

**Critical Thinking Skills:**

**Building Blocks for Success**

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**Abstract**

Although research has been done to identify critical thinking skills, little has been done to extrapolate a comprehensive hierarchy of critical thinking skills sets necessary to the enhancement of academic performance. The link between critical thinking skills and course specific content has not been broken nor is there evidence to indicate that a link has been forged between course specific critical thinking skills and utility in life beyond the classroom. The extrapolation of a comprehensive hierarchy of sets of critical thinking skills provides the foundation to do the following:

1. Move beyond the course-specific link;
2. Develop methods to select appropriate critical thinking skills sets that may be utilized to incorporate critical thinking into most, if not all, aspects of the curriculum;
3. Develop methods by which to evaluate the results of such endeavors; and,
4. Promote an understanding of the utility of critical thinking skills in classrooms as well as electronically delivered courses.

**Critical Thinking Skills:  
Building Blocks for Success**

Critical thinking skills are paramount to the utilization of the intellectual and professional growth opportunities that are provided by institutions of higher learning. It is generally accepted that the enhancement of critical thinking skills is possible in most, if not all, academic settings. However, much of the research is limited to development and delivery of course specific critical thinking skills. Such course specific use of critical thinking skills has a low rate of transference to other courses. Furthermore, there exists no single accepted standard by which to determine what constitutes critical thinking skills.

Examination of literature about critical thinking skills from available sources reveals that few research projects were initiated during the last decade at the college or university level. Research documents include the following:

1. Dispositions exhibited by critical thinkers, (Ennis, 2000);
2. Critical thinking behaviors that are course specific, i. e., high school business education (McEwen, 1994);
3. An effort to define and/or explain what it is (Facione, 2001); and,
4. Explain and promote a particular critical thinking essay examination.

Other sources offered predictable suggestions for eliciting responses in a safe environment through questioning. Papers that dealt with college level instruction include the following: teaching critical thinking skills at the community college level (Novak and Detloff, 1989) and "The Impact of College Residence on the Development of Critical Thinking Skills in College Freshman," (Inman and Pascarella, 1998). Neither dealt with a hierarchy of critical thinking skills although Novak and Detloff did present a task analysis that was

course specific to biology. Among their findings, Inman and Pascarella concluded that participation in activities on campus was valuable to cognitive development. No specific critical thinking skills were identified in the document. Subsequent efforts failed to locate in the research projects and papers either a definitive hierarchy of critical thinking skills or critical thinking skills sets appropriate for *across the curriculum* instruction.

A hierarchy of critical thinking skills should be focused but flexible. Such critical thinking skills sets should have applications from the most basic level to the highest level of critical thinking, the level that moves one to action (Huitt, 1998). Therefore, it has become necessary to extrapolate such a list as well as to devise logical and sequential sets of skills from the list. The critical thinking skills sets were extrapolated from course specific sources such as texts, papers, and research within the field as well as from actual classroom experience.

The skills sets are devised to encourage utilization in most, if not all, courses through the extrapolation of skills appropriate to the course content at each skills level.

The need for a systematic approach for selecting course appropriate critical thinking skills for classroom presentation, electronic interactive television technology delivery, and web-based courses will be addressed briefly within the text for each skill set. Measurement and evaluation of the results of the use of the critical thinking skills sets may be divided into two distinct categories, i. e., those that are generated by the instructor and those that are commercially developed.

Examination of research literature has provided insights that suggest the creation of four critical thinking skills sets. The four sets are based on the criteria that follow:

1. That there exists a core of course specific knowledge prior to or when the enhancement of

- critical thinking skills begins;
2. That recognition and identification of underlying assumptions, major ideas, and key issues within arguments, hypothetical assertions, course content, etc., must exist or must be developed as a requisite skill to enhancing critical thinking skills;
  3. That guidelines shall establish parameters for judging the credibility, reliability, and validity of research sources;
  4. That opportunities exist to develop and enhance the ability to eliminate extraneous information;
  5. That the opportunities exist to master the concept that conclusions be supported by evidence;
  6. That the enhancement of critical thinking skills requires an environment
- in which information is processed, assimilated, integrated, and utilized; and,
7. That evaluative and self-judgment activities are an integral part of the process.

#### **Four Critical Thinking Skills Sets**

The extrapolation of a list of critical thinking skills from specific course sources such as texts, papers, and research within the field as well as from actual classroom experience has resulted in the development of four sets of critical thinking skills. The skills sets have applications from the most basic level to the highest level of critical thinking which Huitt (1998) contends is the level that moves one to action. The skill sets are devised to encourage utilization in most, if not all, courses through the extrapolation of skills appropriate to the course content at each skills level.

