Study Methodology

The methodology for the Common Career Technical Core (CCTC) alignment study was developed by Global Skills X-Change to effectively produce an objective, third-party review of Career Technical Education (CTE) policy infrastructure and standards alignment to the CCTC for each state or territory. The research questions that drove the study included:

- What is the policy infrastructure of the state/territory's CTE Programs of Study and how are state secondary and postsecondary CTE standards developed, adopted, implemented and maintained?
- Are the state/territory's CTE standards aligned with the CCTC standards, including both the Career Cluster content standards and 12 Career Ready Practices?

For the purposes of this study, standards are defined as clear expectations of what students should know and be able to do at the end of a CTE program or course (i.e., verb + object + modifier[1] statements related to a Career Cluster, Career Pathway, or Career Ready Practice).

EXAMPLE STATE STANDARDS

- Discuss (verb) major operations that occur (object) in the food industry (modifier).
- Explain (verb) the hazards (object) associated with specific types of manufacturing (modifier) equipment and tools (object).
- Describe (verb) advertising and sales promotion techniques (object).
- Differentiate (verb) between ethical and legal issues (object) impacting healthcare (modifier).

Additionally, to be included in the analysis the standards must have been:

- Publicly available or provided by the State CTE Director/Staff;
- Acknowledged by the State Director during the interview;
- Approved/adopted by the state and used statewide at the secondary and/or postsecondary level; and
- Not reproductions of standards that are present elsewhere (e.g. industry/national standards)

Below, the key aspects of the study methodology are described in detail and in chronological order starting with the policy scan and leading to the alignment study. The methodology is concluded with a discussion of the study constraints and limitations, which are essential to appropriately interpreting the results of this study.

Outreach & Respondents

All State/Territory CTE Directors were invited to participate in the study by the National Association of State Directors of Career Technical Education Consortium (NASDCTEc) Executive Director via an invitation email. A subsequent invitation was sent by the research team to the State Directors (or designated point of contact) to schedule a one-hour interview. State Directors were informed that the purpose of the interview was to discuss the policy infrastructure regarding their state CTE standards.

[1] Modifiers are not necessary but common in standards statements. In many cases a verb + object standard statement is sufficient.

The research team requested that each state complete the Policy Scan Interview Protocol (hereafter the "Protocol") in advance of the one-hour interview. If respondents did not complete the Protocol in advance, the interview was conducted by verbally examining the Protocol with the respondents over the phone.

State Directors were encouraged to include additional members of their team or partner agency who were knowledgeable of the CTE secondary and postsecondary standards and policy. Thus, in many cases multiple respondents compiled their responses to this interview in order to provide the most accurate and thorough data for the study. The opportunity for multiple respondents for each policy scan interview strengthens the reliability and validity of the policy scan results; however multiple respondents did not consistently occur across all states/territories due to variation in staffing and availability of state personnel.

Policy Scan

This portion of the study answered the following research question:

What is the policy infrastructure of the state/territory's CTE Programs of Study and how are state secondary and postsecondary CTE standards developed, adopted, implemented and maintained?

DATA COLLECTION

The data collection phase of the policy scan for each state/territory included three steps, described below.

Initial Online Research

The research team conducted initial data collection of CTE policy and standards within secondary and postsecondary settings using resources publicly available online through each state/territory education website. Through this process, policy and programmatic information was archived for analysis.

Completion of the Policy Scan Interview Protocol

Three members of the research team led the policy scan interview data collection phase. The team was trained to use the Policy Scan Interview Protocol as a data collection tool with the respondents. As described above in the Outreach and Respondents section, the use of this tool was flexible based on the needs and preferences of each state/territory (i.e. respondents were free to complete the protocol in advance of the interview or complete the protocol on the phone with the researcher). This flexibility in method was preferable for all stakeholders involved in the study. It allowed the researchers to efficiently engage with the respondents to gather a predetermined set of information across all states in a limited amount of time so not to burden the respondents. Because the State Directors and associated respondents had the option to either complete the Protocol in advance of the interview in writing or verbally on the phone, the states/territories directly contributed to the richness of the data used for the analysis. All but one state participated in the policy scan interview process.

Respondent Validation of Policy Scan Interview Protocol and Documentation

Respondent validations[2] were used to improve the accuracy and validity of the results of the Protocol, whether written in advance or spoken over the phone. If the verbal interview was conducted, the notes were emailed to the respondents so they could correct or add additional information as needed. If the Protocol was completed in advance, the respondent validation was conducted during the one-hour interview time. Lastly, respondents were prompted to validate the results of the policy scan when they were asked to review the draft report for their state.

In sum, triangulation of three data sources that were corroborated using respondent validation informed the policy scan analysis:

1. Online/open source information
2. Policy Scan Interview Protocol responses from State Director and associated personnel
3. Associated policy documents provided by the State Director and associated personnel

DATA ANALYSIS

Data from the Policy Scan Interview Protocol were organized, coded and analyzed using an analytical framework referred to as the *CTE Standards Governance Framework*. The framework was based on the research question and includes four components: Development, Adoption, Implementation and Maintenance of state CTE standards.

A member of the research team used the CTE Standards Governance Framework to summarize and integrate the three data sources. Next, a senior policy researcher conducted a secondary analysis to validate the results of the initial analysis. Finally, respondent validation was used to corroborate the results of the policy scan. This was accomplished by sharing the draft results with the State Director and members of the NASDCTEc team with extensive policy analysis experience.

[2] Also called member check, respondent validation is a procedure largely associated with qualitative research, whereby a researcher submits materials relevant to an investigation for checking by the people who were the source of those materials.

Alignment Study

This portion of the study answered the following research question:

Are the state/territory's CTE standards aligned with the CCTC standards?

STANDARDS IDENTIFICATION

State/territory CTE standards were identified and initially verified with the State Director during the policy scan portion of the study.

For the purposes of this study, standards are defined as clear expectations of what students should know and be able to do at the end of a CTE program or course (i.e., verb + object + modifier statements related to a Career Cluster, Career Pathway or Career Ready Practice).

Additionally, to be included in the analysis the standards must have been:

- Publicly available or provided by the State CTE Director/staff
- Acknowledged by the State Director during the interview
- Approved/adopted by the state and used statewide at the secondary and/or postsecondary level
- Not reproductions of standards that are present elsewhere (e.g. industry/national standards)

In other words, the source state/territory standards used for the alignment study are considered *content standards* (e.g., what students need to know and be able to do if they participate in an Agriculture CTE program of study). In addition, *practice standards* (e.g. apply appropriate academic and technical skills) were identified to compare to the CCTC Career Ready Practices standards.

DISTINGUISHING STANDARDS

Some states do not have content standards that can be aligned to the CCTC. This could be, for example, because they have not been developed or because the state allows local districts to develop their own standards based on pre-set criteria (i.e., integration of national or local industry standards). In these cases, there is no one set of common, required standards in use consistently at the local level. Alignments between the CCTC and national, industry-developed standards were outside the scope of this study, given the extent and diversity of industry standards and the underlying intent to determine the alignment between the CCTC and state standards.

It is also common for states/territories to outline "standards" for establishing a CTE program in a school or standards for CTE course approval. These "standards" may not specify what students need to know or be able to do, but they instead are linked to accreditation or program approval processes (common in postsecondary settings). This type of state "standard" document was useful for the policy scan portion of the study but not for alignment of state/territory *content* or *practice standards* to the CCTC, as it does not meet the present definition of standards.

In the event where a state/territory did not have standards that could be aligned to the CCTC, a case-study approach was used to describe the state's CTE policy infrastructure, their specific approach to standards, and if they intend to adopt or adapt the CCTC in the future; however, no alignment results could be generated in comparison to the CCTC content and practice standards. A number of states with statewide secondary and/or postsecondary standards were not included in the alignment part of the study because

they had standards that were not publicly available (more often the case at the postsecondary level), were in the process of revising their standards during the alignment study and chose not to submit those drafts, or used very different formats across Career Cluster areas, making a consistent review impossible. In total, the secondary standards of 46 states and territories and the postsecondary standards of 11 states and territories were included in the study.

STANDARDS EXTRACTION

Once the standards were identified, the research team convened to determine the key elements of the state standards appropriate for alignment to the CCTC. This is termed "extraction" because the relevant state standards needed to be extracted from the source document into a database.

The level of extraction required an initial analysis of the state standards structure. Some standards have multiple levels, for example:

Competency

Descriptors

[Optional Descriptors]

In most cases the highest level of the standard, **Competency** in the example above, would be selected for alignment to the CCTC because these broad competencies were most likely to align to the CCTC statements which are also broad in nature. For some state standards the **Competency** level was not consistent throughout Career Clusters or even Career Pathways. For example, one Career Cluster may display the **Competency** level as a sentence (e.g., *The student will be able to demonstrate positive work behaviors and personal qualities*), which would be used for the alignment study (i.e. this statement meets our definition of a standard).

However, others may simply state a competency as a subject area (e.g., *Performing Arts*) or a noun (e.g., *Technology*). When subject areas or nouns are presented as standards, this does not meet the definition of a standard. That is, there is no description of what a student should be able to do using a verb, and there is no description of what a student should know using a clear object and modifier (if applicable).

In cases of standards inconsistency across and within Career Clusters, the lower level of the standard would be incorporated, such as the *Descriptors* in the example provided above. In no instance were the *Optional Descriptors*, or other **suggested or elective** standards, benchmarks or competencies, used for alignment to the CCTC, as they are not consistent and accurate reflections of what the state expects CTE students to know and be able to do at the end of a POS or course.

Once standards were identified for the alignment, they were extracted and placed into a database categorized by The National Career Clusters Framework, which is comprised of 16 Career Clusters and their related 79 Career Pathways, as well as the 12 Career Ready Practices. For states that do not organize their standards based on The National Career Cluster Framework, the research team made determinations about which standards were appropriate for aligning to which Career Cluster(s) and placed the standards in the corresponding Career Cluster Excel file, so the alignment determination to the appropriate Career Cluster(s) could be made. This was often facilitated by states using The National Career Clusters Framework as a way of organizing their standards conceptually (e.g., externally) if not in practice.

A number of states organized their standards using six Career Clusters (e.g., Environmental & Agricultural Systems; Business Marketing & Management; Human Services & Resources; Health Sciences; Industrial, Manufacturing & Engineering Systems and Communication & Information Systems) or a variation of a similarly condensed organization scheme. In this case, the research team analyzed the standards to determine whether they were a) further differentiated into The National Career Clusters Framework or b) integrated standards. If option b was determined, standards were applied to all Career Clusters applicable. For example, if a state integrated Business, Management & Administration; Finance and Marketing standards into one Career Cluster, these standards would be applied to all three Career Clusters in the alignment analysis.

ALIGNMENT ANALYSIS

Upon completion of standards identification and extraction, the alignment analysis process consisted of two stages:

Automated algorithm to determine the extent to which the CCTC content is represented in the state standards

The GSX Alignment Tool[3] was employed to assist in determining the extent to which CCTC content is represented in the state standards by scoring the match between two bodies of text by searching the first body of text (the state standards) for keywords associated with a second body of text (the CCTC). The research team developed the keywords after a careful review of the CCTC content and an extensive testing and optimization phase. These keywords included not only the objects and modifiers included in the CCTC statements but also synonyms and commonly used associated objects and modifiers. The use of technology to support standard and curriculum alignment has been documented in the educational community.[4]

The GSX Alignment Tool searched each state standard for keywords based on each CCTC standard. The GSX Alignment Tool then assigned a score indicating the degree to which the particular CCTC standard is represented by the state standards for that Career Cluster, based on the number of keyword matches. This score was then used to preliminarily place the results for a CCTC standard into one of three categories (Aligned, Partially Aligned, Not Aligned). The tool performed this matching task for all possible pairs of CCTC standards and state standards within each Career Cluster. If there were no corresponding standards for the entire Career Cluster, then alignment results were not generated for that Career Cluster. It is important to understand that when a result is not presented, that does not necessarily indicate that the state is "Not Aligned" to the CCTC as some states simply do not have corresponding standards for specific Career Clusters or Career Pathways by design.

Human-driven quality assurance (QA) process to ensure the validity of the automated algorithm results

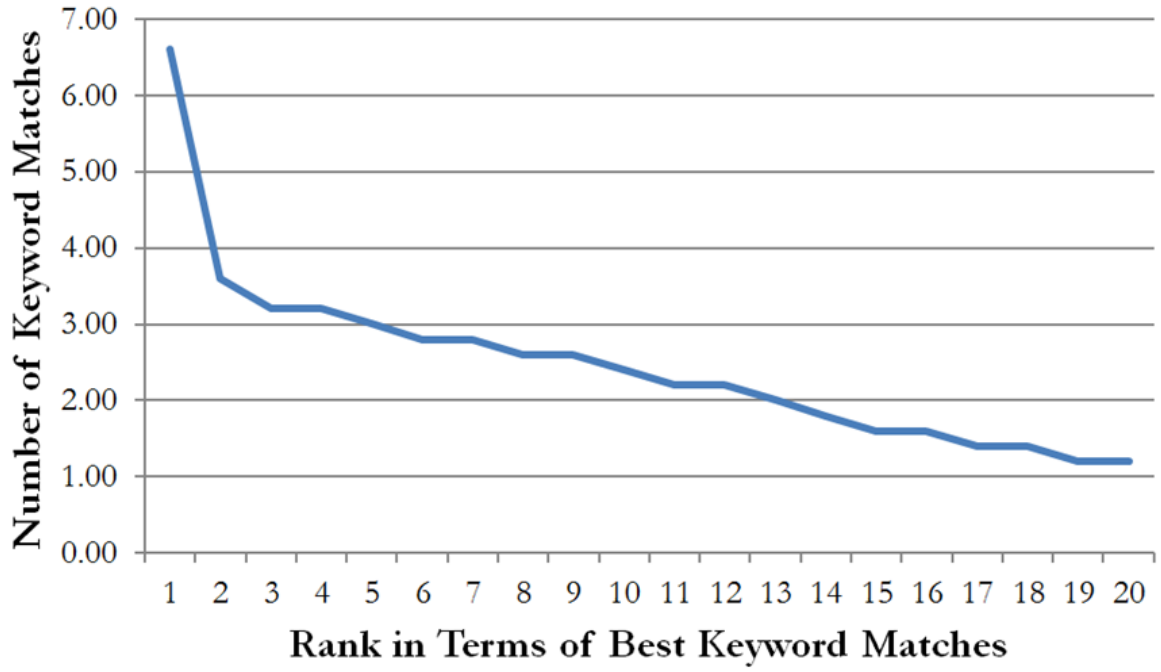
Trained standards professionals reviewed the best matches for each CCTC standard to ensure that the CCTC standard was properly assigned to its category (Aligned, Partially Aligned, Not Aligned). Experience in examining the keyword matches over multiple states suggested that alignment (if it was

[3] The GSX Alignment Tool is a proprietary alignment analysis research tool developed by Global Skills X-Change (GSX).
[4] See the following articles and citations for a review of algorithmic alignment tools:
http://people.oregonstate.edu/~marshaby/Papers/ReitsmaMarshallChart_StandardsCrosswalking_JASIST2012.pdf
http://digitalcommons.usu.edu/itls_facpub/20/

genuine) would typically be found among the best two or three matches to a CCTC standard. The figure below shows a typical scree plot of keyword matches for an aligned standard.

This scree plot reflects the drop in the probability of an alignment after the first few best matches. To reduce the likelihood of missing a matching standard, however, the researchers reviewed the top five matching standards. CCTC standards that were well represented were placed in the "Aligned" category, CCTC standards that were only partially addressed by the state standards were placed in the "Partially Aligned" category, and CCTC standards that had little or no match in the state standards were deemed "Not Aligned."

Typical Scree Plot of Keyword Matches for an Aligned Standard



DEFINING ALIGNMENT

During the alignment analysis two stages occurred: 1) an automated keyword search and 2) a determination of alignment.

The results of stage one are what can be considered a "crosswalk" of content based on carefully developed keywords. A crosswalk is an approach commonly used in educational settings that consists of a simple determination of whether particular content is being covered in standards or curricula.

It is in stage two where the alignment determinations took place and are of particular use and interest to state CTE leaders. ***Alignment, as defined in the present study, requires both the content (objects and modifiers) and verbs (level of proficiency).*** For example, educators would agree that "Develop a business plan in Agriculture, Food and Natural Resources (AFNR)" is not the same standard as "Understand components of a business plan in AFNR". Therefore, in order for a state standard to be fully aligned to a particular CCTC standard there must be agreement between all components of the standards. The table below highlights the rules for determining Aligned, Partially Aligned and Not Aligned.

LEVELS OF ALIGNMENT			
	VERB	OBJECT	MODIFIER
ALIGNED	✓	✓	✓
PARTIALLY ALIGNED		✓	✓
NOT ALIGNED			

Therefore, alignment should be interpreted in light of both content and level of proficiency. The unit of analysis in the present study was the CCTC statements that are defined as end-of-program of study standards. As such, it is unlikely that standards targeting specifically the secondary (and not postsecondary) learner level would align to the CCTC in its entirety. A more in-depth discussion on the limitations, scope and assumptions of the study is presented next in order to guide the reader's interpretation of the results.

Interpreting the Results: Limitations, Scope & Assumptions of the Study

Each individual state/territory report should be reviewed in light of the limitations of the current study. Only then can the reader fully understand the results. The breadth of the study was considerable in that it strove to analyze CTE standards and associated policies established in both secondary and postsecondary programs across all states and territories in the United States during a short period of study (February 2013 – July 2013). The purpose of this study was to (a) provide a high-level overview of the policies supporting each state/territory's CTE standards and (b) to determine the degree to which the state CTE standards align to the CCTC standards and Career Ready Practices. In accordance with the vast breadth of the study and short timeframe allocated for research, a high-level scan of the policies of each state was conducted, as was an alignment study that was assisted using technology (the GSX Alignment Tool).

The data and the analyses are meant to be descriptive (based on the standards-related data collected for each state at the time of the study), and not evaluative. The results are presented to provide state/territory CTE stakeholders with technical information that might assist them if they choose to align their standards to the CCTC.

The research team was asked to collect data using methods that minimized the burden on the states. For example, researchers were permitted to conduct a one-hour interview with each CTE State Director and associated staff (if available). Any additional data were to be collected without burden on the state, and was therefore collected from the state website during the period of February through July of 2013. Some State Directors were just starting their tenure at the time of the interview and may have had limited institutional knowledge, and state websites may not have been updated with the latest information. Thus, it is possible that the State Director and the data available on the website may not have been sufficient to adequately portray the policies or fully define the appropriate state CTE standards.

To ensure proper instrumentation of the research, the researchers included only the data that met the criteria listed in Exhibit A. Also, in accordance with the Carl D. Perkins Career and Technical Education Act of 2006 (Perkins) definition of CTE Programs of Study, only secondary and postsecondary policies

and standards were included, and those standards and policies were included mainly if they were acknowledged by the State Director during the one-hour interview.

EXHIBIT A

Criteria for Data Inclusion

State CTE Standards	• Clearly defined expectations of what students should know and be able to do at the end of a CTE program (i.e., verb + object statements related to a Career Cluster, Career Pathway, or Career Ready Practice) • Publicly available or provided by the CTE State Director/Staff • Acknowledged by the State Director during the interview • Approved/adopted by state • Not reproductions of standards that are present elsewhere (e.g. industry/national standards; The National Career Clusters Knowledge & Skill Statements)
Policy Information	Obtained in the interview with State Director/Staff or through supporting policy documentation provided by State Director/Staff. Given that state websites may not have the updated policy information, researchers used information gleaned from websites in a supporting role only.

The alignment portion of the study addresses the degree to which the state/territory standards of what students should know and be able to do are represented in the CCTC standards. Alignment studies of educational material, in general, tend to contain limitations related to the subjectivity of the term "alignment." In the level-of-alignment table presented previously, the definition of alignment for the present study is highlighted (i.e., agreement between the state standards and the CCTC statements in verb, object and modifier) and goes beyond what is traditionally used to determine alignment—a "crosswalk" of content.

The methodology used in the present study strives to reduce the subjectivity by using advanced algorithms that are free of random human error and that are validated by trained standards professionals to make final alignment determinations. It was found that the advanced algorithms coupled with the trained standards professionals were the most reliable method of generating valid alignment determinations. Subject matter expert variability in judgments posed a risk to reliability and consistency within and across states, while standards professionals coupled with the advanced algorithms were evidenced as more reliable and as valid in their judgments while still maintaining an objective, third-party stance.

Alignment was conducted within Career Clusters only. In other words, only those CTE standards assigned to a particular Career Cluster were used to judge the alignment of CCTC Standards within that Career Cluster or Career Clusters. In the event that a state did not list their CTE standards in terms of the 16 Career Clusters or 79 Career Pathways aligned with The National Career Clusters Framework, researchers assigned the standards to Career Clusters. Typically, standards were assigned to one Career Cluster (or to the Career Ready Practices area) only. However, if the standard made explicit reference to a career clearly listed in the definition of a second Career Cluster, that standard was also applied in that second Career Cluster. Thus, with the exception of Career Ready Practices, the analysis provides for

assignment of CTE standards to multiple Career Clusters only when those standards explicitly refer to careers in those other Career Clusters.

State CTE standards vary in their format and specificity, and the rules developed to address this variance have important implications for the alignment judgments provided. A CCTC standard was judged as "Aligned" only if a particular state CTE standard addressed the CCTC standard with a verb, object and modifier equal to or greater than the CCTC standard. Thus, if the CTE Standards included multiple relevant statements that, by themselves did not address the breadth and depth of the CCTC standard, a judgment of "Partially Aligned" was applied. The definitions of each alignment level are provided in Exhibit B.

EXHIBIT B

Definitions of Different Levels of Alignment

The degree to which the statements in the CCTC standards and Career Ready Practices are represented in the state standards provided.

- ***Aligned*** **indicates that the State Standards address the CCTC standard.**
- ***Partially Aligned*** **indicates that the State Standards address the CCTC standard in part due to granularity differences and/or terminology differences.**
- ***Not Aligned*** **indicates that the State Standards are not addressing the CCTC standard based on the data provided.**

The extent to which a CCTC standard is considered aligned is dependent on a variety of factors related to the input (i.e., state standards) as well as what the state standards are being compared to (i.e., CCTC standards). One important factor to consider is that the CCTC are meant to be end-of-program of study standards. That is, these are standards that a student should meet after postsecondary education in the Career Cluster/Career Pathway. Importantly, most state standards are course-level, occupation-specific standards that are narrower in scope than, and therefore unlikely to be fully aligned to, the CCTC standards. Many state standards are pegged completely at the secondary level, while the CCTC are at the program-of-study level. As such, it should **not** be expected that all standards in a CCTC Career Cluster be 100% aligned with CTE standards designated to secondary students. Therefore, the results, especially the secondary results, should be interpreted with caution.

Lastly, the percentage of standards aligned, partially aligned and not aligned are presented for each Career Cluster in the state reports. These percentages are not related to passing or failing markers or categorizations such as A, B, C, D or F. For example, if 20% of standards are aligned for a particular Career Cluster, this does **not** imply a failing "grade." The purpose of these results is to provide additional insight into alignment so that state/territory CTE stakeholders can make informed decisions about their CTE standards.