Higher Order Thinking (HOT) Program Assessment Plan

Addendum to the Response to the Visiting Committee Report

Prepared August 2010 for Submission to the

Southern Association of Colleges and Schools

Commission on Colleges

Dates of the On-Site Visit: March 9–11, 2010

Prepared by:

Vanneise Collins, PhD

Director, Center for Learning and Development

Vanneise.Collins@unthsc.edu

817-735-2970

University of North Texas Health Science Center

3500 Camp Bowie Boulevard

Fort Worth, Texas 76107

Table of Contents

List of Tables

List of Appendices

Introduction

The University of North Texas Health Science Center's (UNTHSC) Quality Enhancement Plan (QEP)—the Higher Order Thinking (HOT) program—is designed to improve students' higher order thinking skills across the health sciences curricula through faculty professional development and course redesign. The HOT program focuses on two project goals specific to student learning and faculty development. To evaluate the achievement of the two HOT program goals, this Assessment Plan details measurable outcomes and criteria, multiple methods of assessment, corresponding timelines for implementation, and parties responsible for the assessment effort.

The HOT program will be continually assessed throughout a five-year period and revised based on the results. The assessment effort will enable the institution to make data-driven decisions about how best to improve students' higher order thinking through faculty development. The assessment results also will be disseminated and shared with stakeholders including students, faculty, and staff.

Evaluation Design

The UNTHSC HOT Program Assessment Plan includes multiple instruments administered at scheduled intervals throughout a five-year span to provide both formative and summative data regarding students' development of higher order thinking skills and the faculty's commitment to this effort. Assessment measures for student outcomes include the following:

- Pre- and post-tests of self-reported higher order thinking skills via the California Critical Thinking Skills Test (CCTST)
- Pre- and post-tests of self-reported disposition toward using higher order thinking skills via the California Critical Thinking Disposition Inventory (CCTDI)
- Student Higher Order Thinking Rubric created by QEP faculty measuring student demonstrations of higher order thinking skills
- School performance exams measuring students' success in applying higher order thinking skills to medical and health problems or issues within their discipline

(A decision to eliminate the Learning and Study Strategies Inventory instrument was based on the availability of other tools that are more consistent with the goals of the QEP.)

Assessment measures focusing on faculty development and course redesign include the following:

- Revised QEP Course Syllabi Rubric to evaluate syllabi of courses revised for the HOT program
- Locally developed QEP Faculty Survey to evaluate faculty knowledge and practice in implementing instructional strategies that cultivate students' higher order thinking skills

- Individual Development and Educational Assessment (IDEA) Survey, a nationally normed assessment instrument aimed at providing feedback on teacher effectiveness in achieving designated teaching goals, including those pertaining to promoting students' higher order thinking

- Center for Learning and Development Participation Results measuring faculty participation in development activities focused on instructional strategies, technologies, and assessment techniques that improve students' higher order thinking skills

- Faculty Higher Order Thinking Rubric developed by QEP faculty to measure the level of faculty expertise in demonstrating higher order thinking strategies though teaching

Together, these instruments for assessing student and faculty outcomes will provide valuable data for evaluating the overall success of the QEP. The following narrative provides more information about each of these assessment instruments, including why the instrument was selected for use in the HOT program, how it will be implemented throughout the program, and related baseline data, annual targets, and long-term benchmarks.

Assessment Instruments

GOAL 1 ASSESSMENT INSTRUMENTS: MEASURES, IMPLEMENTATION, AND BENCHMARKS

Goal1: Improve and evaluate students' higher order thinking skills

Student Learning Outcomes: *1) Students will apply knowledge and skills toward critically assessing medical and health problems or issues. 2) Students will critically analyze data and other forms of information that address medical and health problems or issues. 3) Students will effectively evaluate data and other forms of information that address medical and health problems or issues.*

California Critical Thinking Skills Test

Measures

The California Critical Thinking Skills Test (CCTST) is a standardized instrument designed to assess students' overall critical thinking skills in three areas: Analysis, Evaluation, and Inference. These three areas represent core critical thinking skills and are reported in scaled scores.

The selection of this particular tool was determined to be appropriate based on the associative research in dental (Williams, Schmidt, Tilliss, Wilkins, & Glasnapp, 2006) and pharmacological (McCall, MacLaughlin, Fike, & Ruiz, 2007) education, as limited findings are available regarding the measurement of higher order thinking skills among medical students. In addition, unlike other similar instruments which have only been field tested with undergraduate populations, this instrument is suitable for the graduate population of UNTHSC's health science programs. Further, the instrument captures data pertaining to students' higher order thinking, which is compatible with the HOT program's conceptual framework and primary goal of improving students' higher order thinking. The instrument measures multiple aspects of students' higher order thinking skills, which allows UNTHSC to identify students' relative strengths and weaknesses in higher order thinking and to tailor the HOT program to address student needs.

Implementation and Benchmark

The CCTST was administered in the fall of 2009 and again in the spring of 2010 to establish baseline criteria for setting a benchmark. The pre- and post-tests were given to all students who participated in the 10 QEP courses in all four schools at the start and end of each course via the Insight Assessment online testing system. Exceptions included students enrolled in MEDE 7410, 7314, 7421 and MPAS 5241 who were assessed in courses MEDE 7320 and MPAS 5242 as a culmination of the preceding courses. Comparative results are illustrated in Table 1 for matched pairs of the same students (N=112).

Table 1. California Critical Thinking Skills Test
Overall and Pre- and Post-Test Scale Scores for Matched Pair Students in All Programs
2009–2010 (N=112)

			Scale Range		
Scale	**Pre**	**Post**	**Weak**	**Satisfactory**	**Strong**
Analysis					
Mean	5.24	5.23	0–2	3–4	5–7
SD	1.07	1.34			
Inference					
Mean	10.12	10.97	0–5	6–11	12–16
SD	2.56	2.70			
Evaluation					
Mean	5.55	5.79	0–3	4–7	8–10
SD	2.14	2.12			
Inductive Reasoning					
Mean	11.14	11.48	0–5	6–11	12–17
SD	2.51	2.34			
Deductive Reasoning					
Mean	9.76	10.51	0–5	6–11	12–17
SD	2.76	3.03			
CCTST Overall					
Mean	20.90	21.99	0–14	15–24	25–31
SD	4.64	4.74			

Baseline data collected from pre-testing students in the fall of 2009 revealed an overall mean score of 20.90. Since scores of 12–24 are considered satisfactory, and scores 25 and above indicate relative strength in critical thinking skills, the UNTHSC students' baseline mean score of 20.90 indicates room for improvement. A further examination of mean scores in individual scales revealed that UNTHSC students were strongest in the Analysis scale, with a mean score of 5.24 falling in the strong competence range. For the other scales—Inference, Evaluation, Inductive Reasoning, and Deductive Reasoning—the students showed only satisfactory competency. The scale with the lowest score was Evaluation, with a mean score of 5.55.

