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U.S. Department of Education, Office of Innovation and Improvement

Assessment Technology Standards Request for Information

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U.S. Department of Education,
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Assessment Technology Standards Request for Information

Public Consulting Group, Inc. (PCG) is pleased to submit this response to the RFI issued by the U.S. Department of Education, Office of Innovation and Improvement. The following sections include our qualifications for responding to this RFI and responses to the following areas:

- 3.2.12 Results Capture
- 3.2.13 Results Privacy
- 3.2.12 Results Capture
- 3.2.13 Results Privacy
- 3.2.14 Anonymization
- 3.2.15 Scoring and Analysis of Results
- 3.2.15.1 Results Aggregation and Reporting
- 3.2.16 Sequencing
- 3.2.25 Metadata

Public Consulting Group

About Public Consulting Group

Established in Massachusetts in 1986, Public Consulting Group, Inc. (PCG) is a management consulting firm offering strategic planning and implementation, operations improvement, policy development, financial management, systems development, rate setting, revenue maximization, and other management advisory services to government and private health and human services providers. As a privately held company, PCG has the flexibility to properly serve our public sector clients with the highest level of customer service. More than 95% of PCG's clients are public sector agencies or agency providers such as school districts, county offices of education, state departments of education, state and county departments of mental health, developmental disabilities, Medicaid, social services, public welfare, county governments and multicounty entities, cities, and municipalities.

PCG is comprised of four divisions: Education, Health and Human Services, Technology Consulting, and Consumer Direction of Care. This structure allows PCG to address a broad range of public sector needs. It also allows the firm to assemble multidisciplinary teams when required, taking advantage of the specialized expertise and experience of each practice area to address the multidimensional objectives of public sector agencies. The firm currently employs over 800 full-time staff in 31 office locations. We have the financial stability, resource depth, and strategic expertise to ensure the quality and applicability of our services to ISBE.

About PCG Education

In 1992, PCG began providing education consulting services and products to Boston Public Schools to modernize school-based Medicaid billing and to provide an easy and innovative approach for clinicians to document services. In the last 18 years, PCG Education has developed considerable expertise and has achieved numerous successes working with school districts, state departments of education, and Medicaid agencies since our initial work with Boston Public Schools. Our areas of expertise include:

- Education Analytics and Data Capacity Services
- Special Education Program Evaluation and Audit Services
- Special Education and At-Risk Student Data Management
- Response to Intervention (RTI), Positive Behavior Supports (PBS) and Education Plans Solutions
- Professional Development and Coaching on district and school-level use of data
- Literacy and Learning
- Strategic Planning and School Improvement
- School-Based Medicaid Reimbursement Services
- Operations Improvement and Financial Consulting Services

Working with school districts and state departments of education ranging in size from 500 to 1.5 million students, PCG Education has the knowledge and expertise to provide a full spectrum of data-based services informed by research and the practical experience of our staff. PCG Education currently has over 800 contracts in 32 states plus Puerto Rico, the US Virgin Islands, Ontario, Quebec, Alberta, Saskatchewan, and British Columbia, Canada. In addition, PCG Education currently serves twelve state departments of education (Arizona, Colorado, Illinois, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, New Hampshire, New Jersey, Tennessee, and Wisconsin) and 13 of the top 25 largest school districts in the nation.

