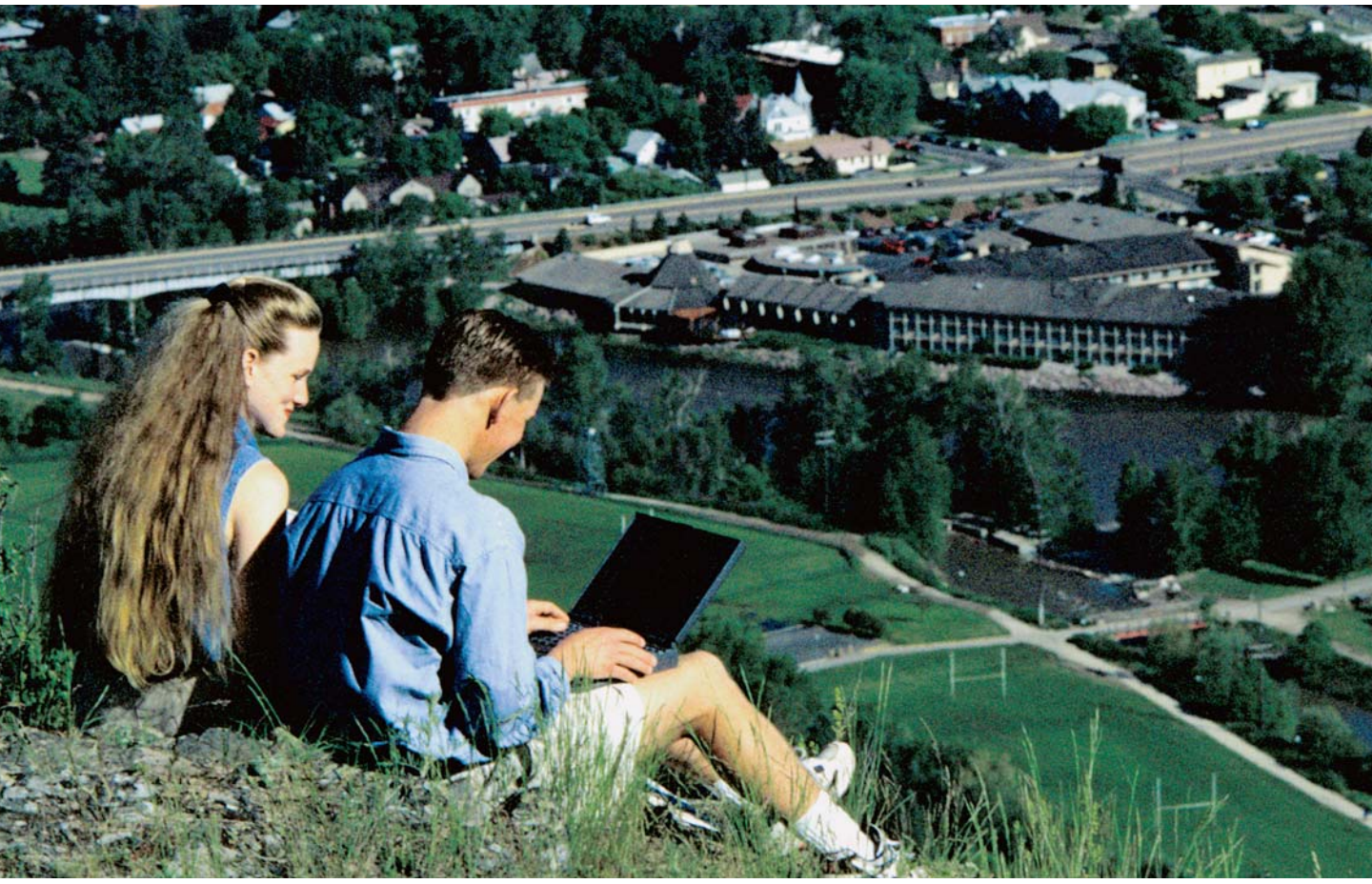
In many ways, learning is about the communication of facts, concepts and ideas. Successful students use a variety of communication skills to show that they understand class material. Writing is one such medium of communication, but clear oral and visual communication is important, as well. Good communication includes engagement with an audience, whether it is one reader or hundreds. When presenting information, good communicators are attentive listeners to the questions and concerns of others. Good academic communication also includes accepting criticisms by others and answering questions with an attentive, positive attitude.

Connections between ideas and facts are vital to the learning process. Successful students make connections regularly between public knowledge and personal observations and experiences. They make connections across disciplines. How do the ideas in economics classes relate to everyday life? How do the concepts learned in sociology apply to the study of geography? Connective intelligence enables students to integrate and use knowledge from across different disciplines both within social sciences and in other areas.