Post-test results obtained in the spring of 2010 showed a significant increase in students' overall critical thinking competence. However, the overall mean score of 21.99 remained in the satisfactory range, again indicating room for improvement. The individual scale scores showed a similar pattern as the pre-test. Students were ranked as strong in the Analysis scale, with a mean score of 5.23. The lowest mean scale score of 5.79 was again identified in the area of Evaluation. Given the students' relative weakness in Evaluation, which is one of the higher order thinking domains defined by Bloom's taxonomy, and given the students' overall competence at a satisfactory rather than a strong level, a definite need is established to target improving students' overall higher order thinking skills. Annual use of the CCTST also will allow UNTHSC to further define and track the higher order thinking skills of its incoming students.

Based on the baseline data and with the intention of allowing sufficient time for students and faculty to acquire knowledge and competence related to developing and teaching higher order thinking skills, the following benchmark was set: 80% of the students in the redesigned QEP courses will show a 10% increase on the post-test Evaluation scale scores of the CCTST compared to their baseline scores by 2013. The pre- and post-test schedules for all QEP courses are defined in the UNTHSC HOT Program Implementation Plan (provided as Table 3 of the Response to the Visiting Committee Report). It is important to note that the year 2013 was

selected as the target benchmark date based on the fact that all courses selected for initial implementation of the HOT program will be completed by that time. The CCTST will be administered to subsequent classes on an ongoing basis.

California Critical Thinking Disposition Inventory

Measure

The California Critical Thinking Disposition Inventory (CCTDI) is a standardized instrument designed to measure students' overall disposition to use higher order thinking as an approach to analyzing and resolving high-stake or time-limited problem situations. The CCTDI is composed of eight scores, including an overall test score and seven scaled scores: Truthseeking, Open-mindedness, Analyticity, Systematicity, Critical Thinking Self Confidence, Inquisitiveness, and Maturity of Judgment. The overall CCTDI score reveals the student's general attitudes and attributes associated with critical thinking. Individual scale scores indicate the student's attitudes and attributes related to each critical thinking element.

The CCTDI was selected for use with UNTHSC students because of its focus on measuring students' disposition toward critical thinking and because of available studies demonstrating effective use of the instrument in health sciences education. For example, Ozturk, Muslu, & Dicle, (2008) used the CCTDI to effectively measure the critical thinking disposition of nursing students in a practice-based learning environment as compared to a traditionally modeled curriculum. Facione, Facione, & Sanchez (1994) also administered the CCTDI within a nursing education environment and found that the CCTDI scores were directly associated with scores on a measure of critical thinking skills. Thus, UNTHSC selected the CCTDI to help define its current student population in terms of students' disposition toward using higher order thinking. Below or average scores on the overall or individual CCTDI scales would indicate a need to improve students' disposition toward using higher order thinking.

Implementation and Benchmark

The CCTDI was administered in the fall of 2009 and again in the spring of 2010 to establish baseline criteria for setting a benchmark. The pre- and post-tests were given to all students who participated in the 10 QEP courses in all four schools at the start and end of each course via the Insight Assessment online testing system. Exceptions included students enrolled in MEDE 7410, 7314, 7421 and MPAS 5241 who were assessed in courses MEDE 7320 and MPAS 5242 as a culmination of the preceding courses. Comparative results are illustrated in Table 2 for matched pairs of the same students (N=129).

From the baseline data collected in fall 2009, the students' overall mean score of 311.97 fell in the range of 240–350, which was indicative of expressing inconsistent attitudes toward higher order thinking. This initial overall score supported UNTHSC's identification of higher order thinking as the primary focus of the QEP.

**Table 2. California Critical Thinking Disposition Inventory
Overall and Pre- and Post-Test Scale Scores for Matched Pair Students
2009–2010 (N=129)**

Scale	Pre	Post
Truthseeking		
Mean	38.67	39.34
SD	5.62	5.78
Open-mindedness		
Mean	43.59	43.22
SD	5.33	5.75
Analyticity		
Mean	46.77	46.45
SD	4.80	4.98
Systematicity		
Mean	43.57	44.37
SD	6.10	6.11
Critical Thinking Confidence		
Mean	46.18	47.04
SD	5.46	5.96
Inquisitiveness	49.68	49.64
Mean	4.92	5.30
SD		
Cognitive Maturity		
Mean	43.81	44.33
SD	5.38	5.76
CCTDI Overall		
Mean	**311.97**	**314.44**
SD	**24.71**	**28.94**

NOTE: CCTDI Scale Score Ranges: Low 10–29, Ambivalent 30–40, Positive 40–50, High 50–60.

For the individual scales of the instrument, four score ranges are defined as follows: low (10–29), ambivalent (30–40), positive (40–50), and high (50–60). UNTHSC students scored in the positive range (mean scores of 40–50) in all scales except for Truthseeking, in which they achieved a mean score of 38.37. These results indicate that, while UNTHSC students showed a strong overall disposition for critical thinking, they need improvement in the particular area of

Truthseeking. Results obtained from the students' post-test showed a similar pattern as the pre-test. While the overall mean score of 314.44 indicated significant gain from the pre-test, it still suggested inconsistent attitudes toward higher order thinking. Further, the low mean score on the Truthseeking scale, 39.34, again validated Truthseeking as an area for improvement. Truthseeking identifies thinkers who are eager to seek the truth even if the results do not support one's own interest or preconceived opinions. Limitations in this area would negatively impact UNTHSC's goal of improving students' higher order thinking skills. Thus, integration of higher order thinking across the health sciences curricula is necessary to improve student attitudes and attributes associated with evaluating opposing opinions.