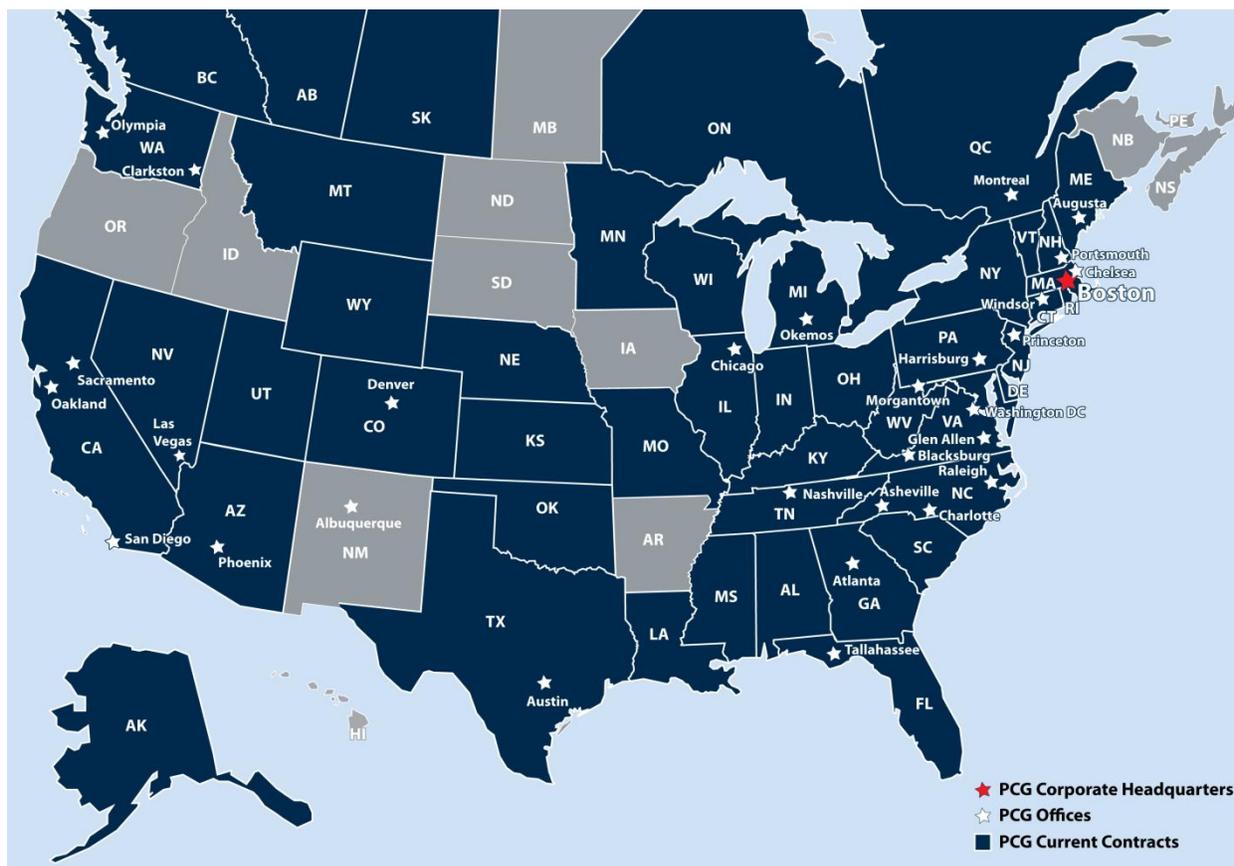


Figure 5.1 PCG Education Contract Locations

As a result of vast experience in the marketplace and a highly knowledgeable staff, PCG Education has a near perfect client retention rate—this is largely due to understanding clients’ needs, efficiently fulfilling our contractual obligations, and continually exceeding client expectations. PCG Education’s track record demonstrates the ability to improve outcomes for clients resulting in long-term relationships, contract extensions, and re-awards.

Experience in Data Models

State Core Model. PCG Education, in partnership with the Council of Chief State School Officers (CCSSO), is leading a national effort to establish a common technical reference model for states implementing state longitudinal data systems (SLDS). The State Core Model was developed for CCSSO as part of the Common Education Data Standards (CEDs) adoption work with funding from the Gates Foundation¹.

¹ The State Core Model will be used by the CEDs Adoption Implementation Task Force (AITF) to validate, improve, and expand future versions of the standards. It incorporates and acknowledges work previously published,

The Model includes early childhood (EC), elementary and secondary (K12), post-secondary (PS), and workforce (WF) elements, known collectively as “P20,” and establishes comparability between sectors and between states.

The core purpose of an SLDS is to fulfill federal reporting (EDEN/EDFacts) and to support SEA, LEA, and research data-driven decision making. The Model could enable states to vastly reduce the number and burden of data collection by replacing 625 distinct Federal reporting types with record-level data collections. In addition, it is designed to support dropout early warning intervention systems (DEWIS), positive behavior intervention systems (PBIS) and response to intervention (RTI), balanced scorecard performance management.

The Model is designed to address unique, complex P20 SLDS relationships, business rules, and entity factoring including: properly distinguishing “official” versus “un-official” (but possibly more current) data; source files with different and or non-existent start and end dates; complex relationships between organizations; and people with multiple roles in multiple organizations including student-teacher linkage. It addresses student-teacher link, common assessment data model, and comes pre-loaded with Common Core learning standards.

National Education Data Model. The National Education Data Model project is a United States Department of Education project to create a catalogue of data used in education and a description of the relationships among those data. Its mission is to create an open framework based on current standards for education data systems.