**Skills Set One: Acquiring Course**

**Specific Core Knowledge**

A prerequisite to the enhancement of critical thinking skills is the development of a basic core of knowledge related to specific course content. Therefore, entry level survey or introductory courses, of necessity, emphasize the acquisition of appropriate vocabulary as well as an understanding of course content that provides an overview of the subject. Appropriate vocabulary development is linked directly to course content, appropriate assignments, activities, and evaluation. Processing the information and evaluation of the results are the critical thinking skills sets that are emphasized. Activities, discussions, written assignments, laboratory sessions, etc., may be implemented to enhance intellectual growth and development.

Course content is determined in large part by the course description, selected texts, supplemental materials, required activities, discussions, research requirements, and self-directed

independent efforts. It follows that enhancement of critical thinking skills for a given basic course may be limited to the initial processing of meaning and information stored for later retrieval. Examinations used to evaluate mastery of concepts delivered in a basic course of study may be designed to access ability to use critical thinking skills such as basic evaluation and obvious application as an adjunct to activities that develop core knowledge. Therefore, enhancement of critical thinking skills at step one will be evaluated almost entirely at the level of acquiring knowledge with minor focus on applying knowledge.

Interactive electronic delivery of the course should closely resemble that of the physical classroom and should work well with most courses. It may be difficult or impossible to replicate “hands-on” scientific activities and projects using interactive delivery unless the site chosen for electronic delivery is designed to provide needed laboratory equipment and supplies.

Web-based learning requires that appropriate adaptations be made particularly in the areas of in-class presentations and discussions.

Carefully designed written assignments work well with many courses. However, it is difficult to accommodate speech making and certain scientific “hands-on” laboratory requirements via web-based presentations.

**Skills Set Two: Critical Thinking Skills Involved in Processing Information**

The initial processing of core knowledge may be accomplished through the use of such thinking strategies as inductive or deductive reasoning. Other critical thinking skills such as analysis, inference, interpretation, explanation, evaluation and classification also enhance the processing and retrieving of information.

Mathematics and science courses as well as logic and philosophy provide opportunities to process information using inductive and deductive reasoning as well as analysis, classification, explanation,

extrapolation, and evaluation. Social sciences, humanities, English, and communications are courses that also require that information be processed and retrieved in a methodical fashion. The critical thinking strategies of inductive and deductive reasoning used in conjunction with critical thinking skills such as interpretation, inference, classification, analysis, explanation, and evaluation are among the appropriate tools to organize, store, and retrieve information. The lines between “Critical Thinking Skills Involved in Processing Information” in step two and “Critical Thinking Skills Extrapolated from Implied Meanings and Abstraction” in step three blur and overlap when applied to a college or university curriculum. However, these skills may be used individually or together as needed in many courses such as mathematics and sciences as well as English, social sciences, communications, the humanities, logic and philosophy.

Once information has been processed, it is assimilated and integrated into the thought processes

of the individual. These critical thinking skills might be thought of as change agents because both produce change in an individual's knowledge and belief systems as well as influencing his/her perceptions.

The enhancement of critical thinking skills used for processing and retrieving information is key to use of information for academic success and for other endeavors as well. Activities to enhance the preceding skills should be developed around the core course content.

Writing activities for the humanities, social sciences, and English courses can easily require the use of inductive and deductive reasoning processes. Explanation papers may require the use of inductive and deductive reasoning, extrapolation, evaluation, etc., to explain such cognitive processes as assimilation and integration as well as other topics selected by the instructor and/or the students. Mathematics and science courses offer ample opportunities to process information and to retrieve it.

Both knowledge and application of critical thinking skills should be tested at step two in order to draw conclusions that are accurate about the effectiveness of enhancement efforts. Questions may be formatted to require that the answers reflect knowledge of both inductive and deductive reasoning as well as to demonstrate the ability to use both kinds of reasoning as required in any given situation.

Theoretically, interactive television technology presentations should require only minor adaptations provided that the receiving site has been equipped to meet the needs of each specific course content area accessing the site.

Web-based presentations for all subject matter, not just critical thinking skills, rely heavily on additional required reading, research, and writing activities as the means for developing all skills. However, academic use of chat rooms eventually may move beyond the few specific workshops, etc., available at this time. Although

much can be accomplished with web-based instruction, it may not work as well for “hands on” demonstrations for the sciences that require extensive use of laboratory equipment and supplies or for classes such as speech that may lack the means to provide interaction with an audience.

**Skills Set Three: Critical Thinking Skills Extrapolated from Implied Meanings, Underlying Assumptions, and Abstractions**

The presentation of information may be straightforward and didactic or less obvious and more speculative or it may be implied. The nature of the presentation depends upon the analysis of the criteria that follow: the content that is being presented, the reason or reasons for which the information is presented, the purpose for which it is presented, and the characteristics of those who will receive it. Likewise, the critical thinking skills needed to obtain, process, retrieve and utilize meaning vary. Therefore, analysis of the strategies used for presentation of

course content precedes the selection of critical thinking skills to be employed.

Implied meaning calls into play such strategies as the recognition and identification of the use of connotation, satire, figures of speech, symbolism, irony, underlying assumptions, philosophies, etc. Observation coupled with an understanding of the conventions used in course content may reveal the implied meaning. Other strategies that may be classified as critical thinking skills are also used to determine meaning. In literature courses interpretation and inference have utility for providing insights into the author’s use of tone, theme, point of view, allusion, figures of speech, symbolism, and drawing conclusions. Extrapolation or speculation of consequences based on known facts or observations are particularly helpful in courses such as English, humanities, communications, social sciences, logic, and philosophy.



Predicting and projecting are useful higher level thinking skills utilized to access implied meaning in literature through the use of foreshadowing. Both predicting and projecting are valuable as thinking skills in social sciences, mathematics and science, business courses, etc. In mathematics courses estimating is a useful critical thinking skill. Many content areas, especially the sciences, require the use of classification to bring order to information through the creation of categories, by examination of significance, and for the clarification and/or verification of meaning or results of manipulation or experimentation.

This level of academic behavior requires evaluation of the process of critical thinking. Measurements of this nature may be obtained by eliciting responses to well-drafted questions that require judgmental or evaluative thinking as well as knowledge of the course content. Explanations and demonstrations also reveal the quantity and quality of critical thinking skills. Evaluating both

knowledge and its application are important aspects of testing at this level.

Interactive television technology should work well for delivering the higher levels of critical thinking skills in classes such as English, the humanities, social sciences, business courses, mathematics, and the sciences provided the receiving site is well-equipped to handle classes with laboratory requirements.

Web-based delivery works well with classes that require much reading and writing but do not offer enough at this time to be feasible for "hands-on" laboratories in science. Actual speech-making requirements for speech courses are difficult to meet with web-based delivery. Furthermore, the lack of an audience response to the activity denies access to an important aspect of delivering a speech. Web-based background information can be delivered in such a manner for such a class but it does not suffice for in-depth development of speech-making skills.

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**Skills Set Four: Critical Thinking Skills  
for Utilizing Meaning or Information**

Critical thinking skills for utilizing meaning or information represent the highest level that can be achieved. Whereas, the skills in set three might be considered change agents, the skills in set four may be considered as the call to action. It is at this point that plans, ideas, and possibilities are developed and subsequently evaluated against more rigorous standards than previously. Problems are identified and options or solutions are drafted, modified, argued, analyzed, evaluated, and implemented. Through synthesis the old and new come together in different and, oftentimes, rewarding ways. Think for a moment about two mechanics, the engineers of their day, who walked into their machine shop that was filled with parts for creating bicycles and saw in their minds a flying machine. Accepting everything at face value was probably not a concept that they accepted. They chose a different approach that gives way to qualitative judgment that examines

content, underlying assumptions and philosophies, proposes applications, projects long-term results as well as short term, and considers other relevant information before committing to action. While it is doubtful that they could have imagined the impact on this country, we can understand that their priorities made it possible for us to come together at this well-known institution of higher learning to explore ways to nurture that kind of thinking.

We also recognize that it is but a short step from synthesis to creativity. Some believe that the two are linked in ways that have only begun to be understood. Others contend that creativity is a different sort of thinking. It is likely that the Wright brothers were so busy transforming bicycle parts into a flying machine that they were not concerned about synthesis, creativity, or critical thinking skills. If they thought about critical thinking skills at all, they probably referred to them as having or lacking “common sense” or “horse sense.”

However, stating problems and examining options and possible solutions are inherent in concepts of higher education. Therefore, instructional strategies and methodologies for delivery of course content as well as enhancement of critical thinking skills are concerns that are addressed in various ways. Techniques for solving a problem once it has been identified and stated will depend on the nature of the particular course. Brainstorming individually or in a group is one option. Research from authoritative sources or interviews with experts in the field to determine what is known is a possibility. Trial and error is sometimes used if no better options are available. The course itself will dictate to large extent the strategies employed for solving problems.

Evaluation of the effectiveness of enhancing problem solving skills can be accomplished through examination of knowledge of various procedures and application of that which has been learned. Format is determined by the

nature of the course and may include hypothetical problems requiring both knowledge and its application to develop a logical solution.

If the evaluation is a pen and paper format, both interactive television technology and web-based delivery of instruction should produce the desired results. However, adaptation may be required if either delivers evaluation as a "hands-on" project.

Another aspect of critical thinking skills that will benefit from enhancement is that of establishing priorities based on criteria other than personal desires, wants, whims, or instant gratification. Goal setting for both the short and long term is involved. Consideration may be given to both short and long-term effects of striving to meet the goals that have been selected. Establishing priorities suggests the making of predictions and projections as well as giving consideration to probabilities. Well-thought out priorities lead to better planning and better planning provides the foundation for solving problems. Classification and

categorization skills can be transferred from one content area to another to enhance the development of the ability to establish priorities for academic purposes or for purposes beyond the academic setting. Priorities may be ranked according to importance, i. e., from greatest to least or according to probability of occurrence from most likely to least to mention just two possible strategies for establishing them.

It is likely that informal, if not formal, instruction for enhancing the establishment of priorities is an integral component in most courses because it becomes increasingly important to do so at the more advanced academic levels. If this assumption is correct, minor adjustments in delivery of instruction in the content area can accommodate emphasis on establishing priorities.

Testing the effectiveness of instruction to establish priorities can be accomplished through the use of hypothetical situations that require determining importance or

probability of occurrence of various needs, concepts, or characteristics.

Both interactive television technology and web-based delivery should provide adequate forums for the inclusion of instruction in content areas for establishing priorities.

Delivery of instruction can be accomplished through written responses and so can evaluation.

No discussion of critical thinking skills is complete until evaluation has been examined. Evaluation is used in academic settings to determine placement, progress, and achievement. It has medical, legal and business applications. Even driving skills are evaluated at specified intervals according to state laws.

Evaluation lends itself to further scrutiny, when we examine who evaluates and for what purpose. Much academic evaluation is performed for the benefit of an instructor, for the benefit of the student, and for the benefit of an institution. Instructors delivering course content assess student progress and achievement. In

addition, many assess their own performance and methods of delivering course content for effectiveness. Students benefit from such assessment because, ideally, it provides timely insights into individual performance and achievement in a given context. Such evaluative information has utility to students for planning for future endeavors. Institutions of higher learning benefit from various kinds of evaluation that may influence future directions and plans based on current and anticipated needs of enrollees, performance of the enrollees and the institution itself, projected expansion plans, risk factors, etc. Institutions of higher learning may perform statistical studies to map trends, to make predictions or projections, or to determine behaviors. Each type of evaluation can be analyzed, compared, contrasted, quantified, and qualified for the purposes of making inferences, or drawing conclusions.

The mastery of judgmental critical thinking skills provides a

standard by which to evaluate the validity and reliability of authoritative sources, the validity and reliability of content of sources, and the feasibility of the application of the results of the evaluation process. Such mastery is required for successful completion of upper level, graduate, and post graduate projects and/or research.

Realistic self-evaluation is another aspect of critical thinking skills by virtue of the fact that the results are immediate and can be utilized toward achieving self-regulation which has been considered by some as the highest level of critical thinking. Such self-evaluation can be utilized to make reality-based decisions that dramatically increase the probability of success in academic settings, and business and personal settings as well.

With so much evaluation facing each and every member of society, it is evident that the enhancement of critical thinking skills including the evaluative or judgmental skills should be an

integral part of academic courses at all institutions of learning, not just institutions of higher learning.

Developing activities to enhance the evaluative critical thinking skills at various levels may be seen as a challenging task.

However, enhancing the critical thinking skill of evaluative judgment is inherent in each research project undertaken in any course.

Evaluation is required to develop a workable hypothesis for an experiment in science, to develop a thesis regarding a piece of literature, to predict the existence of a moon or planet that cannot yet be seen in space, or to develop a better method of treating illness. It is inherent in the nature of research to judge the quality of sources, authorities, concepts, possibilities, etc., as one engages in such efforts.

The question then becomes one of how to evaluate the instruction delivered to enhance the critical thinking skill of evaluative judgment. One possibility is to develop activities that may be used for evaluating or critiquing sources

of information, determining the authenticity of research, policies, proposals, experiments, and course content as well as for determining the basis for authority in a given field.

Delivering instruction for solving problems, setting priorities, adapting information through synthesis to new and different uses, and evaluation for both self-evaluation and judgmental evaluation through interactive television technology is possible. If the receiving site is well equipped, most of the advantages of being present in a classroom should be in place. However, it may demand creative approaches as well as technological training to deliver web based quality critical thinking skills instruction equal to that available in a classroom or an interactive setting for critical thinking skills.

The threshold of the 21<sup>st</sup> century is here and it is fleeting. As the world changes, so must the strategies of instruction for course content with emphasis to offer more and better instruction as well as more

and better opportunities to enhance and use critical thinking skills.

Quality course content in the respective subject areas must, if they do not now, incorporate instruction for critical thinking skills as an integral part of the preparation for academic success as well as success in life.

Necessity has dictated that the means of delivery of instruction have expanded to include interactive television technology and web-based instruction. Necessity now demands that institutions of higher learning, especially those on the cutting edge of technology, produce more and better critical thinkers than ever before.

It is time to embrace the challenge.

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