Students need to understand that things happen in sequence and that something that happened later can't cause something that happened earlier.

Faculty Viewpoint

Just as students are encouraged to make connections between disciplines, they are encouraged to anchor historical, geographical or sociological materials to a sense of self. Successful students are engaged intellectually with the material they encounter in their studies. Rather than focusing entirely on outcomes and grades, they engage in the learning process and accept a challenge to do something new. They are comfortable with ambiguity. Students often come into classes in a quest for answers alone. Some questions and problems have no obvious solutions, while others have more than one solution. Social science faculty members, much like their peers in other disciplines, expect students to demonstrate a variety of study skills that will help them succeed in college. These include taking personal responsibility for their work, showing up to class, doing homework and reading assignments, completing written assignments on time and managing their time well.



Social Sciences Standards

*= Items with an asterisk are those expected of students who plan to major in a social science.

I. General Knowledge & Skills

A. Successful students have a basic understanding of the social sciences (history, economics, geography, political science, sociology). They:

A.1. know the defining characteristics of disciplines within the social sciences.

A.2. understand the diversity of human beings and human cultures (e.g., cultural, biological, emotional and intellectual diversity).

A.3. know that each social science discipline is subject to certain criticisms and limitations, and are aware of the primary criticisms and limitations of at least one discipline in the social sciences.

A.4. are aware of major current world events, issues and problems and know how concepts and theories in the social sciences can be applied to understand them.

A.5. perceive events and circumstances from the vantage point of others, including those in racial and cultural groups different than their own; from the other gender; from other ages; and from those who live under other political and economic systems.

A.6.* integrate concepts learned from at least two different social science disciplines.

A.7.* understand the significant generalizations, principles and theories of each discipline.

II. History

A. Successful students know significant periods and events in United States history. They:

A.1. understand important events, social movements and political processes that have shaped U.S. history, and are aware of the major historical figures that influenced history. These include but are not limited to:

- European exploration and colonization, 15th and 16th centuries
- interaction of Native Americans and European settlers
- development of American colonial government
- causes and consequences of slavery
- The Revolutionary War
- creation of the U.S. Constitution
- The Bill of Rights
- development of political parties
- westward expansion
- The Mexican-American War
- antebellum sectionalism and polarization
- The Civil War
- reconstruction
- industrialization and the rise of big business
- Federal Indian Policy of the late 19th century
- Spanish-American War
- The Progressive Movement
- social and cultural movements of the 1920s
- The Great Depression
- The New Deal
- U.S. in World War II
- The Cold War
- The Civil Rights Movement
- Vietnam
- immigration and migration patterns in the contemporary U.S.
- the influence of religion on U.S. history

B. Successful students know significant periods and events in world history and social, religious and political movements, as well as major historical figures who influenced such movements. They:

B.1. understand important events and social, religious and political movements that have shaped world history, as well as the major historical characters who influenced history. Examples of important topics and areas include but are not limited to:

- early civilizations in India and the Middle East
- development of Judaism
- Ancient Greece
- rise and fall of Ancient Rome
- emergence of Christianity
- development of Buddhism
- The Byzantine Empire
- emergence of Islam
- Mayan civilization
- feudalism/manorialism in Medieval Europe
- the influence of Christianity in Europe and the Crusades
- The Aztecs
- the exchange of flora/fauna/pathogens known as the "Columbian Exchange"
- The Renaissance
- The Scientific Revolution
- The Reformation and Counter (or Catholic) Reformation
- The French Revolution
- The Industrial Revolution
- European nationalist movements of the 19th century
- World War I
- The Russian Revolution
- World War II
- The Cold War
- African and Asian history

C. Successful students understand historical perspective and historical analysis. They:

C.1. understand their own position in history and how history has influenced their kinship group and family ancestors.

C.2. know the effects that specific human decisions have had on history.

C.3. understand the contingency of history; that is, events depend on human ideas and actions and that things may have been different in the absence of those ideas and actions.

C.4. demonstrate the ability to perceive past events with historical empathy.

C.5. know the influences that specific ideas and beliefs had on a period of history and how events may have been different in the absence of those ideas and beliefs.

C.6.* know how to evaluate the credibility and authenticity of historical sources.

C.7.* know how to evaluate different historical interpretations.

C.8.* understand the social, economic and political climate of significant periods in history and how a particular climate shaped those who lived at that time.