- The first major release of NEDM is published by USED National Center for Education Statistics (NCES) at <http://nces.ed.gov/forum/datamodel/>. This version deals solely with K-12 education at a conceptual level. Version 1 recognizes the top-level role of entities, attributes, relationships, and taxonomies.
- The second major release of NEDM is currently under development by CCSO and the SIF Association for USED. A draft view is published at <http://nces.sifinfo.org/datamodel/>. This draft version does not yet reflect official USED policy nor is it necessarily the final form-it is a work in progress. This Fall, a multi-level public participation process to release version 2.0 as a deliverable to USED with validation and alignment activities occurring with states, districts, post-secondary institutions, and the early childhood community. NEDM version 2.0 is expected to be published in December 2009.
- A Standards Comparison report was created using NEDM to identify a sub-set of NEDM-2. It resulted from an attempt to merge into a common set the list of ‘elements’ <entity.attribute> for students, programs, school districts, and post secondary institutions including:
 - EDEN/EDFacts record level elements
 - National Center for Education Statistics (NCES) Handbooks
 - School Interoperability Framework (SIF) v2r3
 - Post-secondary Electronic Standards Council (PESC)
 - Data assurance called out in the American Recovery and Reinvestment Act (ARRA)

specifically the National Center for Education Statistics (NCES) data handbook, National Education Data Model (NEDM) v2.0, Early Childhood Data Collaborative (ECDC) recommendations, School Interoperability Framework (SIF) v2.4 specification, Post-Secondary Electronic Standards Council (PESC) schemas, State Higher Education Executive Officers (SHEEO) State of State PS Data Systems report , and Common Education Data Standards v1.0.

- The ten check points of the Data Quality Campaign (DQC)
- NEDM State Core Data Set: A team lead by PCG is working with participating states to refine the Standards Comparison Report into a common set of entity.attribute elements called the State Core Data Set. This set is a common data view that all SLDS could share that would produce EDFacts aggregates, meet ARRA assurances, and fulfill LDS application priorities. A Data Site Visit team is to validate and add to the NEDM State Core sub-set of NEDM by visiting selected states and creating a self-assessment mapping tool for additional states. This team is staffed by experts drawn from Public Consulting Group and ESP Solutions Group under the administration of the SIF Association.

LEARN. The National Education Data Model does more than bring together a national consensus on education data standards. The NEDM State Core Data Set establishes a common foundation in each participating state for the next generation of state longitudinal data systems (SLDS), integrated into a common national e-education “platform” called “LEARN.” The Learning Exchange and Resource Network (LEARN) is a CCSSO-led, multi-state collaborative designed to fulfill Federal funding requirements and priorities and to accelerate state-based, K-20 education data system adoption. LEARN will create a national “utility” that provides secure, longitudinal, record-level data to authorized and identified students, teachers, educators, researchers, and vendors. LEARN is:

- A single national architecture for state education data systems and digital learning objects developed in collaboration with participating states and supported by the National Education Data Model.
- 52 identical entity-level (student, staff, org) data structures managed by each state education agency or its designee.
- An unlimited ecosystem and marketplace of public and private application and content providers that makes use of the LEARN platform to deliver personalized learning for students and continuous improvement for educators, schools, and districts.

The central vision of LEARN is to enable pervasive personalization of learning and differentiation instruction. Like a car navigation system, LEARN will establish the current location of each student and provide multiple paths for both classroom-based differentiated instruction and outside interventions to support all our Nation’s students achieve the common set of state academic standards.

LEARN is intended to provide participating states with immediate benefit increasing USED EDFacts reporting compliance and fulfilling the requirements and priorities of Race to the Top and other major Federal grant opportunities stressing K-20 data use. LEARN will facilitate exchange of best practices by tightly aligning with Colorado’s open source growth model and Wyoming’s student-section-teacher statewide SIF implementation. LEARN will also harness the research community in higher education and elsewhere to mine the correlations and explore the underlying patterns that maximize student success.

3.2 Assessment Technology Standards

The following contains our responses to selected sections of the assessment technology standards RFI.

3.2.12 Results Capture

How can technology standards accurately link individual learners, their assessment results, the systems where they take their assessments, and the systems where they view their results? How do technology

standards accurately make these linkages when assessments, content, and other data reside across numerous, distinct learning and curriculum management systems, sometimes maintained by different organizations?

PCG Response

The CCSSO's State Core Model provides an example for how to link individual learners, their assessment results, the systems where they take their assessments, and the systems where they view their results, despite having this information housed in distinct managements systems. The State Core Model achieves this link by establishing comparable metadata standards among data sets, and by linking through a unique structure of person-person, organization-organization, and person-organization relationships.

The State Core Model is able to link diverse collections by creating a comprehensive model of elements – including attributes of students, organizations, assessments and assessment items, and so on -- with comparable metadata standards. The various data systems in which assessment, content, and other data reside are then mapped to the common model, which is streamlined to eliminate redundant elements. By mapping separate data systems to the comprehensive model, states and organizations create crosswalks between data sets.

The other feature necessary for linking students to their assessment results, especially over time, is to understand that people must remain consistent, despite varying or multiple roles and relationships with organizations. The State Core Model maintains an integrated, current view of each person by differentiating between those attributes that belong to the person – and move with the person throughout time – versus attributes that exist only in the context of a person's relationship with a particular organization.

Person: For the most part, Person attributes are associated with a particular Person-Organization Relationship. People tend not to have roles or types outside of their relationship to an organization. A person is not a student unless and until they are enrolled in a school. The types of elements directly attributed to a person include things like name, demographics, and unique IDs. It is through the use of (and crosswalking of) unique person IDs that the State Core Model is able to link data across multiple P20 domains.

Organization: Organizations are entities that are not people. The most common type of organizations are public schools and local education agencies (school districts), however, there are many other types and sub-types. Organizations also carry unique IDs, as so sub-types within organizations. The use of organization IDs allows an organization to be linked with a person in a person-organization relationship.

Person-Organization Relationship: The Person-Organization Relationship component of the State Core will contain a greater volume of data then all the others combined. It will hold a standard representation of each change in relationship between a Person and an Organization. Examples of these relationships include every time a student enrolls in a school or changes grades over the summer, or

every time a teacher changes assignments within a district. In addition to storing the relationship between people and traditional organizations, it must also hold the relationship between other groups of people used for counting at particular dates for state and Federal reporting.

This Person-Organization Relationship must be the central component to the more normalized, “operational” portion of the data warehouse. Most importantly, each change in relationship between a person and organization must record a single start date and, if applicable, end date. This subject establishes a common time dimension and is essential for creating proper snapshots of data at particular “as of” dates to fulfill state and Federal reporting.

Standards and Assessments: Neither a person nor an organization, Standards and Assessments have relationships to both People and Organizations. They include Assessments, Assessment Result Sets (Student Scores), and Learning Standards. They are entities that can be linked to the students who take them, as well as to the teachers and organizations that administer them.

The State Core Model is able to distinguish between people, organizations, and person-organization relationships through the use of three interconnected technical schemas of data that could be created from each state's SLDSs:

1. The *operational data store* (ODS) layer represents the SLDS's most current data. The ODS is normalized and optimized for storage of a record for each relationship between a person and organization. Attributes can be updated in an existing enrollment record or a new enrollment can be added.
2. The *entity-attribute-value* (EAV) layer provides ultimately atomic change control. A small set of tables is used to hold a record with a date for every change in value for an attribute of an entity. The EAV is the auditing data store with a complete log of all data modifications.
3. The *reporting data store* (RDS) layer is a “flat” “star schema” optimized for reporting. The primary structure is a snapshot of active students enrolled as members and teachers assigned to schools on a specific day. Additional data marts are created to support specific reporting requirements, such as EDEN, balanced scorecards and other school and district aggregate reports.

3.2.13 Results Privacy

How do technology standards enable assessment results for individual learners to be kept private, especially as assessments results are transferred across numerous, distinct learning systems? How can such results best be shared securely over a distributed set of systems managed by independent organizations that are authorized to receive the data, while still maintaining privacy from unauthorized access?

PCG Response

The options listed below are possible methods to share student data. The steps below do not illustrate the sole method possible for sharing data under the current restrictions but offer one example of how the state may proceed. Additionally, the steps below might not address privacy concerns specific to the initiatives that could come from this deliverable. Steps to overcome privacy barriers may need to be taken to adjust current data sharing allowances.

- **Option 1: Share Directory Information.** The first option considers the exception above that states that directory information can be shared without the student's prior consent. Note that social security numbers cannot be shared under this option. Each education agency defines directory information. Directory information is published or made available to participating agencies.
- **Option 2: Share De-Identified Student Information.** Education agencies may disclose information to organizations conducting research. This information may not be personally identifiable. Mask data set so it contains only de-identified data (no SSN, address, phone, parents' names, etc.). No individual consent necessary. For examples of how the State Core de-identifies data, see the response to 3.2.14 below.
- **Option 3: Share Data with an Authorized Representative.** An "authorized representative" of an SEA is an employee or contractor that performs duties directly on the behalf of the SEA. Each agency identifies individuals and other agencies that meet the criteria of an Authorized Representative and determines activities required of the authorize representative. Draft and implement MOU that outlines the permissible activities of the authorized representative and distribute to agencies that have been determined to have administrative purposes that meet the criteria of an authorized representative. When possible, utilize existing MOUs to draft data sharing agreements.
- **Option 4: Seek Individual Consent.** Provide students/guardians with a consent form to release their personal information for the data interoperability effort. Work with LEAs to establish a routine consent form process. One option is to include a question on enrollment forms regarding the release of personal information for case management, program evaluation and research purposes only.

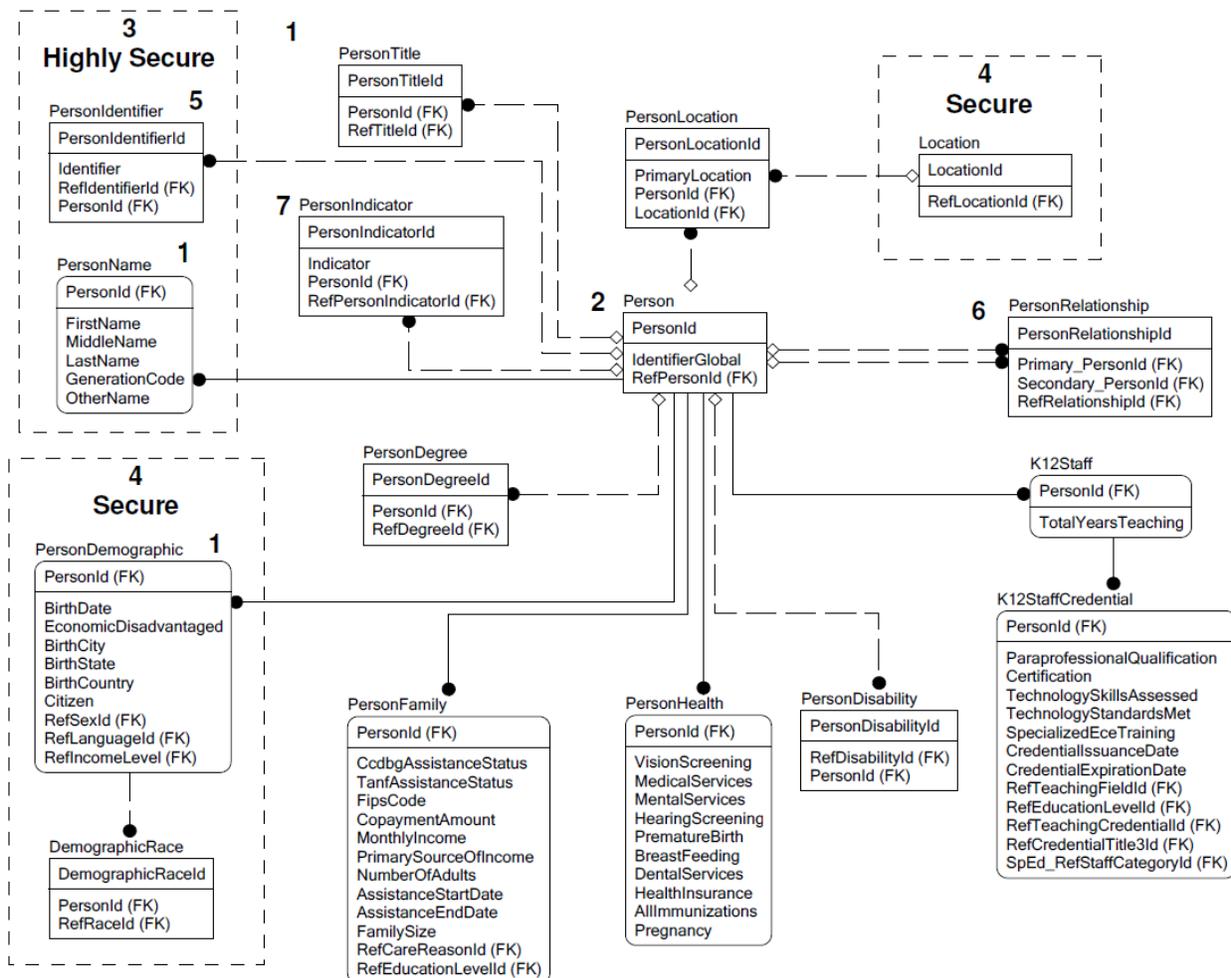
3.2.14 Anonymization

Do technology standards or technologies permit or enable anonymization of assessment results for research or data exchange and reporting? How do various technology standards accomplish these tasks? For example, where a number of students take a test, can their answers be anonymized (through aggregation or other techniques) and shared with researchers to examine factors related to the

assessment (e.g., instructional inputs, curriculum, materials, validity of the instrument itself) without revealing the identity of the learners? Is this an area where technology standards can help?

PCG Response

The State Core Mode, which links assessment data to individual student identities as described in 3.2.12, is able to de-identify that information for research or data exchange and reporting. The following image shows the subject detail for People within the State Core Model:



Key features include:

1. PersonName and PersonDemographic tables are shared across all types of people and can be more strictly controlled to restrict record and aggregate access in compliance with FERPA.
2. The PersonID in the Person table is a synthetic key (generated by the system).

3. The PersonIdentifier table holds all types of Person IDs including the following types stored as a reference list in RefPersonIdentifier field: Social Security Number², EC Local ID, EC State Assigned ID, K12 Local ID, K12 State Assigned ID, PS Institution ID, and PS State Assigned ID. PersonIdentifier and PersonName should be considered highly secure and should not be made available to any individual without clear authorization under FERPA and/or HIPPA. Highly secure tables can directly identify records associated with specific people. This information must be used for identity resolution and access by educators with legitimate educational interests.
4. PersonDemographic and Location almost must be kept secure at the record level as they can be used to identify individuals, however, they often play an important role in research and reporting, particularly in aggregate. Low N masking should be used when reporting this data to ensure that privacy is preserved.

3.2.15 Scoring and Analysis of Results

How can technology standards be used for the scoring, capture, recording, analysis or evaluation of assessment results?

PCG Response

Technology that is developed in harmony with a common data model such as the State Core Model (see response to 3.2.12) will allow easy capture, recording, and analysis of assessment results, because it will link assessments to the people and organizations associated with them, and will link assessment scores to student information such as demographics, enrollment, and so on.

3.2.15.1 Results Aggregation and Reporting

How can technology standards enable assessment results to be aggregated into statistical or other groupings? How can technology standards provide capabilities for results (aggregated or raw) to be reported across multiple technology systems? For example, if a learner takes an assessment in one system, but the results are to be displayed in another, how do technology standards address transferring results across those systems? How do technology standards address aggregation of results for a number of learners who are assessed in one system and whose results are displayed in yet another technology system? Can anonymization controls be included with aggregation and reporting solutions to ensure individual data privacy and protection (see also 3.2.14 above).

PCG Response

Technology that is developed in harmony with a common data model such as the State Core Model (see response to 3.2.12) can enable results aggregation and reporting. The State Core Model links assessment data with the students assessed and the organizations that administer assessments.

² It should be understood that Social Security Number must be optional for the model and should be used only for sanctioned workforce activities. In some cases workforce IDs are used for non-citizens as a replacement for SSN.

Through the various maps within the State Core Model, data can be aggregated along the lines of any element found within the Model. The State Core Model can also provide a crosswalk for any data systems that are mapped to it.

3.2.16 Sequencing

How do technology standards enable assessment items stored within an assessment instrument to be sequenced for appropriate administration, when the assessment consists of more than a single linear sequence of items? For example, how do technology standards address computer-adaptive assessments? How are the logic rules that define such sequencing embedded within a technology standard?

PCG Response

The Standards and Assessments portion of the State Core Model contains an Assessment Item entity, within which are tables and fields describing individual items, their characteristics, predecessors, and relationships. Assessment technology capable of linking to and mining the information in this data model will be able to customize the sequence of items in a computer-adaptive assessment.

3.2.25 Metadata

What kinds of metadata about assessments (i.e., information describing assessments) are permitted to be stored within technology standards or technologies? How do technology standards accommodate structured data (such as new State curriculum standards) that were not anticipated when the technology standard was designed? How are metadata describing unstructured (such as free-text input) and semi-structured data incorporated within assessment technology standards?

PCG Response

Assessment metadata can be stored in a data model such as the State Core Model, to which the assessments, assessment results, and learning systems are mapped. Changes that are made to metadata can be made once in the State Core Model, and will automatically be reflected in any data sets that are mapped to it.

The following diagram shows the subject detail for Standards and Assessments within the State Core Model:

