



Validation Study III: Alignment of the Texas College and Career Readiness Standards with Courses in Two Career Pathways

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Prepared by:

The Educational Policy Improvement Center

Principal Investigator

David T. Conley, PhD

Primary Project Staff

Charis McGaughy, PhD

Derek Brown, MA

Adrienne van der Valk, MS

Brittney Young, MS

Executive Summary

This is the fourth report in a series of five reports resulting from the Texas College and Career Readiness Initiative (TCCRI) established by the Texas Higher Education Coordinating Board (THECB) under contract with the Educational Policy Improvement Center (EPIC). The purpose of the TCCRI is the Facilitation of the Development and Implementation of the College and Career Readiness Standards. The results of the TCCRI include the following:

- Texas College and Career Readiness Standards
- Validation Study I: Alignment of Texas College and Career Readiness Standards with Entry-Level General Education Courses at Texas Postsecondary Institutions
- Validation Study II: Alignment of Texas College and Career Readiness Standards with Entry-Level Career and Technical Education College Courses at Texas Postsecondary Institutions
- **Validation Study III: Alignment of Texas College and Career Readiness Standards with Courses in Two Career Pathways**
- Texas College Readiness Assignments

Texas College and Career Readiness Standards. In 2007, EPIC facilitated the development of the Texas College and Career Readiness Standards (CCRS) in partnership with the THECB and the Texas Education Agency (TEA). Vertical teams of secondary and postsecondary faculty representing all regions of the state engaged in the development process. These standards were adopted by the THECB in January 2008 and approved by the Commissioner of Education later that year. Subsequently, the State Board of Education (SBOE) incorporated the CCRS into the secondary Texas Essential Knowledge and Skills (TEKS), Texas public school curriculum. Under the leadership of TEA, reconstituted vertical teams of secondary and postsecondary faculty assisted TEA and the SBOE in conducting an alignment analysis of the newly adopted CCRS and the secondary TEKS.

Similar to the TEKS alignment analysis, three validation studies conducted by EPIC compared the CCRS with general education and career and technical education college courses to establish the validity of the CCRS as an accurate representation of the key knowledge and skills necessary for college and career readiness and success. The results of each of the validation studies affirm the accuracy of elements of the CCRS and identify areas where additions, deletions, or modifications to the standards should be considered.

Validation Study III: Alignment of Texas College and Career Readiness

Standards with Courses in Two Career Pathways. The analysis in Validation Study III builds upon two previous studies exploring the relationship between the CCRS and current practice in postsecondary education in Texas. The first, *Validation Study I: Alignment of the Texas College and Career Readiness Standards and Entry-Level General Education Courses at Texas Postsecondary Institutions* (October, 2008; herein referred to as Validation Study I), reported the results of an alignment analysis between the CCRS and what is taught in entry-level general education college courses in Texas postsecondary institutions. The second, *Validation Study II: Alignment of Texas College and Career Readiness Standards with Entry-Level Career and Technical Education Courses at Texas Postsecondary Institutions* (March, 2009; herein referred to as the Validation Study II), reported the results of an alignment analysis conducted to determine the relationship between the CCRS cross-disciplinary standards and the content taught within a representative range of entry-level CTE courses offered at Texas postsecondary institutions.

This study replicates the methodology employed by the two previous efforts. It analyzes the alignment between all of the CCRS (English, mathematics, science, social studies, and cross-disciplinary standards) and two specific CTE course pathways – nursing and computer programming. In particular, this study analyzed the CCRS in relation to the level of preparation necessary for entire CTE career pathways beyond entry-level courses in all five CCRS subject areas.

To determine alignment, faculty members who teach courses typically included in nursing and computer programming pathways at two-year institutions of higher education (IHE) in Texas were invited to participate by completing an online rating exercise in which they described the importance of each of the CCRS to their course. Between August and October of 2009, 115 CTE course instructors representing 22 courses in two course pathways at 27 different postsecondary institutions throughout Texas submitted ratings about the importance of the CCRS in relation to their course(s), resulting in 138 course submissions.

For this study, a standard is considered aligned if one of two criteria is met: 1) the instructors from at least one course within the pathway most frequently reported (modal response) that the standard was *most necessary* or *more necessary* in preparing students to succeed in the course; or 2) the instructors from at least one course within the pathway most frequently selected (modal response) the rationale statement that the standard is: *required, not covered in course; reviewed only, not re-taught; or introduced as new material*. Overall, a standard is considered aligned to a pathway if a standard is considered necessary or is taught in at least one course and that course is necessary for successful completion of a pathway.

The results of the faculty ratings indicate that the CCRS are considered to be 100 percent “necessary” or “taught” in at least one course in all subject areas (English, mathematics, social studies, and cross-disciplinary standards), except for 87 percent of the science standards. Stated another way, every CCRS except for 13 percent in science are either necessary for successful preparation or included in at least one course within these two common CTE pathways. The findings offer empirical evidence from current practice that the CCRS are a valid representation of career readiness as indicated by the percentage of alignment between the CCRS and the knowledge students are expected to know or will learn as they progress down common career pathways.

The findings are consistent with the results of the previous two validation studies comparing the CCRS to postsecondary expectations in Texas institutions of higher education. Secondary institutions can use the alignment results to create integrated CTE courses aligned with current postsecondary expectations and practice. Postsecondary institutions can use this information to conduct self-studies of content included in course pathways and to increase consistency between the pathways offered at different institutions. Statewide, this study is a continuing step toward deeper understanding of the knowledge and skills needed for success in select two-year CTE programs.

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Background

In May 2006, the 79th Texas Legislature (Third Called Session) passed House Bill 1, a major piece of legislation that included multiple initiatives related to high school success and college and career readiness. This legislation added Section 28.008, entitled “Advancement of College Readiness in Curriculum,” to Chapter 28 of the Texas Education Code. Its goal was to increase the number of students who graduate from Texas high school ready to succeed in college and 21st century careers.

In response to elements of this legislation, the Texas Higher Education Coordinating Board issued a Request for Proposals for the Facilitation of the Development and Implementation of College and Career Readiness Standards (CCRS). The Educational Policy Improvement Center (EPIC) was awarded a four year contract for the project. as part of the Texas College and Career Readiness Initiative (TCCRI). The purpose of the TCCRI is to develop and implement college and career readiness standards and related initiatives to improve alignment between secondary and postsecondary education, resulting in an increased number of students prepared for college and career success.

The TCCRI represents a significant advancement in the field of college and career readiness. No other state has undertaken such a comprehensive approach to identifying, validating, and implementing the knowledge and skills necessary for college success. For the first time, what is being taught in entry-level career and technical education (CTE) courses is systematically analyzed through a representative sample of coursework from two-year postsecondary institutions throughout the state. The findings from this research will enable high school faculty to determine the degree to which what they are teaching is aligned with the knowledge and skills necessary for college success. Furthermore, both high school and postsecondary faculty teaching entry-level CTE courses will have a concrete benchmark against which they can compare the challenge levels of their courses.

Texas College and Career Readiness Initiative Overview

Under the TCCRI, EPIC facilitated the vertical team process to create the CCRS. In addition, EPIC conducted several studies and produced study findings and recommendations for the THECB to ensure policymakers receive appropriate information to support and further the college and career readiness agenda in Texas. Included in the outcomes were the following:

Texas College and Career Readiness Standards

Under the leadership of Coordinating Board and Texas Education Agency staff, EPIC facilitated the development of the Texas College and Career Readiness Standards (CCRS).

Development: In March 2007, vertical teams (VTs) were formed to develop college and career readiness standards specifying the knowledge and skills necessary to succeed in entry-level courses (i.e., non-remedial, general education courses into which entering freshmen are typically placed) at Texas institutions of higher education. The VTs were comprised of secondary and postsecondary instructors in four subject areas: English/language arts, mathematics, science, and social studies. The teams met four times between March and October 2007 and completed interim online homework assignments independently to reach agreement on the CCRS.

Public Comment: On October 25, 2007, the THECB made the draft standards available for public comment. This six-week public comment period drew feedback from over 1,200 Texas residents, representing students, parents, faculty, and administrators from secondary and postsecondary institutions, and the general public. Following the public comment period, the VTs reconvened to discuss and incorporate the comments and modified the standards accordingly before submitting the final draft in January 2008 to the THECB.

Approval: The THECB adopted the Texas CCRS in January 2008 and were approved by the Commissioner of Education later that year. Subsequently, the State Board of Education (SBOE) incorporated the CCRS into the secondary Texas Essential Knowledge and Skills (TEKS), Texas public school curriculum.

Availability: The final report entitled “Texas College and Career Readiness Standards” is available online at:
<http://www.thecb.state.tx.us/collegereadiness/TCRS.cfm>

Organization: The CCRS, which cover four content areas (English/language arts, mathematics, science, and social studies) as well as cross-disciplinary skills, are arranged in four nested levels. The THECB adopted the first three levels; the fourth level includes Performance Indicators intended to serve only as examples. The CCRS are organized into the following outline format:

I. Key Content – overarching or keystone ideas of a discipline that reverberate as themes throughout the curriculum. Example: *II. Algebraic Reasoning*

A. Organizing Component – knowledge and subject areas that organize a discipline around what students should retain, be able to transfer, and apply to new knowledge and skills. Example: *C. Solving equations, inequalities, and systems of equations.*

1. Performance Expectation – knowledge and skills that represent the important ideas of the current understanding of each organizing component as well as the multiple contexts in which each organizing component can be manifest. Example: *1. Recognize and use algebraic (field) properties, concepts, procedures, and algorithms to solve equations, inequalities, and systems of linear equations.*

a. Performance Indicator – examples of how to assess and measure performance expectations. This is not intended to be an exhaustive list. Example: *a. Solve equations and inequalities in one variable (e.g., numerical solutions, including those involving absolute value, radical, rational, exponential, and logarithmic).*

Validation Study I: Alignment of the Texas College and Career Readiness Standards with Entry-Level General Education Courses at Texas Postsecondary Institutions

This study explored the degree of consistency between the CCRS and current practices in entry-level general education courses in Texas. The study established whether and to what degree the CCRS are a valid representation of the knowledge and skills necessary to be ready to succeed in general education courses at Texas postsecondary institutions. The data collection efforts generated a statewide sample of entry-level course documents and materials submitted by higher education faculty. Design teams analyzed this data, resulting in the creation of Reference Course Profiles representing a snapshot of current practice in entry-level courses in Texas. The key elements of the study included:

Data Collection: The Coordinating Board selected 20 entry-level general education courses to include in the study. College Readiness Special Advisors, selected to serve as liaisons between the THECB and the advisors' postsecondary institutions, consulted department heads at their postsecondary institutions to obtain nominations of entry-level college courses that best represented their institutions and the CCRS. Instructors of the courses nominated for inclusion in the study completed the course submission process using a secure website to complete a course profile, upload a course syllabus, and compare the CCRS to the knowledge and skills necessary to succeed in the course. Overall, EPIC collected 960 course submissions, including 913 syllabi and 47 partial submissions, from 813 instructors of entry-level courses to determine how the CCRS compare with actual practice in entry-level college courses in Texas.

Results: Results from the analysis indicate that the CCRS are highly aligned with entry-level college courses in Texas. Rates of alignment by subject area for all standards were 99 percent in social studies, 97 percent in English/language arts, 87 percent in mathematics, and 86 percent in science. For the cross-disciplinary standards, 100 percent are aligned across the four subject areas (90 percent are aligned within each of the four subject areas individually). Whereas all of the CCRS may not be aligned in any single course, an examination across all courses within a given subject area reveals the high degree of alignment between the CCRS and all entry-level courses in that subject.

The other result from this study was the creation of 18 Reference Course Profiles (RCP). The RCP are composite courses designed to represent the content and rigor of what is typically being taught currently in entry-level college courses. They provide a snapshot of current practice and are not intended to represent best practice. A profile includes a course syllabus (with significant detail including course policies, student resources, and CCRS alignment) along with attendant course materials, such as assignments, assessments, and scoring rubrics. The purposes of the RCP are two-fold. At the secondary level, instructors can refer to the materials as they prepare their students for the course content they will encounter when they reach college. At the postsecondary level, the materials serve as a point of comparison that faculty can use when creating or refining entry-level courses. Whereas the use of the RCP is purely voluntary, the goal for institutions of higher education is to ensure that entry-level courses are aligned with the CCRS, contain college-level content, and are cognitively challenging. By making expectations more transparent, the RCP will help students, educators, and policymakers understand more clearly and reach agreement more quickly on the nature of the student preparation necessary for college success.

Validation Study II: Alignment of the Texas College and Career Readiness Standards with Entry-Level Career and Technical Education College Courses at Texas Postsecondary Institutions

This study replicated Validation Study I by exploring the relationship between the CCRS cross-disciplinary standards and Career and Technical Education (CTE) courses to establish the validity of the standards as an accurate representation of the key knowledge and skills necessary for college and career readiness and success. The key elements of the study included:

Data Collection: The Coordinating Board selected nine CTE courses to include in the study. College Readiness Special Advisors consulted department heads at their postsecondary institutions to obtain nominations for CTE courses that best represented their institutions and the CCRS. Instructors of CTE courses nominated for inclusion in the study completed the course submission process using a secure website to complete a course profile, upload a course syllabus, and compare the CCRS cross-disciplinary standards to the knowledge and skills necessary to succeed in the course. Overall, EPIC collected 157 course submissions representing the nine CTE courses from 136 CTE instructors to determine how the CCRS compare with actual practices in CTE courses in Texas and to ascertain the common components of entry-level courses that are well aligned with the CCRS cross-disciplinary standards and highly representative of common practice.

Results: Overall, the findings from this study indicate that every CCRS cross-disciplinary standard is aligned with at least one of the nine CTE courses analyzed. The level of alignment (including standards deemed either necessary for preparation or covered in the course) between the full set of cross-disciplinary standards and the nine CTE course titles analyzed ranged from 100 percent to 66 percent. While the level of alignment of the cross-disciplinary CCRS and any single course included varies, an examination across all CTE courses studied reveals high alignment between the cross-disciplinary skills across a range of typical entry-level CTE coursework.

The other result from this study was the creation of 7 CTE Reference Course Profiles. The CTE Reference Course Profiles created as a result of Validation Study II are intended for the same purposes described in the overview of Validation Study I, above.

Validation Study III: Alignment of the Texas College and Career Readiness Standards with Courses in Two Career Pathways

This study analyzed the alignment between all of the CCRS (English, mathematics, science, social studies, and cross-disciplinary standards) and two specific CTE course pathways—nursing and computer programming. In particular, this study analyzed the CCRS in relation to the level of preparation necessary for entire CTE career pathways beyond entry-level courses in all five CCRS subject areas. The key elements of the study included:

Data Collections: The Coordinating Board selected the nursing and computer programming career pathways because of the high demand or high need for these career pathways. A set of 22 courses determined by the Texas Career Cluster Project to be typical of the courses required to earn an Associate of Arts degree in either nursing or computer programming were analyzed. A total of 115 CTE course instructors representing 22 courses in two course pathways at 27 postsecondary institutions throughout Texas submitted ratings about the importance of the all CCRS in relation to their course(s), resulting in 138 course submissions.

Results: The results of this study indicate that the CCRS are strongly related to what students are expected to know, or will learn how to do, in two common career pathways. The results of the faculty ratings indicate that the CCRS are considered to be “necessary” or “taught” at a rate of 100 percent in at least one course in all subject areas (English, mathematics, social studies, and cross-disciplinary standards), except for 87 percent of the science standards. Stated another way, every CCRS except 13 percent in science are either necessary for successful preparation or included in at least one course within these two common CTE pathways. The findings offer empirical evidence from current practice that the CCRS are a valid representation of career readiness, as indicated by the percentage of alignment between the CCRS and the knowledge students are expected to know or will learn as they progress through common career pathways. Rates of alignment were higher in nursing than in computer programming.

Study Overview

The scope of this study, **Validation Study III: Alignment of Texas College and Career Readiness Standards with Courses in Two Career Pathways**, consists of a single-phase alignment analysis designed to illuminate the relationship between the CCRS and two complete career and technical education (CTE) course pathways. The primary goal of this study is to establish the degree to which the CCRS align with the content of a representative range of CTE courses taught within the nursing and computer programming pathways at Texas postsecondary institutions.

A unique feature of this study is the inclusion of CCRS spanning *all* subject areas, including cross-disciplinary skills (cross-cutting knowledge, skills, and cognitive strategies that underlie and connect all subject areas). This is a departure from *Validation Study II: Alignment of Texas College and Career Readiness Standards with Entry-Level Career and Technical Education College Courses* (herein known as Validation Study II), which analyzed only the cross-disciplinary standards. All standards were included in the current study to get a comprehensive view of all of the knowledge and skills, across subject areas, that are necessary for success in the two most common CTE course pathways.

The CCRS are arranged in four nested levels. The THECB and Commissioner of Education adopted the first three levels of standards statements. The fourth level includes Performance Indicators representing examples of how the Performance Expectations might be assessed, and are only included in the CCRS appendix. This study analyzes the first three levels of the adopted standards. The CCRS are organized as follows (using mathematics standards as an example):

I. Key Content – keystone ideas of a discipline that reverberate as themes throughout the curriculum. Example: *I. Numeric Reasoning*

A. Organizing Component – knowledge and subject areas that organize a discipline around what students should retain, be able to transfer, and apply to new knowledge and skills. Example: *A. Numeric representation*

1. Performance Expectation – knowledge and skills that represent important ideas of the current understanding of each organizing concept as well as the multiple contexts in which each organizing concept can be manifested. Example: *1. Compare real numbers.*

a. Performance Indicator – examples of how to assess and measure performance expectations. This is not intended to be an exhaustive list. Example: *a. Classify numbers as natural, whole, integers, rational, irrational, real, imaginary, and/or complex.*

Study Purpose and Design

This study was designed to answer the following question:

How do the standards compare to what is currently taught in two-year nursing and computer programming course pathways at Texas institutions of higher education?

This question was addressed by replicating the research design from two prior studies: Validation Study I which analyzed and reported on the relationship between the CCRS and entry-level general education courses and Validation Study II which analyzed and reported the relationship between the CCRS and nine entry-level CTE courses offered in Texas institutions of higher education. The alignment study methodology for this study included working with College Readiness Special Advisors to nominate instructors within the nursing and computer programming pathways to participate in the study, developing an online document collection and self-ratings tool, collecting course syllabi and instructor self-ratings for the level of necessity of each CCRS for preparation for the course, providing quality control and technical assistance for all participants, and using the results to analyze and report on the level of alignment between the CCRS and the 22 CTE courses typically included within the two pathways.

There are two key differences between Validation Study I and this study. First, Validation Study I examined entry-level general education courses in English/Language Arts (ELA), mathematics, science, and social studies, subjects explicitly addressed by the content standards of the CCRS. This study examines a representative range of CTE courses typical of nursing and computer programming pathways in Texas institutions of higher education, only some of which are entry-level.

Second, Validation Study I examined the relationship between specific subject area standards and the related entry-level courses (for example, the ELA standards were analyzed against entry-level composition and literature courses). This study compares representative courses within both pathways to the standards, including cross-disciplinary standards, in all subject areas.

There are also two key differences between Validation Study II and this study. First, Validation Study II examined nine different entry-level course titles that enrolled significant numbers of entry-level CTE students statewide. Validation Study III looked instead at courses determined to be typically required for nursing and computer programming two-year degrees by the Texas Career Cluster Project. Specifically, this study examined the courses identified by the Texas Career Cluster Project in these two areas:

1. Therapeutic services (nursing) under the Health Science career cluster; and
2. Computer programming and software development (computer programming) under the Information Technology career cluster.

Nursing and computer programming were chosen by the THECB because they are the two most frequently chosen Associate of Arts degree pathways in Texas.

The second key difference is that Validation Study II asked instructors to rate their courses against only the cross-disciplinary standards within the CCRS, while the CTE Pathways Analysis study asked instructors to rate the importance of standards in every subject area, including the cross-disciplinary standards. All standards in the current

study were included to obtain a comprehensive view of all of knowledge and skills embedded within the pathways, spanning all subject areas.

Data Collection and Analysis Methods

Between August and October of 2009, 115 CTE course instructors representing 22 courses in two course pathways at 27 different postsecondary institutions throughout Texas used a web-based application to rate the importance of the CCRS in relation to their course(s).

Course Data Collection Process

To determine what course pathways to analyze for this study, the THECB identified course pathways among the Associate of Arts degree CTE programs that enrolled the highest numbers of students statewide. EPIC selected the courses to include in each pathway analysis based on the recommendation of the Texas Career Cluster Program, which surveyed CTE degree programs to determine courses most commonly taught within the respective pathways. After the specific courses were identified for data collection, the College Readiness Special Advisors at 64 two-year public postsecondary institutions were contacted to solicit course nominations for each identified course from their respective institutions.

The course numbers and titles selected for the nursing pathway (course numbers contain an “X” because those numbers varied across institutions):

- BIOL 2X02 Anatomy & Physiology II
- BIOL 2X20 Microbiology
- HITT 1X05/MDCA 1X13/SRGT 1X01 Medical Terminology I
- HITT 1X53 Legal and Ethical Aspects of Health Information
- HPRS 1X01 Introduction to Health Professions
- HPRS 1X02 Wellness
- HPRS 1X04 Basic Health Profession Skills
- HPRS 1X05 Essentials of Medical Law & Ethics
- HPRS 1X06 Essentials of Medical Terminology
- HPRS 2X01 Pathophysiology
- MDCA 1X02 Human Disease/Pathophysiology
- MDCA 1X05 Medical Law & Ethics
- PSYC 2X14 Developmental Psychology

- RNSG 1X01 Dosage Calculation
- RNSG 1X07 Nursing Jurisprudence

The course numbers and titles selected for the Computer programming pathway:

- COSC 2315/ITSE 2345 Data Structures
- COSC 2330 Advanced Structure Language
- COSC 2336 Programming Fundamentals III
- CPMT 1305 PC Hardware & Software
- ITSC 1325 PC Hardware
- ITSE 2459 Advanced Computer Programming
- MATH 2313 Calculus

These lists represent the course titles selected for data collection during the current phase of the study and do not represent the complete course pathway within each discipline. In addition to the courses listed above, the nursing pathway includes PSYC 2X01 (General Psychology) and BIOL 2X01 (Anatomy and Physiology I), and the programming pathway includes MATH 1314 (College Algebra). These three courses were previously analyzed during Validation Study I and their alignment levels were included in this analysis to avoid duplication and allow for a thorough examination of each course pathway in its entirety.

Course nominations were collected from College Readiness Special Advisors between July 21 and October 31, 2009. The Special Advisors nominated 232 courses (456 including nominations for the three Validation Study I courses discussed above) by submitting the faculty member's name and contact information and the institution-specific course title when it was known.

In August 2009, instructors whose courses had been nominated received an email asking them to log into the online course review application. The online course review process included the following steps:

1. Consent to Participate: Participating instructors granted the THECB permission to publish, in part or in whole, data based on their responses and any of the documents they submitted. (See Appendix A for a copy of the consent form.)
2. Course Ratings: Instructors were asked to rate the Performance Expectation level of every CCRS including the cross-disciplinary standards. The rating response chosen for each Performance Expectation implied that the same response would apply to the Organizing Component and Key Cognitive Strategy under which the Performance Expectation is nested. The fourth level of the CCRS includes the Performance Indicators, which are not standards per se, but examples of how the standards could be demonstrated and measured. Because the Performance Indicators are only intended to provide examples, they were not included in the ratings analysis. Participating instructors completed an online rating form that asked them to answer the following question for each Performance Expectation: “How necessary is this element in preparing students to succeed in my course?” Respondents chose one of five options: *most necessary*, *more necessary*, *less necessary*, *least necessary*, or *not necessary*. After selecting a response option for each standard, instructors then selected one or more rationale statement(s) to explain the reason they rated the item the way that they did. Respondents again chose one of five options: *required*, *not covered in course*; *reviewed only*, *not re-taught*; *introduced as new material*; *taught in a subsequent course*; or *irrelevant to course*. (See Appendix B for a list of scale items and rationale statements.) The rationale statements were included to explain the responses. For example, an instructor might designate a standard as *not necessary* or *least necessary* for one of several reasons. The standard might not be necessary to succeed in the course because it was irrelevant to the subject area, or it might be covered in a subsequent course. The rationale statements were particularly valuable in interpreting the reasons why specific standards were found to be inconsistently or not well aligned.
3. Upload Course Materials: Participating instructors were invited to upload key course documents, including syllabi, assignments, assessments, grading rubrics and any other relevant materials. All identifying information was removed.

Overall, instructors at 27 public two-year postsecondary institutions throughout Texas completed course submissions. Table 1 presents an overview of the disposition of all nominated courses.

Table 1: Final Course Status for All Nominated Courses

Course Title	Completed Course Submission	Partial Completed Course Submission	Course Deactivated	No Response	Total
Nursing Pathway					
BIOL 2X01 Anatomy & Physiology I*	48*	4*	0	15*	67*
BIOL 2X02 Anatomy & Physiology II	14	4	0	9	27
BIOL 2X20 Microbiology	9	2	1	8	20
HITT 1X05/MDCA 1X13/SRGT 1X01 Medical Terminology I	8	2	1	6	17
HITT 1X53 Legal and Ethical Aspects of Health Information	7	1	0	3	11
HPRS 1X01 Introduction to Health Professions	6	0	0	1	7
HPRS 1X02 Wellness	1	0	0	2	3
HPRS 1X04 Basic Health Profession Skills	3	0	0	1	4
HPRS 1X05 Essentials of Medical Law & Ethics	2	0	1	1	4
HPRS 1X06 Essentials of Medical Terminology	5	0	0	5	10
HPRS 2X01 Pathophysiology	7	4	0	1	12
MDCA 1X02 Human Disease/Pathophysiology	2	0	0	1	3
MDCA 1X05 Medical Law & Ethics	5	0	0	0	5
PSYC 2X01 General Psychology*	52*	3*	0	19*	74*
PSYC 2X14 Developmental Psychology	14	0	0	4	18
RNSG 1X01 Dosage Calculation	3	1	0	6	10
RNSG 1X07 Nursing Jurisprudence	4	1	0	4	9

Course Title	Completed Course Submission	Partial Completed Course Submission	Course Deactivated	No Response	Total
Programming Pathway					
COSC 2315/ITSE 2345 Data Structures	1	3	1	2	7
COSC 2330 Advanced Structure Language	2	0	3	3	8
COSC 2336 Programming Fundamentals III	2	1	1	3	7
CPMT 1305 PC Hardware & Software	2	2	2	4	10
ITSC 1325 PC Hardware	6	0	1	7	14
ITSE 2459 Advanced Computer Programming	0	3	1	2	6
MATH 1314 College Algebra*	73*	1*	0	9*	83*
MATH 2313 Calculus	11	0	1	8	20
Total	114	24	13	81	232

**Nominations for these courses were submitted during a previous round of TCCRI data collection. Totals only include course nominations for the current round of data collection to summarize the response rates for the CTE Pathways study. For more information about the data collected for these three courses during the previous study, please refer to the Validation Study I).*

Participating campuses submitted an average of five courses for the study. Table 2 summarizes the distribution of course submissions (completed or partial) by institution type and region for the courses included in the current round of data collection.

Table 2: Distribution of all Course Submissions by Region and Institution Type¹

Region	Community College	Technical College	Total
Central	15	0	15
Gulf Coast	29	0	29
High Plains	2	0	2
Metroplex	6	0	6
Northwest	8	0	8
South	24	10	34
Southeast	5	6	11
Upper East	6	0	6
Upper Rio Grande	13	0	13
West	14	0	14
Total	122	16	138

Ratings

To determine the level of alignment, the modal (most frequent) instructor response was determined for each individual standard. The modal response was used because the mode is the best statistical measure to describe ordinal data such as the importance ratings. Because the ratings span a range of qualitative responses, reporting the most frequent response captures the data more accurately than a statistical measure that assumes an evenly distributed, linear scale. In addition, this approach is consistent with current practice for determining instructor expectations, and replicating the methodology employed in the other CCRS validity studies enables comparisons. Participants were asked to choose one response ranging from *not necessary* to *most necessary* on a five-item scale for each Performance Expectation. These responses were coded during the data analysis process to correspond to a numerical scale ranging from 1 (*not necessary*) to 5 (*most necessary*). Instructors then selected rationale statements that best explained their responses. (See Appendix B for a list of scale items and rationale statements.) Results are reported in tables that contain the mode for each standard in each course. (See appendices C through W.) In the course level tables, data are color

¹ Includes complete and partial submissions.

coded:

- Aligned standards are those with modes of *most necessary* and *more necessary*; these are highlighted in green.
- Inconsistently aligned standards are those with modes of *less necessary*; these are highlighted in yellow.
- Standards that are not aligned with the CCRS are those with modes of *least necessary* or *not necessary*; these are highlighted in red.
- Multimodal standards are those that do not have a most common response; these are highlighted in blue.

Results

This section presents the percentage of alignment between the CCRS and the courses in the nursing and computer programming pathways. A standard is determined to be aligned to a course if it is most frequently rated (modal response) as *most necessary* or *more necessary* by instructors from at least one course within the pathway. A standard is considered aligned to a pathway if a standard is considered *most necessary* or *more necessary* for success in at least one course, and if that course is necessary for successful completion of a pathway. (For a summary of the pathway alignment by standard see Appendix E.)

Table 3 below lists the overall percentage of alignment by pathway, with the combined totals broken down by the five subject areas within the CCRS. The level of alignment when combining all of the results across both career clusters ranges from 100 percent alignment for the cross-disciplinary skills to 50 percent alignment for the science standards.

Table 3: Summary of Ratings Alignment by Pathway and Combined by Subject Area

Section of CCRS	Nursing			Computer Programming			Combined		
	Aligned	Incon-sistently Aligned	Not Aligned	Aligned	Incon-sistently Aligned	Not Aligned	Aligned	Incon-sistently Aligned	Not Aligned
English	86%	14%	0%	45%	30%	25%	86%	14%	0%
Mathematics	37%	37%	26%	73%	27%	0%	77%	23%	0%
Science	46%	38%	16%	18%	16%	66%	50%	38%	11%
Social Studies	75%	25%	0%	6%	19%	75%	75%	25%	0%
Cross-Disciplinary	100%	0%	0%	71%	29%	0%	100%	0%	0%
ALL	59%	29%	12%	36%	21%	43%	68%	27%	5%

This analysis includes data from three courses collected during Validation Study I. The data collected from these three courses are also required for the pathways included in this analysis. The nursing pathway includes PSYC 2X01 (General Psychology) and

BIOL 2X01 (Anatomy and Physiology I), and the programming pathway includes MATH 1314 (College Algebra). Only the cross-disciplinary and the specific subject area standards were rated for these three courses, with the results added to this study so that the instructors who participated previously were not asked to resubmit the same data (more detailed information about these three courses can be found in Validation Study I).

Tables 4 and 5 report the alignment levels by course within the two-year nursing and computer programming career clusters, respectively. For both programs, there is a range of alignment both between courses (some courses being much higher aligned with the CCRS than others) and within courses (some courses being much higher aligned with specific subject area standards than other subject areas). These results confirm the hypothesis that students must be prepared to apply knowledge and skills across subject areas and courses to be successful within these two common career pathways.

Table 4 reports the overall alignment of the CCRS to the level of necessity for successful preparation within the nursing pathway. Regarding the nursing courses, 59 percent of the CCRS were aligned across the pathway, 29 percent were inconsistently aligned, and 12 percent were not aligned. Table 4 also shows the distribution of the level of alignment across the different courses within the pathway. The percent of the CCRS aligned within a course ranges from 34 percent in BIOL 2X02 Anatomy & Physiology II to 5 percent in HPRS 1X01 Introduction to Health Professions (data collected for the courses with asterisks occurred during a previous study that did not require instructors to rate the CCRS in entirety, therefore making the determination of the overall alignment across all standards not possible; the omitted data is treated as missing data in this study).

Table 4: Nursing Summary of Alignment of CCRS

Course Title	Aligned	Inconsistently Aligned	Not Aligned	Multimodal
BIOL 2X01 Anatomy & Physiology I*	4%	1%	2%	0%
BIOL 2X02 Anatomy & Physiology II	34%	7%	54%	6%
BIOL 2X20 Microbiology	31%	2%	61%	7%
HITT 1X05/MDCA 1X13/SRGT 1X01 Medical Terminology I	6%	2%	91%	3%
HITT 1X53 Legal and Ethical Aspects of Health Information	11%	2%	80%	6%
HPRS 1X01 Introduction to Health Professions	5%	2%	84%	10%
HPRS 1X02 Wellness	6%	24%	70%	0%
HPRS 1X04 Basic Health Profession Skills	9%	1%	77%	14%
HPRS 1X05 Essentials of Medical Law & Ethics	8%	0%	65%	27%
HPRS 1X06 Essentials of Medical Terminology	6%	5%	80%	8%
HPRS 2X01 Pathophysiology	12%	2%	77%	8%
MDCA 1X02 Human Disease/Pathophysiology	33%	3%	19%	47%
MDCA 1X05 Medical Law & Ethics	21%	3%	67%	10%
PSYCH 2X01 General Psychology*	19%	7%	3%	1%
PSYC 2X14 Developmental Psychology	26%	3%	68%	4%
RNSG 1X01 Dosage Calculation	11%	1%	76%	12%
RNSG 1X07 Nursing Jurisprudence	28%	7%	52%	12%

**Data for these courses was collected during Validation Study I of the TCCRI. The alignment percentages for these courses do not add to 100% because during Validation Study I, data was only collected for the course's subject specific standards and the cross-disciplinary standards. Standards from the other subject areas were not collected, and are treated as missing data in this study.*

Table 5 reports the results from the computer programming courses. Overall, 36 percent of the CCRS were aligned across the pathway, 21 percent were inconsistently aligned, and 34 percent were not aligned. The percent of the CCRS aligned within an individual course ranges from 21 percent in MATH 2313 Calculus to 2 percent in CPMT 1305 PC Hardware & Software. (See Appendix F for a summary of all highly aligned Performance Expectations.)

Table 5: Computer Programming Summary of Alignment of CCRS

Course Title	Aligned	Inconsistently Aligned	Not Aligned	Multimodal
COSC 2315/ITSE 2345 Data Structures	15%	5%	67%	14%
COSC 2330 Advanced Structure Language	12%	0%	56%	33%
COSC 2336 Programming Fundamentals III	15%	5%	56%	23%
CPMT 1305 PC Hardware & Software	2%	2%	65%	29%
ITSC 1325 PC Hardware	10%	2%	81%	7%
ITSE 2459 Advanced Computer Programming	No Response			
MATH 1314 College Algebra*	11%	8%	10%	1%
MATH 2313 Calculus	21%	4%	73%	4%

**Data for this course was collected during Validation Study I of the TCCRI. The alignment percentages from this course do not add to 100% because during Validation Study I, data was only collected for the course's subject specific standards (mathematics) and the cross-disciplinary standards. Standards from the other subject areas were not collected, and are treated as missing data in this study.*

Adjusted Results Including Rationale Statements

The summary data presented above only reported the results of the faculty responses to the question, “How necessary is this element in preparing students to succeed in my course?” Respondents chose one of five options: *most necessary*, *more necessary*, *less necessary*, *least necessary*, or *not necessary*. In addition to this question, instructors were then asked to provide one or more explanatory rationale statement(s) to explain the reason for their rating. Respondents again chose one of five options: *required*, *not covered in course*, *reviewed only*, *not re-taught*, *introduced as new material*, *taught in a subsequent course*, or *irrelevant to course*. (See Appendix B for a list of scale items and rationale statements.) The rationale statements were included to explain the responses. For example, an instructor might designate a standard as *not necessary* or *least necessary* because the standard is irrelevant to the subject area and therefore not necessary to succeed in the course or because it is covered in a subsequent course.

The additional information offered through the explanatory rationale statements provides an even deeper understanding of the relationship between the CCRS and the nursing and computer programming course pathways. Examining the rationale statements is particularly valuable for interpreting why specific standards are inconsistently or not well

aligned. A review of the most common (modal) rationale statements explaining why the standards are less necessary for successful preparation indicates that students are expected to know the standard coming into the course or that the standard is reviewed in the course.

The data for this study can be analyzed in two ways. The first way, as reported in Tables 3 through 5 above, offers the percentage of alignment based on the faculty ratings alone. The second way, as reported in Table 6, combines the faculty ratings with the explanatory rationale statements to list the “Cumulative Percent of Aligned Ratings.” This cumulative percentage data combines all standards that received modal rankings of either required, reviewed, or introduced as new material. Stated another way, alignment is by combining instructor ratings of importance and the rationale statements that indicate the standard will be taught in the course. The standard is considered aligned because it is necessary or taught. When combining the ratings and rationale statements across all courses included in this study, the CCRS are 100 percent necessary or taught in all subject areas except science, with 87 percent.

Table 6: Summary of Ratings Alignment by Pathway and Combined by Subject Area

Section of CCRS	Nursing		Computer Programming		Combined	
	Percent Aligned Using Ratings	Percent of Standards Necessary or Taught	Percent Aligned Using Ratings	Percent of Standards Necessary or Taught	Percent Aligned Using Ratings	Percent of Standards Necessary or Taught
English	86%	100%	45%	77%	86%	100%
Mathematics	37%	77%	73%	100%	77%	100%
Science	46%	82%	18%	37%	50%	87%
Social Studies	75%	100%	6%	31%	75%	100%
Cross-Disciplinary	100%	100%	71%	100%	100%	100%
ALL	59%	88%	36%	61%	68%	94%

Table 7 provides the comparison of the alignment levels using only ratings for the nursing pathway. The adjusted percent of the CCRS aligned with a course ranges from 81 percent for MCA 1X02 Human Disease/Pathophysiology to 9 percent for HITT 1X05 Medical Terminology I. This higher level of alignment suggests that many nursing faculty members do not expect prior knowledge of the CCRS to be necessary for student success in their course, but that the knowledge or skills will be taught within the course.

Table 7: Nursing Summary of Standards Necessary or Taught

Course Titles*	Percent Aligned Using Ratings	Percent of Standards Necessary or Taught
BIOL 2X02 Anatomy & Physiology II	34%	48%
BIOL 2X20 Microbiology	31%	48%
HITT 1X05/MDCA 1X13/SRGT 1X01 Medical Terminology I	6%	9%
HITT 1X53 Legal and Ethical Aspects of Health Information	11%	22%
HPRS 1X01 Introduction to Health Professions	5%	18%
HPRS 1X02 Wellness	6%	33%
HPRS 1X04 Basic Health Profession Skills	9%	24%
HPRS 1X05 Essentials of Medical Law & Ethics	8%	33%
HPRS 1X06 Essentials of Medical Terminology	6%	14%
HPRS 2X01 Pathophysiology	12%	22%
MDCA 1X02 Human Disease/Pathophysiology	33%	81%
MDCA 1X05 Medical Law & Ethics	21%	34%
PSYC 2X14 Developmental Psychology	26%	32%
RNSG 1X01 Dosage Calculation	11%	29%
RNSG 1X07 Nursing Jurisprudence	28%	41%

**This summary only includes the data for the 15 courses collected during this round of data collection for the nursing pathway.*

Table 8 offers comparisons of the alignment levels for the computer programming pathway. In particular, it shows the distribution of the level of alignment across the different courses. The adjusted percent of the CCRS aligned within a course ranges from 44 percent for COSC 2330 Advanced Structure Language and COSC 2336 Programming Fundamentals III to 24 percent for ITSC 1325 PC Hardware. The increase in the alignment percentages is similar to that of nursing, again indicating that many faculty members do not expect prior knowledge of the CCRS and that they will teach the knowledge or skills within the courses.

Table 8: Computer Programming Summary of Standards Necessary or Taught

Course Title*	Percent Aligned Using Ratings	Percent of Standards Necessary or Taught
COSC 2315/ITSE 2345 Data Structures	15%	37%
COSC 2330 Advanced Structure Language	12%	44%
COSC 2336 Programming Fundamentals III	15%	44%
CPMT 1305 PC Hardware & Software	2%	39%
ITSC 1325 PC Hardware	10%	24%
ITSE 2459 Advanced Computer Programming	No Response	
MATH 2313 Calculus	21%	28%

**This summary only includes the data for the 7 courses collected during this round of data collection for the computer programming pathway.*

Nursing Pathway

Differences between the nursing and computer programming pathways became apparent in the data. Nursing emerged with a higher percentage of CCRS alignment in all areas except mathematics. The importance of the cross-disciplinary skills was another finding. Within the set of nursing courses, all 45 cross-disciplinary standards (or 100 percent) were aligned across the pathway, meaning that every standard was considered aligned within at least one of the courses in the pathway.

Table 9 presents the relationship between nursing and the CCRS. It notes the percentage of alignment based on combining the faculty ratings and the explanatory rationale statements (i.e. “Cumulative Percent of Aligned Ratings”) broken down into the Key Content areas within each of the five CCRS subject areas. The Key Content areas represent the organizing structure of the subject area and keystone ideas of the discipline. This level of analysis is illuminating when considering a secondary program of study within the CTE arena. Of the 32 Key Content areas for nursing, 23 -- including all English, social studies and cross-disciplinary Key Content. – were found to be 100 percent necessary or taught within at least one required nursing course. Four more Key Content areas have more than 80 percent alignment. The Key Content areas with the lowest levels of alignment were Measurement Reasoning and Functions (mathematics)

and Earth and Space Sciences with 63 percent alignment, and Physics with 56 percent alignment.

The lower percentages of alignment in nursing might be explained, at least in part, by the nature of the specific content expertise related to nursing. While a general knowledge of life sciences and algebra appears to be important, specific knowledge of other sciences and mathematics areas is less important. However, nursing candidates need to have mastered a broad range of foundational and applied skills, such as literacy and communication; problem solving and reasoning; scientific ways of learning and thinking; perspectives on diverse human experiences; and analysis, synthesis and evaluation of information.

Table 9: Alignment of Nursing Pathway to CCRS Key Content

CCRS Key Content	Percent Alignment Using Ratings			Percent of Standards Necessary or Taught
	Aligned	Inconsistently Aligned	Not Aligned	
English				
I. Writing	100%	0%	0%	100%
II. Reading	70%	30%	0%	100%
III. Speaking	100%	0%	0%	100%
IV. Listening	100%	0%	0%	100%
V. Research	100%	0%	0%	100%
Mathematics				
I. Numeric Reasoning	75%	25%	0%	100%
II. Algebraic Reasoning	50%	50%	0%	100%
III. Geometric Reasoning	100%	0%	0%	91%
IV. Measurement Reasoning	38%	13%	50%	63%
V. Probabilistic Reasoning	67%	33%	0%	100%
VI. Statistical Reasoning	33%	67%	0%	89%
VII. Functions	17%	50%	33%	67%
VIII. Problem Solving and Reasoning	70%	30%	0%	100%
IX. Communication and Representation	63%	38%	0%	100%
X. Connections	20%	80%	0%	100%
Science				
I. Nature of Science: Scientific Ways of Learning and Thinking	100%	0%	0%	100%

CCRS Key Content	Percent Alignment Using Ratings			Percent of Standards Necessary or Taught
	72%	22%	0%	
II. Foundation Skills: Scientific Applications of Mathematics	72%	22%	0%	78%
III. Foundation Skills: Scientific Applications of Communication	100%	0%	0%	100%
IV. Science, Technology, and Society	100%	0%	0%	100%
V. Cross-Disciplinary Themes	100%	0%	0%	100%
VI. Biology	85%	15%	0%	100%
VII. Chemistry	26%	67%	7%	93%
VIII. Physics	8%	44%	49%	56%
IX. Earth and Space Sciences	0%	75%	25%	63%
X. Environmental Science	19%	69%	13%	81%
Social Studies				
I. Interrelated Disciplines and Skills	65%	35%	0%	100%
II. Diverse Human Perspectives and Experiences	88%	13%	0%	100%
III. Interdependence of Global Communities	25%	75%	0%	100%
IV. Analysis, Synthesis and Evaluation of Information	92%	8%	0%	100%
V. Effective Communication	100%	0%	0%	100%
Cross-Disciplinary				
I. Key Cognitive Skills	100%	0%	0%	100%
II. Foundational Skills	100%	0%	0%	100%

Computer Programming Pathway

Table 10 presents the relationship between computer programming and the CCRS. It shows the levels of alignment based on the necessity ratings (“Percent Alignment Using Ratings”) and the adjusted alignment levels, including all standards determined to be relevant by faculty (“Percent of Standards Necessary or Taught”) broken down into the Key Content areas within each subject. The Key Content areas represent the organizing structure of the subject area and keystone ideas of the discipline. This level of analysis is illuminating when considering a secondary program of study within the CTE arena. Of the 32 Key Content areas for computer programming, 20 Key Content areas were found to be 100 percent necessary or taught within a course from the computer programming

career cluster. All Key Content areas within mathematics and the cross-disciplinary skills are 100 percent aligned. For the remaining 12 Key Content areas, three have over 70 percent alignment, another had 44 percent alignment, and still another had 38 percent alignment. The seven Key Content areas with the lowest alignment are in science (including Biology, Chemistry, Earth and Space Sciences, and Environmental Science) and social studies (including Interrelated Disciplines and Skills, Diverse Human Perspectives and Experiences, and Interdependence of Global Experiences).

Different results for computer programming and nursing can be explained by the fact that the knowledge and skills necessary to becoming a successful programmer and nurse differ. In particular, broader expertise is needed in nursing. For example, a school nurse requires a different overall set of knowledge and skills than a nurse specializing in geriatric oncology. The nursing career pathway reflects this broader base of preparation. Computer programming also offers a range of career opportunities, but the knowledge needed is more specified and focuses on the technical expertise. Clearly, however, the CCRS include foundational and applied knowledge and skills – such as strong literacy and communication skills, a deep understanding of mathematics, and a strong foundation in the understanding of and ability to apply scientific ways of learning and thinking – that are necessary for success in the computer programming arena.

Table 10: Alignment of Computer Programming Pathway to CCRS Key Content

CCRS Key Content	Percent Alignment Using Ratings			Percent of Standards Necessary or Taught
	Aligned	Inconsistently Aligned	Not Aligned	
English				
I. Writing	20%	80%	0%	100%
II. Reading	70%	30%	0%	70%
III. Speaking	40%	60%	0%	100%
IV. Listening	50%	50%	0%	100%
V. Research	100%	0%	0%	100%
Mathematics				
I. Numeric Reasoning	100%	0%	0%	100%
II. Algebraic Reasoning	100%	0%	0%	100%

CCRS Key Content	Percent Alignment Using Ratings			Percent of Standards Necessary or Taught
III. Geometric Reasoning	55%	45%	0%	100%
IV. Measurement Reasoning	75%	25%	0%	100%
V. Probabilistic Reasoning	0%	100%	0%	100%
VI. Statistical Reasoning	11%	89%	0%	100%
VII. Functions	100%	0%	0%	100%
VIII. Problem Solving and Reasoning	100%	0%	0%	100%
IX. Communication and Representation	100%	0%	0%	100%
X. Connections	80%	20%	0%	100%
Science				
I. Nature of Science: Scientific Ways of Learning and Thinking	54%	46%	0%	100%
II. Foundation Skills: Scientific Applications of Mathematics	72%	28%	0%	100%
III. Foundation Skills: Scientific Applications of Communication	75%	25%	0%	100%
IV. Science, Technology, and Society	20%	60%	20%	80%
V. Cross-Disciplinary Themes	11%	33%	56%	44%
VI. Biology	0%	0%	100%	4%
VII. Chemistry	0%	4%	96%	7%
VIII. Physics	10%	21%	69%	38%
IX. Earth and Space Sciences	0%	0%	100%	0%
X. Environmental Science	0%	0%	100%	0%
Social Studies				
I. Interrelated Disciplines and Skills	0%	0%	100%	0%
II. Diverse Human Perspectives and Experiences	0%	13%	88%	13%
III. Interdependence of Global Communities	0%	0%	100%	0%
IV. Analysis, Synthesis and Evaluation of Information	8%	54%	38%	85%
V. Effective Communication	67%	33%	0%	100%
Cross-Disciplinary				
I. Key Cognitive Skills	89%	11%	0%	100%
II. Foundational Skills	58%	42%	0%	100%

Data Limitations

A low response rate from instructors might limit some generalizations. The initial research design sought 10 completed course submissions per course title for each of the 22 courses included in the data collection for this study. As reported in Table 1, three courses fully met this goal (BIOL 2X02 Anatomy and Physiology II, PSYC 2X14 Developmental Psychology, and MATH 2313 Calculus).

In the computer programming course cluster, particular caution is needed. Two of the seven courses had more than five completed respondents, three courses had two completions each, one course had one respondent, and one course had no completed responses. See Table 1 for details on response rates.

Three reasons for the low response rate were identified: (1) lack of responsiveness on the part of the College Readiness Special Advisors (CRSAs), (2) the amount of time required for faculty to review all the TCCRS, and (3) the difficulty of identifying courses commonly offered in the two pathways across institutions.

CRSAs' hesitation to nominate faculty members was an unexpected challenge. During the first CTE study, EPIC sought nominations for only nine courses and received 211 responses. For the career pathways study, EPIC sought nominations for 22 courses and received 232 responses. EPIC staff called 29 CRSAs who nominated few or no faculty members. The CRSAs who responded to this follow-up effort (approximately 30 percent of the total to whom EPIC staff placed phone calls) explained that their institution did not offer the courses or that the faculty they approached refused to participate.

The CRSAs further indicated that the low response rate resulted from amount of time it would take faculty to rate all of the TCCRS, and that some faculty were receiving compensation for participation in the study and some were not. The THECB staff also called 38 faculty members who had been nominated but did not participate in the analysis. Again, lack of time was a consistent reason for opting out of participation.

among the 10 instructors who responded. Five additional instructors asserted that they did not in fact teach the course(s) for which they had been nominated. Only 49 percent of nominated faculty completed surveys.

Identifying the courses to include in the pathways analysis and the availability of these courses statewide were the final challenges. EPIC reviewed course catalogs and contacted individual institutions to determine which courses are typical of the nursing and computer programming two-year course pathways, but found very little consistency among community and technical colleges. EPIC then contacted staff from the Texas Career Cluster Project to use the findings from their research. Courses in therapeutic services (nursing) under the Health Science career cluster as well as computer programming and software development (computer programming) under the Information Technology career cluster were identified. As the course nomination process proceeded, it became clear that few schools offered either complete pathway. Also, some of the courses were offered at a limited number of institutions. One course was offered at only two of them.

The preliminary conclusion that these two course pathways are not consistently implemented among institutions was reinforced by a state-funded project to determine the most consistent pathways. It found course combinations that occur relatively infrequently. For this study, inadequate consistency among pathways and courses statewide contributed directly to the relatively low numbers of course nominations and completions for certain courses

Conclusions

These findings are consistent with the results of the previous two alignment studies that compared the CCRS to postsecondary expectations in Texas institutions of higher education. An evidentiary base that documents the relationship between the CCRS and the knowledge and skills necessary for college and career readiness in Texas is emerging from these studies. The first study, referred to as Validation Study I,

determined that the CCRS are a valid representation of the knowledge and skills necessary for college readiness in credit-bearing, entry-level general education courses. The second study, Validation Study II, which explored the relationship between the CCRS and career readiness by examining the level of necessity of the cross-disciplinary skills for success in entry-level CTE courses, found every cross-disciplinary skill to be aligned with at least one of the entry-level CTE courses. The third and current study, known as the CTE Pathways Study, explored the relationship between all of the CCRS in all subject areas (including the cross-disciplinary skills) and the two most frequently selected CTE two-year degree programs in Texas.

The strongest finding across all three studies is that the cross-disciplinary skills in the CCRS are highly aligned with career pathway courses, as summarized in Table 11.

Table 11: Comparison of 3 CCRS Validity Studies Results

Cross-Disciplinary Results		
Study	Description of Study	% Cross-disciplinary Standards Aligned
Validation Study I	Level of alignment between 20 entry-level general education courses and the CCRS	100%
Validation Study II	Level of alignment between 9 entry-level CTE course and cross-disciplinary standards only	100%
Validation Study III	Level of alignment between CTE nursing and computer programming course pathways and the CCRS	100%

Although the small sample size for some courses in this data suggests caution in generalizing specific relationships, the responses offer insight into the overall relationship between the CCRS and career pathways. Table 12 lists the percentage of standards necessary or taught within each CCRS Key Content area across all courses. The results show that all of the Key Content in English, mathematics, social studies, and cross-disciplinary areas are either necessary for success or are taught in at least one course.

In science, the subject area with mixed results, Physics was aligned at 69 percent and Earth and Space Sciences at 63 percent. This suggests that specific scientific content knowledge at a detailed level in these two areas might be less important than a strong foundation in the understanding of and ability to apply scientific ways of learning and thinking. In short, the ability to think like a scientist, enabling a student to learn career-specific scientific content knowledge, could be the most important attribute for students pursuing career pathways in the areas reported on in this study.

Table 12: Overall CTE Alignment to CCRS Key Content

CCRS Key Content	Percent of Standards Necessary or Taught in at Least One Course
English	
I. Writing	100%
II. Reading	100%
III. Speaking	100%
IV. Listening	100%
V. Research	100%
Mathematics	
I. Numeric Reasoning	100%
II. Algebraic Reasoning	100%
III. Geometric Reasoning	100%
IV. Measurement Reasoning	100%
V. Probabilistic Reasoning	100%
VI. Statistical Reasoning	100%
VII. Functions	100%
VIII. Problem Solving and Reasoning	100%
IX. Communication and Representation	100%
X. Connections	100%
Science	
I. Nature of Science: Scientific Ways of Learning and Thinking	100%
II. Foundation Skills: Scientific Applications of Mathematics	100%
III. Foundation Skills: Scientific Applications of Communication	100%
IV. Science, Technology, and Society	100%
V. Cross-Disciplinary Themes	100%
VI. Biology	100%
VII. Chemistry	93%
VIII. Physics	69%
IX. Earth and Space Sciences	63%
X. Environmental Science	81%
Social Studies	
I. Interrelated Disciplines and Skills	100%
II. Diverse Human Perspectives and Experiences	100%
III. Interdependence of Global Communities	100%
IV. Analysis, Synthesis and Evaluation of Information	100%
V. Effective Communication	100%

CCRS Key Content	Percent of Standards Necessary or Taught in at Least One Course
Cross-Disciplinary	
I. Key Cognitive Skills	100%
II. Foundational Skills	100%

The results of this study indicate that the CCRS are strongly related to what students are expected to know, or will learn how to do, in two common career pathways. Because each career pathway is complex and unique, additional studies could help further specify the knowledge and skills necessary for successful CTE postsecondary preparation. Furthermore, instructors need to have an opportunity to identify any additional content-specific or cross-disciplinary skills not included in the CCRS. Faculty members that participated in this study were only asked to rate the existing CCRS, not to identify any omitted knowledge or skills that are also necessary for success.

This study also revealed the inconsistency of coursework related to specific career pathways statewide. The work of the Texas Career Cluster Project has taken important steps in exploring career clusters by identifying the baseline structures and availability statewide relative to career pathways. This information is a critical precursor to further exploration of alignment between career pathways and the CCRS. A thorough inventory of available pathways and their requirements would also be quite useful to high schools that want to align their CTE programs with postsecondary career pathways. Ultimately, increased consistency in the courses that compose career pathways statewide would also help students better prepare to meet their career goals.

Table 12 above can help guide secondary educators to align their CTE courses with the CCRS to develop high school programs focused on career pathways. One important caveat is that the CCRS are meant to function as a cumulative model; the more CCRS the students are able to demonstrate effectively, the higher the probability the students will succeed in postsecondary CTE programs. When developing CTE programs, the CCRS should not be used as a checklist per se, but as a guide that points out areas that

need to be included and addressed. For example, the consistent evidence supporting the value of the cross-disciplinary skills suggests that should be a priority in developing any program preparing students for postsecondary career pathway studies.

The information yielded by the Validation III study could be utilized to further assist CTE educators in implementing the CCRS. Educators working with high school CTE programs can use these finding to develop rich programming that both aligns with the CCRS and prepares students for success in CTE courses. For postsecondary CTE programming, institutions can use this information to conduct self-studies for consistency of expectations and course offerings, and building stronger partnerships with their secondary and postsecondary counterparts to increase alignment and transparency as students transition between the systems.

Finally, all three validation studies conducted to date have found that the CCRS to be aligned with expectations and practice in Texas postsecondary institutions. As a result, the CCRS can be used with confidence as a key resource to assist educators in aligning curriculum, instruction, and assessments with college and career readiness, and to help postsecondary faculty members better understand how their courses relate to a general set of readiness standards.