III. Economics

A. Successful students understand basic concepts of economics. They:

A.1. understand the basic economic concepts of scarcity, opportunity cost, trade offs, markets and supply and demand.

A.2. understand the difference between a market economy (capitalism) and a central planned or command economy.

A.3. understand the role government plays in the U.S. economy.

A.4. understand the concepts of exchange and trade and the impacts of a global economy, including implications for individuals, the U.S. and other nations.

A.5. understand the conflict among the social goals of an economic system (e.g., security, freedom, equity, efficiency, stability and growth).

A.6.* understand and know how to use economic analysis tools, including functions and basic statistics.

IV. Geography

A. Successful students have a basic understanding of the tools and concepts of geography. They:

A.1. use maps and atlases to find locations and other geographical information.

A.2. understand the nature, distribution and migration patterns of human populations on Earth's surface.

A.3. understand the role of geography in explaining processes of environmental and human change.

A.4.* realize the advantages and disadvantages of maps, globes and other geographic tools used to illustrate data sets.

V. Political Science (Civics)

A. Successful students have a basic understanding of types of governments. They:

A.1. understand the nature and source of various types of political authority (e.g., the differences between democracy and oligarchy).

A.2.* know the various types of governments throughout the world (e.g., the differences between limited and unlimited governments).

B. Successful students have a basic understanding of the U.S. political system and its history. They:

B.1. know basic facts about the U.S. political system and constitutional government (e.g., federalism; checks and balances; and legislative, executive and judiciary branches of power).

B.2. understand the content and context of documents that established the U.S., especially the Declaration of Independence and the U.S. Constitution.

B.3. understand the content and context of documents important for the protection of individual rights in the U.S., especially the U.S. Constitution and the Bill of Rights.

B.4. know the methods citizens can use to participate in the political process at local, state and national levels, and how political participation can influence public policy.

VI. Sociology

A. Successful students have an understanding of social problems, social structure, institutions, class, groups and interaction. They:

A.1. understand that social problems are larger than the individual.

A.2. understand that social inequalities based on a variety of factors—including gender, race and age—exist and have a range of effects on society.

A.3. understand the global diversity of various family forms, as well as kinship in different societies.

A.4. understand that group and cultural influences contribute to human development.

A.5. understand that group and cultural influences contribute to human identity.

A.6. understand that group and cultural influences contribute to human behavior.

A.7.* understand various meanings of the social group, the general implications of group membership and the different ways that groups function.

A.8.* understand the theory and methods of mediation, cooperation and conflict resolution.

VII. Inquiry, Research & Analysis

A. Successful students understand the scientific method of inquiry and investigation. They:

A.1. understand how hypotheses are formulated to examine social behavior.

A.2. understand that hypotheses are contingent—that they can be disproved by additional evidence.

A.3. understand that well-tested hypotheses may be integrated into a theory predicting social behavior.

A.4. know how to apply a theory to new evidence.

A.5. understand how to write and test a hypothesis using additional evidence.

A.6. know the ethics associated with data collection and human subjects.

A.7. understand the limits of scientific investigation.

B. Successful students are able to read and interpret data. They:

B.1. know how to interpret data presented in tables and graphs.

B.2.* know the basics of probability theory and the concept of a sample.

B.3.* know the difference between statistical and substantive significance.

C. Successful students know how to find a variety of sources of information, and how to analyze, evaluate and use them properly. They:

C.1. locate information from a variety of sources appropriate to the task at hand.

C.2. draw inferences then determine main and supporting ideas.

C.3. critically evaluate information by discerning the quality of the materials.

C.4. critically evaluate information by qualifying the strength of the evidence and arguments.

C.5. critically evaluate information by determining its credibility.

C.6. critically evaluate information by identifying any bias and/or perspective of the author(s).

C.7. critically evaluate information by using prior knowledge.

C.8.* demonstrate familiarity with a data analysis software program.

D. Successful students are able to identify and analyze problems appropriate to the social science discipline being studied. They:

D.1. identify and define a problem.

D.2. use deductive and inductive problem-solving skills as appropriate to the problem being studied.

D.3. use multiple perspectives and resources to analyze a problem.

VIII. Communication

A. Successful students are able to communicate clearly and coherently. They:

A.1. present a coherent thesis when making an argument.

A.2. support the thesis with appropriate evidence when making an argument.

A.3. anticipate and answer possible objections when making an argument.

A.4. present a concise, clear closing when making an argument.

A.5. organize ideas to achieve coherence in communication.

A.6. write research papers that incorporate processes appropriate to the topic being researched. These include:

- integrating information from a range of appropriate sources
- logically introducing and incorporating quotations
- synthesizing information into a logical sequence
- identifying different perspectives
- identifying complexities and discrepancies in information
- offering support for conclusions

A.7. understand the concept of plagiarism and how to avoid it through the use of paraphrasing, summarizing, quoting and citing.

A.8. identify and use parts of speech correctly and consistently (e.g., verbs, conjunctions, interjections).

A.9. use a variety of sentence structures in writing (e.g., compound-complex, analogous).

Second Languages

Students should have the ability to recognize cues in language and extrapolate from them. They need to learn to be good guessers and to figure out meanings of words from context instead of constantly going to a dictionary. ***Faculty Viewpoint***

Knowledge & Skills Foundations

The goal of second language study is to communicate effectively with speakers of another language in authentic cultural contexts. Learning another language involves much more than memorizing a system of grammatical rules. It requires learners to understand the cultures from which the language arises and in which it resides, use the language to communicate accurately and use their first language and culture as a model for comparison with the language and culture being learned. Second language proficiency can improve learning in other disciplines, such as English, history and art, and expand professional, personal and social opportunities.

The Basics

Successful students know the basics of grammar and vocabulary of both their first language and the second language they choose to study. They are able to recognize verb tenses and parts of speech, understand the linguistic functions these elements perform and compare them to their equivalents in their first language. This formal knowledge will help students learn and use a second language while giving them a deeper understanding of their first language.

Students in entry-level courses should have emerging competence in four areas: communication, culture, comparisons and learning strategies.

Communication. Successful students are able to read, write and converse at the Intermediate-Low proficiency level as defined by the American Council on the Teaching of Foreign Languages Proficiency Guidelines (see ACTFL at www.actfl.org). Essentially, this means that students can use the second language to express themselves in simple, full sentences. Students who are ready for entry-level courses have pronunciation that is comprehensible, but they are not expected to approach the quality or accuracy of a native language speaker.

Culture. Language is inseparable from culture. In order to communicate effectively in an authentic cultural context, students must be aware of the practices and perspectives of the culture. This involves knowledge of geography, holidays, lifestyles and material resources of the countries and peoples where the second language is customarily spoken. A student of Japanese might be expected to know that Japanese people bow when greeting each other and to understand the value of humility in Japanese culture that underlies this routine practice. The student should also be able to know what language is appropriate to particular cultural situations.

Comparisons. The ability to view facts from multiple perspectives is an important critical thinking skill developed through second language study. A solid knowledge of a first language and culture is a starting point for making comparisons and drawing contrasts with the second language and culture. For a native English speaker, a comparison of English to another language will deepen his or her understanding of English, of the second language and of the nature of languages in general. Similarly, a comparison of American cultural products, practices and perspectives to those of another culture will lead students to a more profound understanding of what it means

to be an American, what it means to be part of another culture, and the nature of social roles, values and customs.

Learning Strategies. Critical thinking is not only a by-product of second language learning, but also a powerful tool for enhancing language acquisition. Meta-cognitive and meta-linguistic knowledge, mnemonic devices, inference, critical reading, process writing and other strategies should be evident by the time a student begins an entry level course at a university.

The degree to which a student employs these strategies will be a critical factor in determining college success, regardless of second language proficiency level upon entrance. A student who knows how to enhance comprehension by effectively negotiating meaning, for example, may be more successful than a student with superior knowledge of the language itself who relies solely on studying the textbook.

Orientation Towards Learning

It is important that a student can tolerate both linguistic and cultural ambiguity. Successful students accept the linguistically ambiguous aspects of a language, such as grammatical exceptions or words with no exact translation. In studying culture, they understand that meaning is culturally constructed—few absolute rules of behavior exist in any society, and context determines both meaning and appropriate behavior. The particular strategies an individual student uses will vary, but common to all successful students are emotional engagement with the language and culture and openness to thinking about other ways of acting and communicating.

Judgmental attitudes towards other languages or cultures impede the acquisition of another language.

Faculty Viewpoint

Second Languages Standards

*= Items with an asterisk are those expected of students who plan to major in a second language.

I. Communication Skills

A. Successful students use a language other than their first language to exchange information and interact with others within realistic contexts. This is known as the interpersonal mode. They:

A.1. are able to communicate in an on-demand interview at the Intermediate-Low level for European languages, or Novice-High level for non-European languages (see ACTFL).

A.2. are able to use the target language to participate in communicative classroom activities and discussions with peers and teachers.

B. Successful students are able to express personal meaning in a language other than their first language in a variety of genre and formats. This is known as the presentational mode. They:

B.1. use writing processes such as brainstorming, drafting, revising and proofing to produce short texts in the target language.

B.2. use some basic cohesive devices in discourses in the target language.

B.3. demonstrate a developing awareness of audience, context and genre throughout a prepared composition or speech in the target language.

B.4.* are able to defend an opinion, argument or point of view regarding other cultures, academic disciplines or international topics in a prepared, edited text in the target language.

C. Successful students construct meaning from authentic spoken and written sources that are in a language other than their first language. This is known as the interpretive mode. They:

C.1. are able to identify the genre of authentic texts written in the target language, for example, poems, news articles and essays.

C.2. can ascertain meaning from context when they confront unfamiliar words and phrases in the target language.

C.3. are able to distinguish main ideas from supporting details within a text written in the target language.

C.4.* are able to identify literary devices such as point of view, narrative voice and others in texts written in the target language.

C.5.* begin to analyze an author's use of language and literary devices within text written in the target language.

II. Culture

A. Successful students are aware of products, practices and perspectives of the target culture and are able to apply that knowledge in communicative contexts. They:

A.1. are able to locate on a map and identify by name countries, continents and geophysical landmarks relevant to the target language.

A.2. know basic historical facts and cultural traits of the target language country or countries, including the range of languages spoken.

A.3. show knowledge of current events in the target language culture or cultures.

A.4. are able to identify and articulate in their first language, if necessary, perspectives embodied in the culture that uses the target language.

A.5.* are able to identify major physical artifacts and cultural practices of the target language culture or cultures expressed in the form of monuments, icons and customs, and how cultural practices influence daily life.

III. Structure

A. Successful students have a basic knowledge of English syntax, semantics and discourse structures and are able to compare these with analogous forms in the target language. They:

A.1. recognize most common parts of speech, including nouns, verbs, adjectives, articles and adverbs in English and the target language.

A.2. understand the role of grammar and context in various linguistic functions in English and the target language.

A.3. understand and compare how simple clauses are formed in English and the target language.

A.4. are able to identify and compare the coding of tense and aspect in English and the target language.

A.5. apply writing conventions accurately in English and the target language.

A.6. know that a second language cannot be thought of as a simple word-for-word translation of English.

IV. Learning Behaviors

A. Successful students demonstrate awareness of the process of learning a second language and are able to apply a variety of strategies to that learning process. They:

A.1. apply personal discipline to the language-learning enterprise.

A.2. work effectively in a group to help enhance language learning for themselves and for group members.

A.3. are willing to speak in the target language in front of teachers, peers and those who are fluent in the target language.

A.4. are willing to take risks with the target language as they practice new grammatical structures and vocabulary.

A.5. know how to use the dictionary and other reference materials in English and the target language as tools to enhance understanding of the target language.

A.6. have an interest in other cultures, possess curiosity and a willingness to learn about those cultures.

A.7. use questions and other strategies to elicit responses from classmates as well as from fluent speakers of the target language.

A.8. use mnemonic and memorization strategies to enhance the learning of the target language.

A.9. employ knowledge of their first language to help form and test hypotheses regarding the target language.

A.10.* recognize and cope with ambiguity and accept that more than one answer is possible, particularly when trying to understand the perspective of a different culture.

A.11.* use meta-cognitive and meta-linguistic strategies to advance language learning and cultural awareness.

Students should understand their first language and be aware of its grammar and vocabulary. If students know parts of a sentence in their first language, it speeds up the process of learning a second language. We waste a lot less time if they know the grammar of their first language before they come to me to learn another one.

Faculty Viewpoint

The Arts

The pursuit of individual artistic excellence is a lifelong quest that begins by developing a profound understanding and appreciation of the contributions made by the most innovative creators in the field. ***Faculty Viewpoint***

Knowledge & Skills Foundations

This section discusses the attributes of students who are successful in the range of creative endeavors known collectively as the arts. Successful students display a wide range of behaviors, some that can be learned and others that are reflections of personality traits and personal attributes. Successful students in the arts are self-aware individuals who use their time at the university to continue and to intensify a process of skill development and personal growth designed to prepare them to be life-long learners and participants in the arts.

Faculty members describe successful students as those who can think independently, logically and then maturely. Successful students understand themselves as instruments of communication and expression who demonstrate mastery of basic oral and physical expression through sound, movement, and visual representations. They embrace a diversity of academic interests from world cultures and political history to scientific research, sociology, psychology and the study of religion. They view the arts as an instrument of social and political expression. They formulate and present difficult questions through their personal artistic visions. They are able to justify their aesthetic decisions when creating or performing a piece of work and know how to make decisions regarding the proper venue for performing or exhibiting any creative product.

One of the things that differentiates college from high school is the longer periods of time spent improving, revising and perfecting work. Successful students know how to practice in a sustained, focused fashion without external supervision, how to manage their time, and how to discipline themselves to remain focused for extended periods of time while mastering the technical aspects of their area of endeavor. Artists, like athletes, sometimes describe this hard work as *flow*: a state of mind characterized by high concentration and blocking out of distractions, thus achieving advanced levels of creativity. Time management and patience are essential. Starting a project when it is assigned without procrastination, learning to work in stages, and planning so that it can be completed in the amount of time given are critical skills for all arts students. At the same time, successful students do not lose touch with the larger campus community, and, in fact, participate in a wide range of campus activities and interact with a cross-section of the student body.

Students prepared for study in the arts demonstrate intellectual curiosity and a willingness to experiment with media. These students strive to develop their creativity and ingenuity by struggling with a concept, an object, a space, or a sound. Rather than solely fixating on proper form, they seek to utilize knowledge of form to facilitate and support personal creative development. They are aware and curious about genres with which they are not familiar and are eager to experiment with them. They are willing to learn about a diverse range of historical eras and practices related to the arts.

Many arts courses at the college level require research skills in part because the creative process of producing one's own

work usually raises questions about issues that are external to the piece, particularly a knowledge of what influences the piece. This process requires research that incorporates cultural criticism. The presentation of the research is often in the form of a clearly written essay. Successful students also know about the moral and legal issues around plagiarism and can see the difference between being influenced by other artists and stealing from them.

It is crucial that students be able to think critically. Students who are ready for college-level study in the arts must be capable of making independent judgments about a work of art and not be afraid to ask questions. Curiosity and a willingness to explore many layers of meaning are important to success, as well. Successful students reflect on and assess the strengths and weaknesses of others' ideas and ways of expressing them. In addition, they are comfortable formulating and expressing their own ideas.

Successful students are able to accept criticism about their own artwork or performance as well as to critique the work of others. One cannot create art or perform without considering at some point the opinions of others. Students learn through formal critiques how to distinguish between constructive criticism and unfounded criticism and how to use constructive criticism to become more self-analytic. The underlying point of critiques and feedback is not just to improve one's work, but also to foster self-reliance and to build a peer network simultaneously. Different methods of critique are used at the college level. In some, the emphasis is on listening to classmates' comments; in others, the student is expected to present the class with a rationale for the work or performance.

Collaboration is an essential aspect of theatrical production which is manifested in one's ability not only to effectively communicate a personal creative idea but to also engage in an exchange of ideas that will result in a shared artistic vision.

Faculty Viewpoint

A character trait that university-level arts classes develop is helping students learn not to get discouraged when they are asked to do things that are complex or time-consuming. Rising to the substantial challenges students face in university-level arts courses is an integral component of the learning experience. Many students who have been accustomed to being outstanding find themselves in a community where everyone is similarly gifted. The shock of not being the best or the most accomplished is often great for students in entry-level courses. The challenge is to embrace this new role and status and learn from the diversity of expertise, talent and creativity that now surrounds the student.

The Arts Standards

The Knowledge and Skills for University Success standards in the arts are presented in a somewhat different fashion than they are in the other disciplines. The arts section adopts a unique approach due to the fact that arts classes are not necessarily taken during the freshman year. Arts courses may be experienced for the first time by students at any point in their academic careers. Thus, it is more difficult to identify arts classes associated with first-year students, the criterion used to identify knowledge and skills in the other five academic content areas addressed in this document. Additionally, the arts are uniquely complex in a number of other ways. First, the arts include both the performing arts and arts appreciation. Second, the arts comprise a number of distinctly different areas of emphasis. Music, art, dance and theatre require more distinctly different skills and knowledge than do biology and chemistry or geography and history.

Students should be able to consider the social context of the dance performance and ask pertinent questions about the conditions of dance production and the intended audience for the dance.

Faculty Viewpoint

The arts standards presented here represent a set of general skills and abilities derived from national arts standards documents and the expressed values of arts faculty. This section includes knowledge and skills for art history, dance, music, theatre and the visual arts. For each of these sub-areas, knowledge and skills are grouped under three headings: Technical Knowledge and Skills, Cultural and Historical Knowledge and Skills, and Aesthetics and Art Criticism Knowledge and Skills. Although grouped under these headings for organizational convenience, the knowledge and skills are understood best when viewed as being integrated within each heading and across headings within a sub-area.

When students take an introductory course in art history, they often discover a talent or interest that they never imagined—and that's a significant part of what college is about: personal discovery.

Faculty Viewpoint

I. Art History

Technical Knowledge and Skills

Students in introductory art history courses are successful when they:

1. Know a range of subject matter, symbols and ideas in the visual arts.
2. Know how characteristics of the arts vary within a particular historical period or style and how these characteristics relate to ideas, issues or themes in other artistic disciplines. For example, paintings often were made for specific architectural contexts, such as a mural made for a dining area or a specific location in a Hindu temple.
3. Understand the connections between various artistic genres and media, such as the relationships between music and art during a given period.
4. Know that characteristics of the arts vary within a particular historical period or genre.
5. Connect characteristics of visual arts within a particular historical period or style with ideas, issues or themes in the humanities, social sciences or natural sciences.

Cultural and Historical Knowledge and Skills

Students in introductory art history courses do well when they:

1. Recognize that artworks are created in relation to major cultural, socio-political and historical periods.
2. Reflect on how artworks differ visually, spatially, temporally and functionally, and according to geographical place.
3. Analyze common characteristics of visual arts evident across time and among cultural/ethnic groups to formulate analyses, evaluations and interpretations of meaning.

Aesthetics and Art Criticism Knowledge and Skills

Students in introductory art history courses do well when they:

1. Write clearly and cogently, formulate logical arguments and demonstrate intellectual curiosity.
2. Are skilled in visual literacy; can interpret artwork as a visual text.
3. Understand the link between the artist and society, and understand that artists are generally professionals who are successful in their time because they produce what their audiences want to see.

II. Dance

Technical Knowledge and Skills

Students in entry-level dance courses do well when they:

1. Possess technical skills in proper body-part articulation, strength, flexibility, agility and coordination in locomotor and nonlocomotor/axial movements.
2. Display an awareness of proper breathing techniques, and understand choreographic principles, processes and structures.
3. Use improvisation to generate movement for choreography.
4. Understand various complex time elements, such as duple and triple meters and tempi varied in relation to a basic pulse.
5. Create and perform combinations and variations within a broad range of dance styles.
6. Can memorize and reproduce extended movement sequences and rhythmic patterns.
7. Understand that dance is a way to create and communicate meaning.
8. Use movement choices to communicate abstract ideas and social themes in dance.
9. Understand and demonstrate how dance interpretation can be influenced by personal experience.

Cultural and Historical Key Knowledge and Skills

Students in entry-level dance courses do well when they:

1. Understand dance across various cultures and historical periods.
2. Compare and contrast the role and significance of dance in different social, historical, cultural and political contexts.
3. Place significant dance events of the twentieth century in their proper social, historical, cultural and political contexts.
4. Perform and describe similarities and differences between two contemporary theatrical forms of dance, and know the traditions and techniques of classical dance forms.

Aesthetics and Arts Criticism Knowledge and Skills

Students in entry-level dance courses do well when they:

1. Discuss the intentions and effects of dance work in both solo and group dance performances.

2. Analyze and describe the tempo, bodily precision, intention, musicality, costumes, lighting, space, rhythm, body position and synchronicity between elements in their critiques.
3. Describe how a choreographer manipulated and developed basic movement content in a dance.

III. Music

Technical Knowledge and Skills

Students beginning vocal or instrumental college-level music do well when they:

1. Can use their voice as a performing tool.
2. Can sing a varied repertoire of vocal literature with expression and technical accuracy at a moderate level of difficulty including some songs performed from memory.
3. Pay attention to phrasing and interpretation, various meters and rhythms in a variety of keys.
4. Can sing music written in four parts, with and without accompaniment.
5. Know how to play a varied repertoire of music both alone and with others.
6. Can perform with expression using appropriate dynamics, phrasing, rubato and technical accuracy with attention to interpretation.
7. Perform in various meters and rhythms in a variety of keys.
8. Perform in an ensemble, demonstrating well-developed skills in creating balance, varying intonation and maintaining rhythmic unity.
9. Read and notate music that contains moderate technical demands.
10. Are familiar with music theory and composition and can demonstrate an ability to use the elements of music for expressive effect, including pitch, rhythm, timbre, texture and form.

Cultural and Historical Knowledge and Skills

Students in music courses do well when they:

1. Understand how music is related to history and culture.
2. Are able to classify unfamiliar but representative aural examples of music by genre, style, historical period and culture, and to explain the reasoning behind their identification.
3. Can identify and describe music genres or styles that show the influence of one or more cultural traditions.

Aesthetic and Arts Criticism Knowledge and Skills

Students who observe or listen to musical performances do well when they:

1. Know and apply appropriate criteria to music and music performances.
2. Understand the technical vocabulary of music—including terms in Italian and markings for form, harmony and tempo.

3. Understand compositional devices and techniques that are used to provide unity, variety, tension and release in a musical work.
4. Can listen to, analyze and describe music and music performances.
5. Describe the elements of music in a given work that make it unique, interesting and expressive.
6. Evaluate composition, arrangement or improvisation by comparing it to similar or exemplary models.
7. Compare ways in which musical components are used in a variety of works of the same genre or style.
8. Understand and can describe the relationships between music, the other arts and disciplines outside the arts.

IV. Theatre

Technical Knowledge and Skills

Students in entry-level theatre courses do well when they:

1. Demonstrate evidence of dramatic experience including the ability to analyze the physical, emotional and social dimensions of characters found in dramatic texts from various genres and media.
2. Develop, communicate and sustain characters in rehearsal, in informal or formal productions and in an ensemble that communicates with audiences in improvisations.
3. Understand what goes on behind the scenes in terms of design, direction and production of a theatrical piece.
4. Possess the technical knowledge and skills to collaboratively and safely create functional scenery, properties, lighting, sound, costumes and makeup.
5. Can collaborate with directors to develop unified production concepts that convey the metaphorical nature of the drama for informal and formal theatre, film, television or electronic media productions.

Cultural and Historical Knowledge and Skills

Students are successful in theatre when they:

1. Are familiar with the social, cultural and historical contexts in which theatre, film, television and electronic media are performed today and were performed in the past.
2. Demonstrate knowledge of theatrical heritage.
3. Are aware that theatre can reveal universal concepts across time.
4. Appreciate the ways in which personal and cultural experiences can affect an artist's dramatic work.
5. Understand and can describe how their own cultural experiences influence their work.
6. Understand and appreciate cultural and historical effects influencing theatre.
7. Compare, analyze and integrate traditional theatre, dance, music, visual arts and emerging art forms.

Aesthetics and Art Criticism Knowlege and Skills

Students are successful in theatre when they:

1. Know how informal and formal theatre, film, television and electronic media productions create and communicate meaning.
2. Understand how social meanings, represented by aural, oral and visual symbols are communicated.
3. Can identify how productions and performances relate to current issues.
4. Understand that the context in which a dramatic performance is set can enhance or hinder its effectiveness.

5. Are able to compare and explain the roles and interrelated responsibilities of people involved in a production.
6. Can describe the influence of drama in film, television, rock concerts and religious ceremonies and other kinds of ceremonies and performances.
7. Have good observational skills.
8. Articulate and justify their personal aesthetic criteria.
9. Use their knowledge of other aesthetic philosophies such as Greek drama, Shakespearean forms, Japanese kabuki and others.

V. Visual Arts

Technical Knowledge and Skills

Students in entry-level visual arts courses do well when they:

1. Know fundamental visual arts techniques and processes in a variety of media, including basic drawing, color theory and design.
2. Initiate, define and solve challenging visual arts problems in order to create cohesive artworks.
3. Demonstrate awareness of how emotions expressed in art give new insight and clarity to issues.
4. Differentiate between the applications of various media and understand how media generate different types of expression.
5. Explore ways to integrate and combine various arts media.

Cultural and Historical Knowledge and Skills

Students in college-level visual arts courses do well when they:

1. View and identify examples of artworks from a variety of cultural contexts to understand their function and meaning.
2. Understand how visual, spatial, temporal and functional values of artworks are tempered by society, culture and history
3. Show an understanding of the work of critics, historians and artists.
4. Investigate the influence of international and national cultural institutions and art policies on art and art making.
5. Develop an appreciation of art as a social agent that contributes to a sense of community in situations such as community forums, events and festivals.

Aesthetic and Art Criticism Knowledge and Skills

Successful students in entry-level visual arts courses:

1. Are willing to learn from the process of evaluation by peers and faculty.
2. Apply intellectual skills such as analysis, synthesis and evaluation in visual art critiques.
3. Discuss the implications of an artist's intentions.
4. Demonstrate their own interpretations and synthesize those of peers, professors and critics.
5. Form and defend judgments about artistic characteristics.
6. Compare two or more perspectives about the use of organizational principles in an artwork, and defend personal evaluations of these perspectives.
7. Reflect upon and assess how artworks differ visually, spatially, temporally and functionally.
8. Balance between the ability to identify and trust one's instincts and the ability to question one's preconceived assumptions.

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