The CCTDI pre-test will be given to all students in each of the 10 QEP courses in August 2010. Post tests will be given to the same students in all four schools at the start and end of each course as defined in the UNTHSC HOT Program Implementation Plan (provided as Table 3 of the Response to the Visiting Committee Report). Exceptions include students enrolled in MEDE 7410, 7314, 7421 and MPAS 5241 who were assessed in courses MEDE 7320 and MPAS 5242 as a culmination of the preceding courses. As the CCTDI indicated a particular need for improvement in the area of Truthseeking, the following benchmark was established: 80% of the students in the redesigned QEP courses will show a 10% increase on the post-test Truthseeking scores of the CCTDI compared to their baseline scores by 2013. Further use of the CCTDI will allow UNTHSC to continually define and monitor its students' disposition toward critical thinking and to identify areas where heightened emphasis is required to improve students' disposition toward higher order thinking.

Student Higher Order Thinking Rubric

Measure

The Student Higher Order Thinking (HOT) Rubric (Appendix I) is a locally developed rubric for the purpose of evaluating students' higher order thinking skills in the following areas: application, analysis, evaluation, and creation. Mastery levels of higher order thinking skills are defined by cri falls below (*Emerging*), meets (*Developing*), or exceeds (*Accomplished*) identified expectations. The instrument was collaboratively designed and constructed by faculty members across all four UNTHSC schools with an interdisciplinary emphasis. The instrument is intended to serve either as a standalone instrument or one which can be appended to an existing rubric for a course. In either situation, the rubric will measure student mastery of higher order thinking skills. The rubric was constructed at the Annual QEP Retreat held in August 2010. QEP and non-QEP faculty will be testing the inter-rater reliability of the rubric to clarify its intended use and make minor revisions, if needed.

Implementation and Benchmark

The Student Higher Order Thinking (HOT) Rubric will be used in each of the 10 QEP courses to collect both formative and summative data regarding student mastery of higher order thinking skills. Baseline data will be collected with initial use of the instrument in 2010–2011, and an initial benchmark has been set, as follows: 100% of students in the QEP redesigned courses will be at the 'Developing' or 'Accomplished' level on the Student Higher Order Thinking Rubric in demonstrating HOT skills by 2015. A 20% increase each year is targeted to attain this goal, as defined in the UNTHSC HOT Program Implementation Plan (provided as Table 3 of the Response to the Visiting Committee Report). The benchmark set for incremental student success in demonstrating higher order thinking skills over a five-year span allows time for UNTHSC faculty to identify and implement instructional strategies and assessment techniques to improve students' higher order thinking skills. The timeframe allows for a gradual but

consistent integration of effective HOT program strategies and techniques into the health sciences curricula.

School Performance Exams

UNTHSC is composed of four schools, each of which has identified discipline-specific performance exams to measure student learning outcomes related to higher order thinking skills, as described below.

Texas College of Osteopathic Medicine

Measure

The Texas College of Osteopathic Medicine (TCOM) will use the first part of the Comprehensive Osteopathic Medical Licensing Examination (COMLEX I) to measure improvement in students' higher order thinking skills. The exam itself requires students to demonstrate history taking and physical examination skills, integrated differential diagnosis and clinical problem solving, written communication and synthesis of clinical findings, and osteopathic principles and/or osteopathic manipulative treatment. The Osteopathic Principles and Practices (OPP) section of the COMLEX I exam is directly related to TCOM's Osteopathic Manipulative Medicine (OMM) curriculum. The OMM courses, which are among the ten courses targeted for the HOT program, previously used a lecture-based format for a portion of the OMM curriculum but have been redesigned using an application-based curriculum that is in keeping with the educational philosophy of the HOT program.

Implementation and Benchmark

The COMLEX I is given to students at the conclusion of their second year, after completion of the MEDE 7320 course, by the National Board of Osteopathic Medical Examiners (NBOME). Aggregate results are received and compared to the national norm of graduate osteopathic medical student scores. Although UNTHSC students have historically achieved great success on the COMLEX I exam, the lowest scores have been in the OPP section of the test. In the

2009–2010 school year, UNTHSC students' mean score on the OPP portion of the exam was 502.41, which was below the national mean (502.52). As the OPP section is directly related to the previously lecture-based portion of the OMM courses of the TCOM curriculum, the redesign of these courses to an application-based curriculum is projected to increase the OPP scores. A benchmark is set for students taking the COMLEX I exam to demonstrate an overall 20-point increase in average student performance on the OPP portion of the exam over a five-year period up to 2015. A 4-point increase each year is targeted to attain this goal, as defined in the UNTHSC HOT Program Implementation Plan (provided as Table 3 of the Response to the Visiting Committee Report). Data will be collected and reviewed by school leaders and improvements and adjustments to the OMM curriculum will be made in areas of need, as identified by lower student scores.

Graduate School of Biomedical Sciences

Measure

The Graduate School of Biomedical Sciences course targeted for inclusion in the HOT program is the Integrative Biomedical Sciences IV: Physiology course (BMSC 5304). This course, which has traditionally been lecture-based, is being redesigned to use an application-based approach that is in keeping with the educational philosophy of the HOT program. The course has previously used four formative multiple choice exams to measure students' integrated knowledge of biomedical sciences in the following systems: nervous, cardiovascular, pulmonary and gastrointestinal, and renal. Another formative exam of the endocrine and reproductive system has now been added to allow for integration of the application-based approach into the curriculum. The five multiple choice exams are being retooled to assess students' higher order thinking skills with application-based questions.

Implementation and Benchmark

The current indicator of student mastery on the BMSC 5304 exams is a 70% pass rate, but as the curriculum and assessment measures are being revised to improve students' higher order thinking skills and better prepare students for medical school, a new benchmark has been established, as follows: 80% of students in the redesigned BMSC 5304 course will achieve an 80% pass rate on the five formative exams by 2013. The number of students achieving an 80% pass rate is targeted to increase by 20% each year to attain this goal, as defined in the UNTHSC HOT Program Implementation Plan (provided as Table 3 of the Response to the Visiting Committee Report). Results of students' scores will be used to identify areas within the course for further improvement.

School of Public Health

Measure

The School of Public Health (SPH) has chosen its Master of Health Administration (MHA) program for QEP intervention. The program consists of three core courses: Health Management Policy (HMAP 5300), Human Resource Management (HMAP 5328), and Strategic Management and Marketing (HMAP 5324). Curricular mapping was conducted to align the objectives of each of these courses with the competencies outlined by the National Center for Healthcare Leadership (NCHL). The HMAP curriculum is new, and a summative capstone project will be used to measure student knowledge within the curriculum. The capstone project is a newly created, collaboratively designed, problem-based exam being developed by the HMAP faculty and an SPH advisor. Project guidelines will be based on Bloom's taxonomy to facilitate measurement of students' knowledge, application, analysis, and evaluation skills within the health administration program. A rubric will be constructed to determine students' mastery level in each competency area as defined by criteria outlining unsatisfactory, satisfactory, and exemplary expectations. The rubric score will be averaged as part of the overall project score.

Implementation and Benchmark

The HMAP capstone project will be given at the end of the MHA program. As mentioned, this will be a newly created exam, with its first administration targeted for spring 2011. The targeted benchmark for the project is as follows: 100% of the MHA students enrolled in the three QEP-HMAP aligned courses will achieve an 80% pass rate on the Capstone exam by 2013. The number of students achieving an 80% pass rate is targeted to increase by 25% each year to attain this goal, as defined in the UNTHSC HOT Program Implementation Plan (provided as Table 3 of the Response to the Visiting Committee Report). The results will be used to provide feedback to individual students and to identify areas of concern for improving the curriculum and revising the assessment instrument.

School of Health Professions

Measure

The School of Health Professions is using a locally developed Objective Structured Clinical Examination (OSCE) at the conclusion of the Supervised Practice II (MPAS 5242) course. This exam measures student success in using higher order thinking skills to collect and analyze data in addressing medical and health problems or issues as they pertain to the role of the physician assistant in general clinical practice. The OSCE involves simulated clinical scenarios using standardized patients in which students are expected to perform specific clinical tasks within a predetermined time period. Evaluation criteria are based on course objectives and student learning activities, including a rubric designed to measure mastery in the specified area of concentration.

Implementation and Benchmark

The OSCE exam is administered at the conclusion of the MPAS 5242 course. The current indicator of student mastery is 70% success, but as the curriculum and assessment measures are being revised to improve students' higher order thinking skills, a new benchmark has been

established, as follows: 100% of students taking the OSCE competency exam in the MPAS 5242 course will achieve an 80% pass rate by 2015. The number of students achieving an 80% pass rate is targeted to increase by 20% each year to attain this goal, as defined in the UNTHSC HOT Program Implementation Plan (provided as Table 3 of the Response to the Visiting Committee Report). Results will be used to provide individual feedback to students and to identify areas for improvement in course design and assessment.

GOAL 2 ASSESSMENT INSTRUMENTS: MEASURES, IMPLEMENTATION, AND BENCHMARKS

Goal 2: Improve and evaluate faculty knowledge and practice in implementing instructional strategies and assessment tools that cultivate students' higher order thinking skills.

Faculty Outcomes: *1) Faculty will design and use curriculum and curricular materials employing instructional strategies that improve students' higher order thinking skills. 2) Faculty will design and use assessment tools that measure students' higher order thinking skills.*

Revised QEP Course Syllabi Rubric

Measure

UNTHSC faculty have developed syllabi for the ten targeted courses in the HOT program, and each syllabus is scheduled to be revised to include instructional strategies, technologies, and assessments that foster students' higher order thinking skills. The Revised QEP Course Syllabi Rubric (Appendix II) will be used to evaluate the redesigned syllabi in the areas of Course Description, Student Learning Outcomes, Assessment and Grading, Course Requirements, and Schedule.

Implementation and Benchmark

The goal is for all 10 QEP course syllabi to include higher order thinking teaching and assessment strategies by 2013. Thus, the following benchmark is set: 100% of the QEP faculty will reach the 'Meets' or 'Exceeds Expectations' 'level on the Revised QEP Course Syllabi Rubric in including higher order thinking elements into their syllabi by 2013. The implementation

timeline for each QEP course is shown in the UNTHSC HOT Program Implementation Plan (provided as Table 3 of the Response to the Visiting Committee Report). Faculty and school leaders will review the syllabi annually using the Revised QEP Course Syllabi Rubric to ensure that the benchmark is met. The Center for Learning and Development will offer faculty development activities to support QEP faculty and other interested faculty in their endeavor to incorporate higher order thinking instructional strategies and assessment techniques into their courses. School- and class-specific workshops also will be provided to help faculty tailor higher order thinking approaches to unique learning settings. In the process of syllabi revision, the QEP team will provide assistance as needed to help individual faculty members modify their course syllabi and integrate higher order thinking strategies into their courses.

QEP Faculty Survey

Measure

The QEP Faculty Survey (Appendix III) was created in collaboration with the UNTHSC Executive Committee, QEP team, School Directors, and teaching faculty. The institution developed the QEP Faculty Survey to evaluate faculty knowledge and practice in implementing instructional strategies that cultivate students' higher order thinking skills. In addition to establishing baseline data, the survey will be used to identify areas for improvement and corresponding faculty development opportunities.

The survey consists of seven multifaceted questions. The first question asks faculty to identify their academic area(s) of teaching or mentoring. Subsequent questions ask faculty to identify, on a Likert scale, the percentage of time they use particular instructional strategies, technologies, and assessment techniques. Definitions are provided for each of the listed instructional strategies, technologies, and assessment techniques to establish a common understanding for the purpose of completing the survey. The survey also asks faculty to rate, on a Likert scale, their perceived knowledge and confidence levels in teaching and assessing

students' higher order thinking skills. A definition of higher order thinking is provided for participants to gauge their knowledge and confidence levels. After piloting the faculty survey in the spring of 2010, a final question was added to ask faculty whether they had participated in, within the previous year, any faculty development activities on instructional strategies, technologies, or assessment techniques aimed at promoting students' higher order thinking.

Implementation and Benchmark

The QEP Faculty Survey is administered annually online for all UNTHSC faculty via a distinct URL provided by the UNTHSC Testing Services. The online format allows each participant to access and complete the survey at their leisure. Personal login information and each participant's name are also identified within the survey, as suggested by the Executive Committee. Responses to survey questions are collected via UNTHSC Testing Services. Results obtained from the survey are used to establish baseline data regarding faculty knowledge and practice in implementing instructional strategies that cultivate students' higher order thinking skills.

Baseline results from the spring 2010 launch revealed specific strategies, technologies, and assessment techniques that were currently used in academic settings by the participating UNTHSC faculty. Table 3 lists the top five strategies, technologies, and assessments that were reported by the faculty as being 'always' or 'often' used. Discussions, lecture, demonstrations, case-based scenarios, and problem-based learning were the most prevalent instructional strategies reported. PowerPoint, other unlisted technologies, demonstrations, overheads, and simulations were the top five instructional technologies being used. The most frequently used assessment techniques included examinations, feedback, presentations, projects, and review sessions. Among all the indicated areas of current use, the highest percent of use was reported as 77%, indicating room for growth in all instructional strategies, technologies, and assessment techniques intended to cultivate students' higher order thinking.

Table 3. Baseline Results for Faculty Survey Detailing Most Often Used Materials to Cultivate Students' Higher Order Thinking: Spring 2010 (N=122)

Materials	Mean	Percent Identified 'Always' or 'Often' Used
Instructional Strategies		
Discussion	3.9	71
Lecture	3.7	63
Demonstration	3.5	58
Case-based scenario	3.5	60
Problem-based learning	3.2	44
Instructional Technologies		
PowerPoint	4.1	77
Other[a]	2.3	29
Demonstration	2.2	18
Simulation	1.9	16
Overhead projector	2.1	14
Assessment Techniques		
Exam	3.8	71
Feedback	3.7	64
Presentation	3.5	60
Review session	3.0	48
Demonstration	3.1	41

[a] Responses marked 'Other' detail specific individual technologies used that were not included in the given set of materials.

The second portion of the survey revealed even lower percentages of faculty who were knowledgeable about and felt confident in using materials that supported higher order thinking. In terms of faculty knowledge related to higher order thinking, as shown in Table 4, among all the listed aspects of higher order thinking, the highest percentage of faculty (69%) reported being knowledgeable about 'higher order thinking skills.' The lowest reported knowledge was in the area of 'integrating instructional technologies with instructional strategies that support higher order thinking' (42%). Regarding their confidence in promoting higher order thinking, the highest level of confidence (68%) was reported in 'using instructional strategies that support higher order thinking.' Consistent with their level of knowledge in 'integrating instructional technologies

with instructional strategies that support higher order thinking,' respondents reported the lowest level of confidence in the same area (49%). With the generally low percentages in both knowledge about and confidence in using higher order thinking strategies, the survey results indicate a critical need to educate the faculty in various aspects of higher order thinking and how to promote higher order thinking skills through instructional strategies, technologies, and assessment techniques.

Table 4. Baseline Results for Faculty Survey Detailing Percentage of Knowledge and Confidence in Aspects of Higher Order Thinking: Spring 2010 (N=122)

Aspects of Higher Order Thinking (HOT)	% Agree or Strongly Agree	% Neutral	% Disagree or Strongly Disagree
Knowledge About			
Assessment tools that measure aspects of HOT	52	31	17
Bloom's taxonomy	52	25	23
HOT skills	69	19	12
Instructional strategies that support HOT	66	21	13
Instructional technologies that supplement HOT	47	32	21
Integrating instructional technologies with instructional strategies that support HOT	42	36	22
Confidence in Using			
Assessment tools that measure aspects of HOT	54	34	12
Instructional strategies that support HOT	68	25	7
Instructional technologies that supplement HOT	52	31	17
Integrating instructional technologies with instructional strategies that support HOT	49	34	17

Results from the QEP Faculty Survey will be used to guide the Center for Learning and Development's professional development offerings each year and to assist faculty in identifying techniques that can improve students' higher order thinking. The survey simultaneously serves as an ongoing, systematic data collection instrument and an educational tool for faculty development. In consideration of the baseline data, UNTHSC has established the following

benchmark: 100% of the QEP faculty will exhibit knowledge and application of at least two instructional strategies, technologies, and/or assessment techniques that improve students' higher order thinking skills by 2014. The timeline for identifying and implementing new instructional strategies, technologies, and/or assessment techniques is illustrated in the UNTHSC HOT Program Implementation Plan (provided as Table 3 of the Response to the Visiting Committee Report).

Individual Development and Educational Assessment Survey

Measure

The Individual Development and Educational Assessment (IDEA) Survey is a nationally normed assessment instrument aimed at providing feedback on teacher effectiveness in achieving designated teaching goals, including those pertaining to promoting students' higher order thinking. UNTHSC has decided to use the long format of the survey instead of the short form as the former captures more helpful information regarding the delivery and format of the participating courses. The long form asks students to respond to 43 predetermined questions. Twenty additional questions can be added by the instructor. However, these are optional and are not captured as part of the comparative analysis with the nationally normed set. Students rate instructors on their use of particular instructional strategies and methods, and course instructors identify the 'Essential' and 'Important' objectives of the course. Averages and percentages of student ratings are then reported for each of the identified 'Important' and 'Essential' objectives of the course. The IDEA Center provides the institution with a Summary Evaluation and customized reports according to instructors' identified objectives. Also reported are teaching methods and styles targeted toward stimulating student interest, fostering student collaboration, establishing rapport, encouraging student involvement, and structuring classroom experiences. Questions 23 and 31 specifically highlight students' higher order thinking skills. Suggested actions for improvement are also provided based on comparisons with ratings for

classes of similar size and level of student motivation on a national basis. Results from the IDEA Survey will allow UNTHSC to identify and implement instructional strategies, technologies, and assessment techniques that improve students' higher order thinking skills. Best practices among the QEP courses will be identified and shared with all UNTHSC teaching faculty in order to initiate implementation of effective HOT teaching strategies in other courses on campus.

Implementation and Benchmark

The IDEA Survey will be given to students at the end of each of the 10 QEP courses, and faculty will identify the 'Important' and 'Essential' course objectives for each course. As the QEP courses are offered at different times throughout the year for each school, a detailed implementation schedule has been developed and is shown in the UNTHSC HOT Program Implementation Plan (provided as Table 3 of the Response to the Visiting Committee Report). Completed survey forms will be collected by school deans and given to the QEP Assessment Specialist, who will send the forms to the IDEA Center to have them scored and returned. Results will be reviewed with deans and faculty of each school, with a focus on those questions pertaining to higher order thinking. A collaborative benchmark is set for 100% of the QEP faculty to identify higher order thinking as one of their 'Important' or 'Essential' objectives by 2014. Results from the IDEA survey also will be used to guide improvement in teaching strategies.

Center for Learning and Development Participation Statistics

Measure

The Center for Learning and Development offers professional development activities for all UNTHSC faculty, staff, and students throughout the year. In support of the HOT program, the Center will provide professional development activities focused on instructional strategies, technologies, and assessment techniques that improve students' higher order thinking skills. As indicated on the Center's workshop participation sign-in sheet (Appendix IV), the Center collects data on participants' school representation, title, and contact information to provide ongoing

measures of usage, topic coverage, and duration of the Center's services. These data, along with feedback from the QEP Faculty Survey, will be used to identify areas for improvement and to adjust professional development offerings to address faculty needs related to improving students' higher order thinking skills.

Implementation and Benchmark

Aggregate data is reported quarterly to provide insights and updates to stakeholders and to guide the Center in offering services to better meet UNTHSC's faculty development needs. Participant evaluations also are distributed at the conclusion of each faculty development session to determine workshop efficacy and appropriateness to faculty needs. Qualitative feedback concerning future sessions is also solicited. In support of the HOT program, UNTHSC has established the following benchmark: 50% of all UNTHSC classroom teaching faculty will have participated in professional development activities targeting HOT techniques by 2015. A 10% annual increase over a five-year period is targeted to achieve this goal based on the anticipated volume, depth, and frequency of HOT-focused professional development offerings and incentives provided for school and individual participation.

Faculty Higher Order Thinking Rubric

Measure

The Faculty Higher Order Thinking (HOT) Rubric (Appendix V) is designed to measure the level of faculty expertise in demonstrating higher order thinking strategies through teaching. Based on peer observation, the rubric measures the following areas: application, analysis, evaluation, and creation. Mastery levels of higher order thinking skills are defined by criteria outlining whether the faculty member falls below (*Emerging*), meets (*Developing*), or exceeds (*Accomplished*) identified expectations. The instrument was collaboratively designed and developed by faculty members across all four schools with an interdisciplinary emphasis. The rubric was constructed

at the Annual QEP Retreat held in August 2010. QEP and non-QEP faculty will be testing the inter-rater reliability of the rubric to clarify its intended use and make minor revisions, if needed.

Implementation and Benchmark

The Faculty HOT Rubric will be used in each of the 10 QEP courses to collect both formative and summative data regarding faculty mastery related to teaching and assessing higher order thinking skills. Baseline data will be collected with initial use of the instrument in 2010–2011, and an initial benchmark has been set, as follows: 100% of the QEP faculty will be at the 'Developing' or 'Accomplished' level on the Faculty HOT Rubric in demonstrating higher order thinking strategies by 2015. A 20% increase each year is targeted to attain this goal, as shown in the UNTHSC HOT Program Implementation Plan (provided as Table 3 of the Response to the Visiting Committee Report). The five-year incremental span allows time for QEP faculty to identify and practice higher order thinking strategies and techniques tailored to specific educational settings. The Faculty HOT Rubric also allows faculty to provide feedback to one another with respect to the integration of instructional strategies, technologies, and assessment techniques that promote higher order thinking. Based on peer evaluation outcomes, faculty will revise course delivery, design, and/or implementation strategies and techniques as needed.

References

Facione, NC, P.A. Facione, and C.A. Sanchez. 1994. Critical thinking disposition as a measure of competent clinical judgment: the development of the California Critical Thinking Disposition Inventory. Journal of *Nursing Education*, 33(8):345-50.

Krathwohl, D.R. 2002. A revision of Bloom's taxonomy. An overview. *Theory into Practice* 41 (4): 212-218.

Lewis, A. and D. Smith. 1993. Defining higher order thinking. *Theory into Practice* 32 (3): 131-137.

McCall, K.L., E.J. MacLaughlin, D.S. Fike, and B. Ruiz. 2007. Preadmission predictors of PharmD graduates' performance on the NAPLEX. *American Journal of Pharmacy Education*, 15;71(1):5

Ozturk, C., G.K. Muslu, and A. Dicle. 2008. A comparison of problem-based and traditional education on nursing students' critical thinking dispositions. *Nurse Education Today*. 28(5):627-32.

Williams, K.B., C, Schmidt, T.S. Tilliss, K. Wilkins, and D.R. Glasnapp 2006. Predictive validity of critical thinking skills and disposition for the national board dental hygiene examination: a preliminary investigation. *Journal of Dental Education*, 70(5):536-44.

Appendix I. Student Higher Order Thinking (HOT) Rubric

QEP Focus Statement: The focus of the UNTHSC QEP is to improve students' Higher Order Thinking (HOT) skills across the health sciences curricula through faculty development in curricular delivery methods and course redesign.

			Ranking		
Bloom's Category	**Activity/Outcome**	**Criteria**	**1 Emerging**	**2 Developing**	**3 Accomplished**
Apply	Prepare a differential diagnosis or hypothesis	• Knowledge of background and current information • Request of appropriate tests • Interpretation of results	Conducts inappropriate tests, misinterprets results, and incorrectly identifies diagnosis or hypothesis	Either conducts inappropriate tests or misinterprets results, but correctly identifies diagnosis or hypothesis	Orders appropriate tests, correctly interprets results, and identifies correct diagnosis or hypothesis
Analyze	Critique the effectiveness of different treatments	• Knowledge of treatment options • Differentiation of treatment options • Outcomes necessary to achieve an effective result	Conducts treatment achieving none of the following results: • reduction of adverse condition • improvement from previous visit/session • positive change in adverse symptoms • positive change in lifestyle alteration • compliance with treatment	Conducts treatment achieving some of the following results: • reduction of adverse condition • improvement from previous visit/session • positive change in adverse symptoms • positive change in lifestyle alteration • compliance with treatment	Conducts treatment achieving all of the following results: • reduction of adverse condition • improvement from previous visit/session • positive change in adverse symptoms • positive change in lifestyle alteration • compliance with treatment

Evaluate	Compare and contrast normal from abnormal in a case scenario.	• Identification of appropriate problem according to diagnostic criteria • Understanding of distinct elements that characterize 'normal' • Ability to quantify and qualify abnormality and degrees of abnormality • Articulation or demonstration of similarities and differences	Is able to identify the difference/s between a normal and abnormal condition, but unable to explain why.	Is able to define what is normal and identify the differences of an abnormal condition.	Is able to distinguish between a normal and abnormal condition by explaining or demonstrating similarities and differences.
Create	Create a plan.	Explanation of essential plan components: • Knowledgebase • Purpose/need • Goal • Objectives • Process • Outcome measures	Plan lacks two or more essential components.	Plan lacks a single essential component, but is documented or explained in a manner that is appropriately aligned with the goal. Objectives are somewhat attainable and process is sequenced in a logical fashion.	Plan includes all essential components, and is documented or explained in a manner that is appropriately aligned with the goal. Objectives are attainable and process is sequenced in a logical fashion.

Appendix II. Revised QEP Course Syllabi Rubric

QEP Focus Statement: The focus of the UNTHSC QEP is to improve students' Higher Order Thinking (HOT) skills across the health sciences curricula through faculty development in curricular delivery methods and course redesign.

Element	Exceeds Expectations	Meets Expectations	Does Not Meet Expectations
Course description	Describes course's major areas of inquiry. Outlines key concepts, topics, and/or skills to be covered. Provides context for learning and rationale for course. Indicates course's role in department/degree curriculum.	Provides context for learning and rationale for course. Outlines key concepts, topics, and/or skills to be covered. Indicates course's role in department/degree curriculum.	Describes topics to be covered. Does not describe major skills or concepts. Does not link course to competencies or overarching goals.
Student learning outcomes	Are measurable and/or observable. Progress toward more ambitious and rigorous higher order thinking skills. Are anchored by verbs describing what the student will do to provide evidence of mastery. Are grounded in departmental and/or school-wide competencies.	Are measurable and/or observable. Describe desired behaviors that students will perform to demonstrate skill/concept mastery in the course. Involve cognitive challenge and higher-order thinking skills.	Are not measurable or observable. Do not describe behaviors that students will perform in order to demonstrate higher order thinking. May describe content to be covered rather than student learning outcomes.
Assessment and grading policy	Thoroughly describes each assignment. Describes grading policy and philosophy clearly and concretely. Expectations for all forms of assessment (e.g., assignments, exams, group projects, etc.) are clear.	Describes all assignments. Grading policy is defined, and point's distribution is explained.	Assessments are not defined. Grading policy is either not explained or is defined in vague terms.
Course requirements	Clearly and thoroughly outlines requirements for success in course. Specifically and concretely describes all expectations for academic and social behavior. Details policies related to lateness, attendance, group work, citations, etc.	Clearly outlines expectations related to class participation, group work, assignments, etc. Defines policies related to lateness, attendance, group work, citations, etc.	Describes expectations in general terms (e.g., "You should come to class prepared"). Does not specify course policies.
Course schedule	Lists learning objective(s) for each week in addition to topics. Cites related readings, both required and supplementary, for each week and any relevant assignments due.	Lists topics and learning objectives to be covered each week. Identifies required readings and any relevant assignments due.	May list topics to be covered but does not specify a schedule for learning.

Adapted from Columbia University, (2006). Mailman School of Public Health: Syllabus rubric. Retrieved from http://www.mailman.columbia.edu/faculty-staff/enhancing-teaching/syllabus-toolkit

Appendix III. QEP Faculty Survey

Name: _____ School: _____

The purpose of this survey is to evaluate faculty knowledge and skill in using instructional strategies, assessment techniques and instructional technologies that cultivate students' higher order thinking skills. Dissemination and collection will occur annually for all faculty. Results will be included in the SACS-COC QEP 5-year report and as part of the UNTHSC Assessment report.

1. Throughout the year, indicate the percentage of time spent (totaling 100%) in each area that you teach/mentor:
    a. Classroom *(blank text box)*
    b. Clinical *(blank text box)*
    c. Online *(blank text box)*
    d. Research *(blank text box)*

Glossary of Instructional Strategies

Please consider the following glossary terms when responding the questions regarding instructional strategies.

Case-based scenarios:

Instructional design model where students consider realistic scenarios from a perspective which requires analysis.

Concept mapping:

Graphical tools for organizing and representing knowledge typically illustrated using diagrams to show the relationships among concepts.

Cooperative learning groups:

Groups of students working together in groups with their peers to accomplish a common goal.

Debates:

A formal discussion about the pros and cons of an issue.

Demonstration:

Visual displays/presentations of something.

Discussion:

Consideration of a subject by a group through conversation.

Journal writing:

The process of using structured exercises for students to write educational experiences.

Lecture:

An exposition of a given subject delivered before an audience/class for the purpose of instruction.

Meta-cognition:

Teaching students how to plan, monitor, and repair their own comprehension.

Problem-based learning:

An instructional strategy in which students collaboratively solve problems and reflect on their experiences.

Reflection:

Teaching students to reflect critically on one's experience, integrate knowledge gained from experience with knowledge possessed, and take action on insights.

Scaffolding:

Teaching students by defining parameters, rules, or suggestions for given learning situations.

Simulations:

Artificial replication of components of a real-world situation to achieve specific goals.

2. Overall, do you currently use the following **instructional strategies**?

Topic	*Always* 76-100%	*Often* 51-75%	*Sometimes* 26-50%	*Seldom* 1-25%	*Never* 0%
Case-based scenarios					
Concept mapping					
Cooperative learning groups					
Debates					
Demonstration					
Discussion					
Journal writing					
Lecture					
Meta-cognition					
Problem-based learning					
Reflection					
Simulations					
Scaffolding					
Other –please specify:					

Glossary of Instructional Technologies

Please consider the following glossary terms when responding the questions regarding instructional technologies.

AMX: *Automated touch screens, control panel for computers*

Blackboard Learning Management System: *A software package that enables the management and delivery of learning content and resources to students via the internet.*

Blog: *A website that allows users to reflect, share opinions, and discuss various topics in the form of an online journal, and permits readers to comment on posts.*

Demonstration videos: *Videos presenting visual displays of something.*

Document camera: *A projection device that has higher resolution than an overhead projector and allows the user to project text, photos or three-dimensional objects on a screen in the classroom.*

iClicker polling: *Handheld response systems that enable students to use a remote control or "clicker" to answer questions posed by their professors. They can also be used by an instructor to obtain real-time feedback on student comprehension.*

Interactive whiteboard: *A whiteboard that provides touch control of computer applications and annotation over standard Microsoft Windows applications.*

Knowledge base: *An organized, online repository of knowledge consisting of different topics created by content experts.*

Overhead projector: *A display device that projects images from transparencies onto a screen.*

Podcasts: *Music or talk programs made available in digital format for automatic download over the Internet to a personal digital device.*

PowerPoint: *A presentation software that allows the user to create slides, handouts, notes, and outlines.*

Simulations: *Technology-driven, artificial replication of components of a real-world situation to achieve specific goals.*

Statistical analysis software: *Computer software programs that are used for generating statistical analysis.*

Sympodium Digital Ink: *A software and digital pen that allows the user to highlight concepts and take notes using digital ink so that the audience sees the writing projected onto a large screen.*

TELEX Listening System: *An amplification system employing a teacher-worn microphone.*

Wikis: *Websites that allow the creation and editing of a number of interlinked web pages via a web browser.*

3. Overall, do you currently use the following **instructional technologies**?

Topic	*Always* 76-100%	*Often* 51-75%	*Sometimes* 26-50%	*Seldom* 1-25%	*Never* 0%	*Not Available*
AMX						
Blackboard Learning Management System						
Blog						
Demonstration Videos						
Document Camera						
iClicker Polling						
Interactive whiteboard						
Knowledgebase's						
Podcasts						
PowerPoint						
Simulations						
Statistical analysis software						
Sympodium Digital Ink						
TELEX Listening System						
Wikis						
Other –please specify:						

Glossary of Assessment Techniques

Please consider the following glossary terms when responding the questions regarding assessment techniques.

Demonstration: *Student-created visual displays of a concept, skill, or process.*

Examination: *A set of questions or exercises evaluating students' skill or knowledge.*

Feedback: *The return of information about the result of a process or activity; an evaluative response.*

Journal: *The process of using structured exercises for students to write about experiences where they can monitor their own performance and evaluate their progress and accomplishments.*

Knowledge survey: *A series of questions asked of the learner to determine a level of understanding about content. Used to gather baseline and/or summative student information.*

Portfolio: *A culmination of representative samples of each student's work.*

Presentation: *The act formally presenting something to make publicly available; presenting news or other information by speaking or printing it.*

Projects: *Formal assignments given to an individual student or a group of students on a topic related to the curriculum. It may involve both in-class and out-of-class research and development.*

Review sessions: *Sessions where concepts are discussed for further clarification and/or understanding.*

Rubric: *A scoring tool for subjective assessments, defined by a set of criteria and standards linked to learning objectives used to assess a student's performance on papers, projects, essays, and other assignments.*

Survey: *A gathering of a sample of data or opinions considered to be representative of a whole.*

4. Overall, do you currently use the following **assessment techniques**?

Topic	*Always* 76-100%	*Often* 51-75%	*Sometimes* 26-50%	*Seldom* 1-25%	*Never* 0%
Demonstration					
Examination					
Feedback					
Journal					
Knowledge Survey					
Portfolio					
Presentation					
Project					
Review Session					
Rubric					
Survey					
Other – please specify:					

Please rate how strongly you agree or disagree with each of the following statements. Use the following definition of Higher Order Thinking to best respond to the questions below.

Higher order thinking is the intellectually disciplined process that occurs when a person takes new information and information stored in memory; interrelates or rearranges and extends this information to achieve a purpose or find possible answers in non-routine situations.

5. I am knowledgeable about:

Topic	*Strongly Agree*	*Agree*	*Undecided*	*Disagree*	*Strongly Disagree*
Assessment tools that measure aspects of higher order thinking.					
Bloom's taxonomy.					
Higher Order (critical thinking) Skills					
Instructional strategies that support higher order thinking.					
Instructional technologies that supplement higher order thinking.					
Integrating instructional technologies with instructional strategies that support higher order thinking.					

6. I am confident in my ability to:

Topic	*Strongly Agree*	*Agree*	*Undecided*	*Disagree*	*Strongly Disagree*
Use instructional strategies that support higher order thinking.					
Use assessment tools that measure aspects of higher order thinking.					
Use instructional technologies that supplement higher order thinking.					
Integrate instructional technologies with instructional strategies that support higher order thinking.					

7. Have you participated in faculty development activities targeting Higher Order Thinking (HOT) relating to instructional strategies, technologies, or assessment techniques within the past year? (Y/N)

Appendix IV. Center for Learning and Development Workshop Participation Sign-In

Workshop Title: **Day:**
Presenter/s: **Duration:**
Location:

Participant Info:

First	Last	School	Student/Faculty	Email

Appendix V. Faculty Higher Order Thinking (HOT) Rubric

QEP Focus Statement: The focus of the UNTHSC QEP is to improve students' Higher Order Thinking (HOT) skills across the health sciences curricula through faculty development in curricular delivery methods and course redesign.

			Ranking		
Category	**Activity/Outcome**	**Criteria**	**1 Emerging**	**2 Developing**	**3 Accomplished**
Instructional Strategies	Demonstration of instructional strategies that support students' ability to improve higher order thinking skills.	• Apply • Analyze • Evaluate • Create	Instructor demonstrates an instructional strategy that does not align with the specified learning goal which supports students' ability to improve their higher order thinking skills Evidenced by:	Instructor demonstrates an appropriate instructional strategy that aligns with the specified learning goal which supports students' ability to improve their higher order thinking skills Evidenced by:	Instructor effectively demonstrates an appropriate instructional strategy that aligns with the specified learning goal which supports students' ability to improve their higher order thinking skills Evidenced by:

Instructional Technologies	Demonstration of instructional technologies that support students' ability to improve higher order thinking skills.	• Apply • Analyze • Evaluate • Create	Instructor demonstrates an instructional technology that does not align with the specified learning goal which supports students' ability to improve their higher order thinking skills Evidenced by:	Instructor demonstrates an appropriate instructional technology that aligns with the specified learning goal which supports students' ability to improve their higher order thinking skills Evidenced by:	Instructor effectively demonstrates an appropriate instructional technology that aligns with the specified learning goal which supports students' ability to improve their higher order thinking skills Evidenced by:
Assessment Techniques	Demonstration of assessment techniques that support students' ability to improve higher order thinking skills.	• Apply • Analyze • Evaluate • Create	Instructor demonstrates an assessment technique that does not align with the specified learning goal which supports students' ability to improve their higher order thinking skills Evidenced by:	Instructor demonstrates an appropriate assessment technique that aligns with the specified learning goal which supports students' ability to improve their higher order thinking skills Evidenced by:	Instructor effectively demonstrates an appropriate assessment technique that aligns with the specified learning goal which supports students' ability to improve their higher order thinking skills Evidenced by: