November 2019

Interoperable Learning Records Landscape Inventory

Staff at the White House compiled this inventory to provide insight into the current landscape of interoperable learning records (ILRs) as of November 2019. There is currently no intention to update the inventory for subsequent periods.

Many of the stakeholders referenced in the inventory contributed to the compilation of the included information.

The inventory is broken out into five sections:

1. Secure Issuing and Verification Protocols (page 3)
2. Data Standards (page 9)
3. Ontologies/Frameworks (page 21)
4. Implementations, Pilots, and Implementation Support Networks (page 26)
5. Products and Services (page 49)

At the beginning of each section is a definition and the format for the entries contained in the section.

Note that the inventory is not intended to be comprehensive. Included entities were contacted to alert them to their inclusion in this document. All information contained is public information. Inclusion or exclusion of any entities in or from this document is not intended to serve as an endorsement or disapproval of the entity.
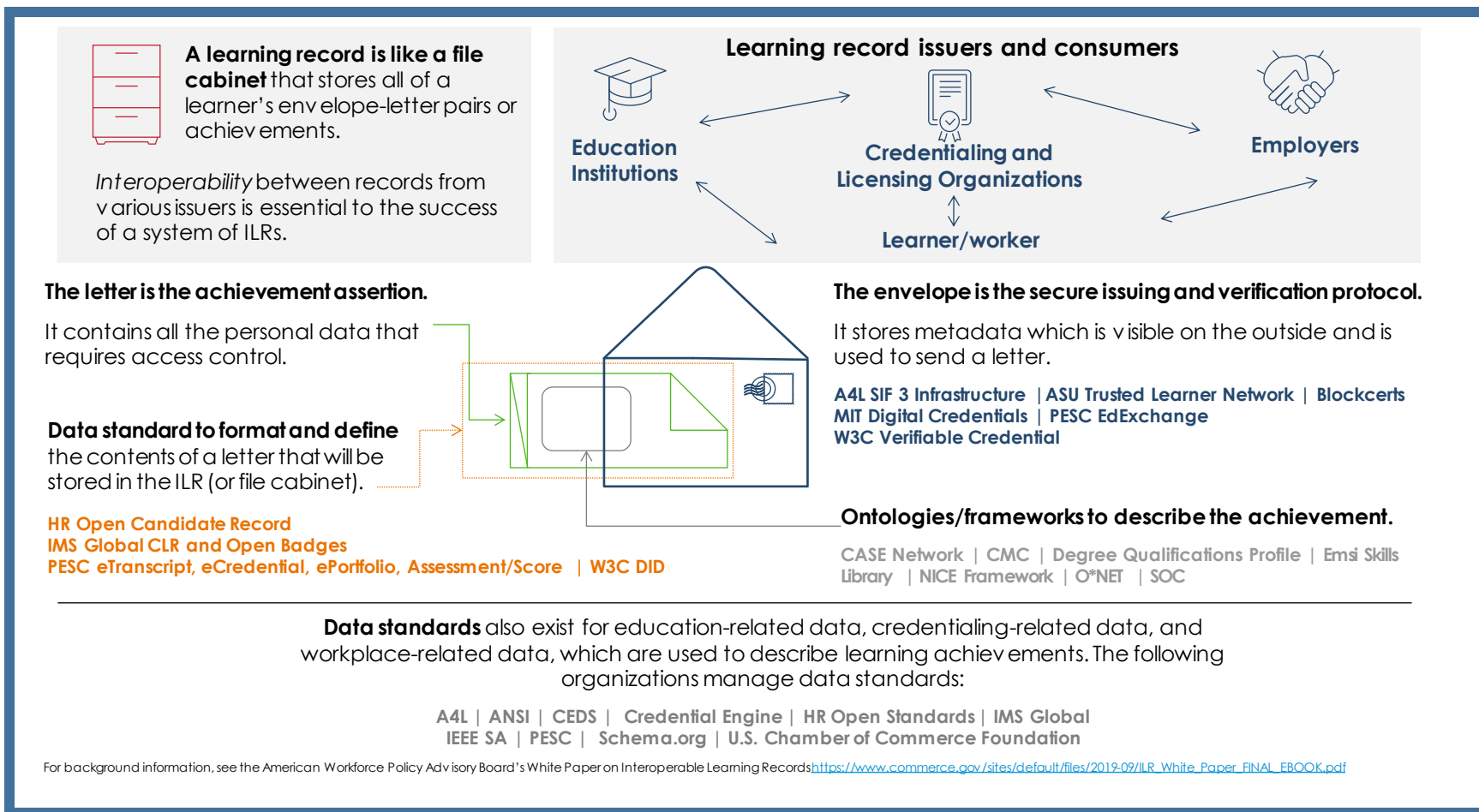
This inventory is in response to a recommendation of the American Workforce Policy Advisory Board set forth in the September 2019 White Paper on Interoperable Learning Records.[1]

The white paper defines ILR protocols using the metaphor of a file cabinet. This inventory references that metaphor. As noted in the white paper, ILR protocols could operate at four layers, with more to emerge as necessary:

 • The file cabinet (ILR): allows the curation and sharing of learner credentials.

• The envelope: verifies the integrity of credential data and issuer/learner identity.

• The letter: contains content details of a specific credential issued to a learner.

• The ontology: represents common language and schemas for occupations, jobs, competencies/ skills, and credential types, etc.

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[1] https://www.commerce.gov/sites/default/files/2019-09/ILR_White_Paper_FINAL_EBOOK.pdf

A learning record is like a file cabinet that stores all of a learner's envelope-letter pairs or achievements.

Interoperability between records from various issuers is essential to the success of a system of ILRs.

Learning record issuers and consumers

Education Institutions

Credentialing and Licensing Organizations

Employers

Learner/worker

The letter is the achievement assertion.

It contains all the personal data that requires access control.

Data standard to format and define the contents of a letter that will be stored in the ILR (or file cabinet).

HR Open Candidate Record
IMS Global CLR and Open Badges
PESC eTranscript, eCredential, ePortfolio, Assessment/Score | W3C DID

The envelope is the secure issuing and verification protocol.

It stores metadata which is visible on the outside and is used to send a letter.

A4L SIF 3 Infrastructure | ASU Trusted Learner Network | Blockcerts
MIT Digital Credentials | PESC EdExchange
W3C Verifiable Credential

Ontologies/frameworks to describe the achievement.

CASE Network | CMC | Degree Qualifications Profile | Emsi Skills Library | NICE Framework | O*NET | SOC

Data standards also exist for education-related data, credentialing-related data, and workplace-related data, which are used to describe learning achievements. The following organizations manage data standards:

A4L | ANSI | CEDS | Credential Engine | HR Open Standards | IMS Global IEEE SA | PESC | Schema.org | U.S. Chamber of Commerce Foundation

For background information, see the American Workforce Policy Advisory Board's White Paper on Interoperable Learning Records https://www.commerce.gov/sites/default/files/2019-09/ILR_White_Paper_FINAL_EBOOK.pdf

SECURE ISSUING AND VERIFICATION PROTOCOLS

Secure issuing and verification protocols provide the infrastructure for issuing, sharing, and verifying credentials. These items are representative of the "envelope" in the ILR metaphor. These protocols store the metadata items such as the issuer of an achievement, the date issued, and the type of achievement. This information is visible to anyone as is the information on the outside of an envelope.

Metadata is data that provides information about other data. The main purpose of metadata is to facilitate the discovery of relevant information. Metadata helps organize electronic resources, provide digital identification, and support archiving and preservation of the resource.[2]

Format for secure issuing and verification protocols entries:

- Developing organization
- Technology
- Key features

Blockcerts
https://www.blockcerts.org/about.html

Developing organization
The initial design was based on prototypes developed at the MIT Media Lab and by Learning Machine. For ongoing development, this open-source project actively encourages other collaborators to get involved. The MIT Media Lab is not actively involved in the ongoing development.

Technology
Blockchain

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[2] "Frequently Asked Questions: Understanding the Public-Private Credentialing Data and Technology Ecosystem of the Credential Transparency Initiative." Credential Transparency Initiative. More information on this initiative is available at: http://connectingcredentials.org/resources/credential-transparency-initative-cti/.

Key features
Blockcerts is an open standard for creating, issuing, viewing, and verifying blockchain-based certificates. These digital records are registered on a blockchain, cryptographically signed, tamper-proof, and shareable. The goal is to enable a wave of innovation that gives individuals the capacity to possess and share their own official records. They invite feedback, contributions, and general discussion. The goal of this community is to create technical resources that other developers can utilize in their own projects.

Digital Credentials
https://digitalcredentials.mit.edu/
MIT Media Lab: https://www.media.mit.edu/projects/media-lab-digital-certificates/overview/

Developing organization
Founding members: Delft University of Technology (The Netherlands), Harvard University (USA), Hasso Plattner Institute of Potsdam (Germany), Massachusetts Institute of Technology (USA), Tecnologico de Monterrey (Mexico), Technical University of Munich (Germany), University of California at Berkeley (USA), University of California at Irvine (USA), and the University of Toronto (Canada)

Technology
The Digital Credentials Consortium is exploring public key infrastructures, public ledgers, and blockchains to rethink the way to recognize and transact with academic achievements.

Key features
Infrastructure for digital verifiable credentials of academic achievement. The infrastructure aims to be a trusted, distributed, and shared infrastructure standard for issuing, storing, displaying, and verifying academic credentials.

EdExchange
https://edexchange.pesc.org/home#/home

Developing organization
The Postsecondary Electronic Standards Council (PESC) was established in 1997 at The National Center for Higher Education. PESC operates as an international 501(c)(3) non-profit, community-based, umbrella association headquartered in Washington, D.C. Member organizations include: data, software, technology service providers and vendors; schools, districts, colleges and universities; college, university and state/provincial systems; local, state/provincial and federal government offices; professional, commercial and non-profit organizations; and non-profit associations and foundations. PESC approved standards, technology, and services are community-sourced. PESC serves as an incubator and standards-development body.

Technology
The EdExchange software is open source so you can extend and configure it as needed. Using the reference directory and network server code as a base, you can send and receive documents for free. To receive documents you'll also need to host a network server, use the reference network server app, create your own custom app, or integrate EdExchange with an existing app at your institution.

Key features
EdExchange is a data exchange service offered and operated by PESC and directly managed by PESC Members. The foundation of the service is a directory 'look up' server or 'platform' to which institutions, vendors, service and data providers that are able to exchange data electronically subscribe. The directory server lists, or itemizes, the technical capacity of each user, the document types supported electronically and additional identifier data. To exchange data, users then connect directly with the respective recipient. While EdExchange is built on open standards and web services architecture, any type of data in any format can be exchanged over EdExchange.

EdExchange is in production and supported by: Credentials Solutions, Digitary, Educational Credential Evaluators, National Student Clearinghouse, Oracle, Parchment and University of Phoenix. EdExchange is supported by a Steering Committee, User Group and based on a subscription-based model.

SIF 3.3 Infrastructure
https://www.a4l.org/page/Infrastructure3-3

Developing organization
Access 4 Learning (A4L) Community

Technology
Secure REST-based infrastructure

Key features
SIF 3.3 is the latest release of an open standard infrastructure, which began over 20 years ago as the product neutral interface of an existing commercial message broker. SIF 3 is designed for the modern era by leveraging a REST-based approach to data exchange. The key contribution of the SIF Infrastructure is to define, coordinate, and standardize the ways in which multiple RESTful clients can access a RESTful services securely, robustly, and in real time.

SIF is not a product, but a technical blueprint for enabling diverse applications to interact and share data. SIF is designed to: facilitate data sharing and reporting between applications without incurring expensive customer development costs; enhance product functionality; and provide solutions to customers.

The SIF 3 Infrastructure has been shown to be: secure, simple to start, and scalable. It is an open standard and does require a special license.

Trusted Learner Network (TLN)

https://uto.asu.edu/initiatives/trusted-learner-network

Developing organization
Developed at Arizona State University (ASU) in a collaboration between the Office of the University Provost, the University Technology Office and EdPlus.

Technology
Blockchain

Key features
ASU's Trusted Learner Network (TLN) describes a new, secure, and decentralized approach to recording, curating, and sharing learner data on abilities and skills across the learner's lifespan. By definition, a network connects together multiple participants in a value exchange of mutual benefit. There are 12 principles of the TLN:
1. Stores learner achievements
2. Safe and secure
3. Always up-to-date
4. Issued and maintained by the entity
5. Presents current information first
6. Records learner consent
7. Shared only within the TLN
8. Co-owned by the learner
9. Open-source tools and APIs
10. Identity and access management tools included
11. Non-commercial use
12. Network of networks

Building a TLN needs to surface the key parameters of trust and the use cases on which they depend to ensure that the value is attained, and the technology under development is uniquely suited to deliver it. This requires a committed group of organizations working together, formalized in the TLN Partnership. ASU is convening a selected group of higher education, K-12, non-profit institutions, government entities and companies to take high-impact use cases, prioritized by the TLN community, and conduct rapid development,

deployment and testing of TLN blockchain proof of concept. This will validate and inform all interested parties, identify areas needing further R&D, or justify the investment in productizing the PoC. This is a curated membership organization based on a commitment, both financial and in-kind contributions, to define, build and assess applications of the TLN against real world problems and opportunities.

Verifiable Credential Authentication
https://www.w3.org/TR/vc-use-cases/#introduction

Developing organization

World Wide Web Consortium (W3C) leads the World Wide Web to its full potential by developing protocols and guidelines that ensure the long-term growth of the Web. W3C standards define an Open Web Platform for application development that has the potential to enable developers to build interactive experiences, powered by data stores that are available on any device. The full strength of the platform relies on many technologies that W3C and its partners are creating, including CSS, SVG, WOFF, the Semantic Web stack, XML, and a variety of APIs. W3C develops these technical specifications and guidelines through a process designed to maximize consensus about the content of a technical report, to ensure high technical and editorial quality, and to earn endorsement by W3C and the broader community.

Technology

The specification is a data model representation, encoded primarily in JSON-LD, and a suite of non-normative definitions, explanations, and potential business case and use case descriptions.

Key features

A verifiable credential is a structure that contains credential data including digital keys and signatures allowing it to be cryptographically verified.

From the W3C Verifiable Credential Data Model, a credential might consist of:
- Information related to identifying the subject of the credential (for example, a photo, name, or identification number).
- Information related to the issuing authority (for example, a city government, national agency, or certification body).
- Information related to the type of credential this is (for example, a Dutch passport, an American driving license, or a health insurance card).
- Information related to specific attributes or properties being asserted by the issuing authority about the subject (for example, nationality, the classes of vehicle entitled to drive, or date of birth).
- Evidence related to how the credential was derived.
- Information related to constraints on the credential (for example, expiration date, or terms of use).

A verifiable credential can represent all of the same information that a physical credential represents. The addition of technologies, such as digital signatures, makes verifiable credentials more tamper-evident and more trustworthy than their physical counterparts. Holders of verifiable credentials can generate verifiable presentations and then share these verifiable presentations with verifiers to prove they possess verifiable credentials with certain characteristics.

Both verifiable credentials and verifiable presentations can be transmitted rapidly, making them more convenient than their physical counterparts when trying to establish trust at a distance.

DATA STANDARDS
Data standards are agreed-upon sets of characteristics used to establish a common understanding of the meaning or semantics of the data to ensure correct and proper use and interpretation of the data by its owner and users. For example, it defines what each piece of information is, what formats (integer, decimal, mmddyy) are used and what the vocabulary means.[3]   Data standards define the format for the contents of a letter in the ILR metaphor. Letters are stored in the ILR (or file cabinet).   Format for data standards entries: • Description of organization   • ILR-related activities, standards and resources

Access 4 Learning Community (A4L)
https://www.a4l.org/

Description of organization
The Access 4 Learning (A4L) Community, previously the SIF Association, is a non-profit collaboration composed of schools, districts, local authorities, states, US and International Ministries of Education, software vendors and consultants who collectively address all aspects of learning information management and access to support learning.

ILR-related activities, standards, and resources
- **Unity Specification** is built using 20 years of experience by A4L volunteer members developed using open, non-proprietary and transparent processes linked to a quality control Certification Program. It contains a comprehensive K12 data model and modern transport technologies to securely move the data to provide it to the right person at the right time in the right way under local data privacy policies. https://www.a4l.org/page/Unity

- **xPress Roster, Student Records Exchange and IEP** are open, standard APIs (Application Programming Interfaces) built on the SIF 3 infrastructure, which provides schools and developers with a way to simply and securely exchange data among modern apps, whether they are hosted locally, in the cloud or on mobile devices. https://xpressapi.org

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[3] "Frequently Asked Questions: Understanding the Public-Private Credentialing Data and Technology Ecosystem of the Credential Transparency Initiative."

American National Standards Institute (ANSI)
https://www.ansi.org/about_ansi/overview/overview?menuid=1

Description of organization
The American National Standards Institute (ANSI) is a private, not-for-profit organization dedicated to supporting the U.S. voluntary standards and conformity assessment system and strengthening its impact, both domestically and internationally.

ILR-related activities, standards, and resources
ANSI provides a framework for fair standards development and quality conformity assessment systems, and safeguards their integrity. The Institute represents the diverse interests of more than 270,000 companies and organizations, and 30 million professionals worldwide. ANSI is the official U.S. representative to the International Organization for Standardization (ISO) and, via the U.S. National Committee, the International Electrotechnical Commission (IEC). ANSI is also a member of the International Accreditation Forum (IAF). Although ANSI itself does not develop American National Standards (ANSs), it provides all interested U.S. parties with a neutral venue to come together and work towards common agreements. The process to create these voluntary standards is guided by the Institute's cardinal principles of consensus, due process and openness and depends heavily upon data gathering and compromises among a diverse range of stakeholders.

Common Education Data Standards (CEDS)
https://ceds.ed.gov/

Description of organization
The Common Education Data Standards (CEDS) contain a broad scope of data element definitions spanning P-20W (early learning through postsecondary and workforce) with data models and tools for understanding and implementing the standards. CEDS is developed through an Open Source Community.

ILR-related activities, standards, and resources
The standards reflect data vocabularies developed by various industry standards bodies in addition to standards developed through public-private collaboration that represent data definitions and code sets recognized for federal reporting programs such as EdFACTS and IPEDS. CEDS include data definitions for early learning, K-12, postsecondary, career and technical education, adult education, and workforce sectors, and it has data domains for assessments, competency frameworks, credentials, learning resources, authentication and authorization, facilities, and implementation variables.

- **CEDS Data Vocabulary** includes over 1700 data element definitions and a mapping toolkit for mapping other standards and organizational data dictionaries to CEDS.

- **CEDS Align** is a web-based tool that enables users to import or input their data dictionaries, align their elements to CEDS, compare their data dictionaries with those of other users and analyze their data in relation to various other CEDS alignments. CEDS Align is designed to enable education stakeholders to understand how their data dictionaries relate to the Standards, as well as what similarities or gaps might need to be addressed in sharing data among educational sectors and across state lines.

- **CEDS Connect** enables users at different levels to consider "connections" such as metric definitions of data points, policy questions, or federal data reporting requirements by establishing the data elements necessary to answer a given connection, as well as recommend logic and routines for analysis. CEDS Connect is designed to help the education data community work together toward standard definitions and methodologies that will provide common, comparable data measurements and reporting across districts, state and multiple educational agencies. The myConnect feature builds upon CEDS Align to apply their Align maps to the elements needed for any connection.

- **CEDS Data Models**:
  - **Conceptual Model** is a canonical organization of entities based on a foundation of person, organization, role, event, and resource.
  - **DES** is a domain-entity schema used as a web interface on the CEDS website and within the CEDS tools, Align and Connect, to organize and present data element definitions organized by domain.
  - **NDS/IDS** is a P-20W logical normalized data schema (NDS) and physical integration data store (IDS) relational data model are based on superclasses/categories in the Conceptual Model.
  - **DW/RDS** is the P-20W data warehouse model and reporting data store (DW/RDS) is a star-schema data model designed initially to support state reporting needs.

Credential Engine
www.credentialengine.org and www.credreg.net

Description of organization

Credential Engine is a 501(c)3 based in Washington, D.C. whose mission is to bring transparency to all credentials in the marketplace, reveal the marketplace as it exists, improve credential literacy, and help individuals and institutions make more informed decisions about credentials. There are at least 738,000 confirmed unique credentials in the U.S., including diplomas, badges, certificates, certifications, licenses, apprenticeships, and degrees of all types and levels. In such an expansive and chaotic marketplace, credentials remain the most important and common signal of an individual's knowledge, skills, and abilities. Credentials are often the best signal employees have of the competencies required for particular occupations. Open, transparent data on credentials, competencies, and outcomes is fundamental to improving access to opportunity, increasing accountability, and aligning education and training offerings with employer needs. Credential Engine provides an open family

of specifications for describing credentials, competencies, and outcomes as well as technologies that support trusted search, discovery, and comparison.

ILR-related activities, standards, and resources
- **Credential Transparency Description Language (CTDL)** & **CTDL-ASN** provide a common set of terms that define the "rules of the road" for how credentials, credentialing organizations, quality assurance bodies, and competencies are described in Credential Engine's Credential Registry and on the Internet. By creating a common language to describe this information, CTDL and CTDL-ASN enable universal credential and competency comparability. The Credential Registry is similar to a dictionary of credential and competency data that people, organizations, and software can refer to in order to structure information. It provides searchable and comparable information about all types of credentials—from diplomas, badges, and certificates to licenses, certifications and degrees of all types and levels. It is a central location to collect, maintain, and connect credential and competency information to support an open applications marketplace. When credential and competency information is published to the Credential Registry, the CTDL links each data point (e.g. competency), making it possible to compare that credential's data across all other credentials in the Registry and globally.

Ed-Fi Alliance
https://www.ed-fi.org/

Description of organization
The Ed-Fi Alliance is a 501(c)(3) nonprofit funded by the Michael & Susan Dell Foundation. They are a group of former teachers, administrators, and developers who understand education technology from all angles. Together with a nationwide community of people and partners, they are working toward a future where student data is always standardized, always secure, and always supporting teachers and students.

ILR-related activities, standards, and resources
- **Ed-Fi Assessment Outcomes API** describes a REST API surface to enable exchange of assessment metadata and student assessment results between disparate and geographically separated systems operated by different organizations.

- **Ed-Fi Core Student Data API** describes a REST API surface that covers the core data domains typically managed by student information systems in K–12 education. These standards can be used to drive analysis of student performance, both alone and in combination with data from other systems.

- **Ed-Fi Data Standards** are a common model providing the data elements and serialization formats on which all other Ed-Fi data systems are based.

- **Ed-Fi Enrollment API** describes a set of read-only REST APIs for transfer of basic student and teacher demographic data and enrollment data for K–12 education. The API is intended to allow source systems to provide the basic data needed to provision a broad range of online teaching and learning applications.

HR Open Standards

https://hropenstandards.org/

Description of organization

HR Open Standards Consortium is a voluntary, consensus-based standards organization. Its community of HR technologists facilitate discussions on global technology concepts and challenges. Members collaborate to develop free standards, which encompass the full HR domain from hire to retire and are open to all HR professionals.

HR Open is leading an Employment and Earnings Record project in coordination with the T3 Innovation Network. HR Open is also participating in several other T3 initiatives including the Data Standards Harmonization, Learner Record, Public-Private Standards, and Empowering the American Student & Worker.

ILR-related activities, standards, and resources

- **HR Open Candidate Record** (education, employment and military history, assessments, and screening results) contains information on an employee's achievements.

- **Data standards** for the following HR-related topics:
    o Assessments
    o Benefits
    o Contingent Staffing
    o Employee Performance Management
    o Payroll
    o Provisioning
    o Recruiting
    o Screening
    o Time Management

IEEE Standards Association – Learning Technology Standards Committee (LTSC)
https://standards.ieee.org/

Description of organization
IEEE Standards Association is a global voluntary consensus standards body and consensus building organization that nurtures, develops and advances global technologies. They bring together a broad range of individuals and organizations from a wide range of technical and geographic points of origin to facilitate standards development and standards-related collaboration. With collaborative thought leaders in more than 160 countries, they promote innovation, enable the creation and expansion of international markets and help protect health and public safety. Collectively, their work drives the functionality, capabilities and interoperability of a wide range of products and services that transform the way people live, work, and communicate. Standards related to Interoperable Learner Records are stewarded by the IEEE Learning Technology Standards Committee (LTSC).

ILR-related activities, standards, and resources
- **IEEE Standard Data Model for Reusable Competency Definitions (1484.20.1)** defines a data model for describing, referencing, and sharing competency definitions, primarily in the context of online and distributed learning. The standard provides a way to represent formally the key characteristics of a competency, independently of its use in any particular context. A current workgroup is revising the standard informed by the 2017 "Ecosystem Mapping Project" with participants representing various technical standards organizations including A4L, CASS, CEDS, Credential Engine, Ed-Fi, HR Open Standards Consortium, IMS Global, IEEE LTSC, MedBiquitous, PESC, and Schema.org/DCMI-LRMI.

- **IEEE SCORM Standards (1484.11.3/1484.12.3)** when integrated with a web-based dynamic user interface can become a platform for the educators distributed across the globe to create, store and reuse the domain-specific and user-specific e-learning modules.
- **IEEE Conceptual Model for Learning Technology Standards (CM4LTS)** is a new study group with the goal of updating the IEEE's 2003 Learning Technology Systems Architecture standard 1484.1 and publish a crowd-maintained, updated, conceptual/logical meta model with linked alignments to relevant data, technical, policy, and achievement standards.

- **IEEE Standard for Child and Student Data Governance (P7004)** will define specific methodologies to help users certify how they approach accessing, collecting, storing, utilizing, sharing, and destroying child and student data. This project will standardize specific metrics and conformance criteria regarding these types of uses from trusted global partners and how vendors and educational institutions can meet them.

- **IEEE Experience Data Tracking and Access (P9274.1)** will provide an interoperable means to store and retrieve learning experience data as required by modern, data-intensive learning technologies by advancing the Experience API (xAPI)

specification to an IEEE standard. This project will standardize the data model format and communication protocol for learning experience data allowing vendors to build interoperable solutions and to take advantage of many products that support the xAPI.

IMS Global
https://www.imsglobal.org/

Description of organization
The IMS Global Learning Consortium (IMS Global/IMS) is a nonprofit, member organization that strives to enable the adoption and impact of innovative learning technology to advance lifelong learning. The mission of IMS Global is to advance technology that can affordably scale and improve educational participation and attainment. To ensure that learning impact of technology-enabled innovation is achieved around the world, IMS's community of educational institutions, suppliers, and government organizations develops open interoperability standards, supports adoption with technical services, and encourages adoption through programs that highlight effective practices.

ILR-related activities, standards, and resources
IMS Global members participate in any or all of the aspects of the IMS work: from standards creation to adoption of ed-tech innovation to large-scale deployment of technology to achieve learning impact: improving access, affordability and quality of learning. The interaction and feedback among these three "stages" of market adoption are critical to the success of the open architecture and the fostering of new opportunities in lifelong learning. All IMS published standards are open, free, and available for all to use.

- **Comprehensive Learner Record (CLR)** is a secure and verifiable digital record for learners, supporting learning experiences and achievements including courses, competencies, skills, co-curricular achievements, prior learning, internships and experiential learning. The CLR is designed to support traditional academic programs as well as co-curricular, competency-based education, and mastery-based learning to capture and communicate a learner's achievements in a form they can control, manage and share. The CLR is a modern lifelong learner record that is structured yet flexible enough to meet the needs of learners, registrars, and employers. Based on the IMS Global's work in digital credentials and closely following the guidance of the American Association of College Registrars and Admissions Officers (AACRAO), the CLR standard is interoperable with the Open Badges standard and the emerging work of the W3C on decentralized identity (DID) and verifiable credentials (VC). The Comprehensive Learner Record was designed as a secure, learner-centered record for the 21st century for K12, Higher Education and employer-based learning. The IMS CLR standard is designed to be compatible with the emerging data ecosystem of credentials and job definitions. https://www.imsglobal.org/activity/comprehensive-learner-record

- **Open Badges from IMS Global** are information-rich visual forms of recognition with onboard structured data. The Open Badges standard describes a method for packaging information about accomplishments, embedding it into portable image files as digital badges, and establishing resources for its validation and verification. In other words, Open Badges contain detailed metadata about achievements such as who earned it, who issued it, the criteria required, and in many cases even the evidence and demonstrations of the relevant skills. Open Badges 2.0 provides new features such as endorsements, internationalization and multi-lingual capabilities, versioning, improvements for accessibility, and full adoption of JSON-LD. Open Badges 2.0 is in Final status. Open Badges 2.1, referred to as the Badge Connect API, puts badge earners in control of where their badges are stored. Originally developed by the Mozilla Foundation, Open Badges were transferred to IMS Global in 2016 to lead future advancements of the specification which is an important component of the digital credential's ecosystem. Open Badges 2.x is designed for compatibility and interoperability with the other IMS standards and most especially Comprehensive Learner Record and Competencies and Academic Standards Exchange (CASE)®.

- **Competencies and Academic Standards Exchange (CASE) by IMS Global** provides an open standard to publish, align and share skill and competency frameworks and data across organizations, learning records and learner-held digital credentials. For example, connecting an educator-published curriculum with a framework of job roles such as those in the new JDX JobSchema+. CASE provides a format for digitally expressing competency statements and associated evaluation rubrics so the broader ecosystem of digital credentials systems can easily access and integrate this information. CASE provides educators a faster and more reliable way to align curriculum, content and instruction with career requirements. CASE allows for the digital exchange of competency definitions between applications and systems and eases sharing of resources utilizing different learning standards by providing linkages between sets of standards and competencies using different terms and even in different languages. CASE provides a standard method for provisioning and transmitting skills and competency framework documents, items, associations and optional assessment rubrics. http://www.imsglobal.org/initiative/advancing-digital-credentials-and-competency-based-learning

JDX JobSchema+
https://www.uschamberfoundation.org/jdx/job-schema

Description of organization
The Job Data Exchange™ (JDX), developed by the U.S. Chamber of Commerce Foundation, is a set of open data tools and resources that leverage global data standards and advancements in artificial intelligence (AI) to transform how employers send signals about hiring requirements for in-demand jobs.

ILR-related activities, standards, and resources

Using structured, linked data, the JDX improves how job descriptions and postings are communicated. This is accomplished through the development of a JDX schema (JDX JobSchema+) that extends and improves upon a widely-deployed schema in the employment context, the JobPosting Schema, in partnership with HR Open Standards. JobSchema+ is a standardized way of organizing structured data on the web for jobs. The U.S. Chamber of Commerce is currently pilot testing and refining JDX JobSchema+.

Learning Resource Metadata Initiative (LRMI)
https://www.dublincore.org/specifications/lrmi/

Description of organization

The Learning Resource Metadata Initiative (LRMI) is a project started in 2011, originally co-led by the AEP—the 501(c)(3) division of the Association of American Publishers—and Creative Commons, to establish a common metadata framework for describing learning resources. The aim of the Learning Resource Metadata Initiative (LRMI) is to define learning resource related metadata terms that can be used with any RDF or linked data resource description schema, especially the Schema.org vocabulary. Schema.org was jointly founded by Google, Microsoft, Yahoo, and Yandex in 2011. Shortly thereafter, LRMI was organized to represent the educational community to Schema.org. Initially, LRMI was a joint initiative of the Association of Educational Publishers and Creative Commons with funding from the Bill & Melinda Gates Foundation and the William and Flora Hewlett Foundation. Since 2014, LRMI has been managed by the Dublin Core Metadata Initiative (DCMI).

ILR-related activities, standards, and resources

LRMI defined a set of metadata terms that can be applied to Creative Works in the Schema.org framework. These terms indicate key features such as the competencies to which the resource is aligned (educationalAlignment), how a work is intended to be used (educationalUse), the typical age range of students that might use the resource (typicalAgeRange), the time required to make effective use of the resource (timeRequired), and more.

When a person engages in a learning activity that has been described using LRMI terms, that LRMI information is used to create an entry in their Interoperable Learner Record.

More recently, the LRMI Task Group has supported the development of the Schema.org Course entity and the work of the Schema.org Educational and Occupational Credentials Community Group. Guided by the simplicity of both Schema.org and the DCMI, the LRMI terms are simple, clearly-defined, and broadly applicable. Because of this, the same terms are used in many educational metadata contexts beyond Schema.org.

Postsecondary Electronic Standards Council (PESC)
https://www.pesc.org/pesc-approved-standards.html

Description of organization
The Postsecondary Electronic Standards Council (PESC) was established in 1997 at The National Center for Higher Education. PESC operates as an international 501(c)(3) non-profit, community-based, umbrella association headquartered in Washington, D.C. Member organizations include: data, software, technology service providers and vendors; schools, districts, colleges and universities; college, university and state/provincial systems; local, state/provincial and federal government offices; professional, commercial and non-profit organizations; and non-profit associations and foundations. PESC approved standards, technology, and services are community-sourced. PESC serves as an incubator and standards-development body.

ILR-related activities, standards, and resources
PESC-approved standards are available openly and free of charge. The standards are workgroup-developed, approved, ratified, and maintained through an open, transparent, rigorous, community-based, collaborative process. This includes a public notification when development initiates and a formal 30-day public comment period before approval by PESC Members. PESC-approved standards are platform, system and application neutral; used, implemented, adopted and integrated in systems, networks, applications, products and services; are hub and spoke and web services friendly; support a transaction or business process; and can be used or implemented independently from another.

PESC approved standards:
- **Core Main** is an XML schema that contains a dictionary of common element type definitions that can be used to construct and validate XML messages.

- **Academic Record** is an XML schema that contains a dictionary of element type definitions that can be used to construct and validate XML messages. The library contains element types that are specific to information about a student's academic experience and accomplishments.
- **Academic College Transcript and Academic High School Transcript** includes transcript data for admissions and transfer.

- **Admissions Application** includes admissions specific information.

- **Education Course Inventory and Education Test Score Reporting** is for exchanging course data and test scores.

- **ePortfolio** schema facilitates the transmission of ePortfolio data from one ePortfolio system to another.

- **Credential for Certificates, Degrees & Diplomas** uses Core Main. Includes XML Schema and Academic Record.

- **Global Education Organization (GEO) Code** is a free, open and standardized directory of codes & identifiers for institutions and education organizations. https://www.pesc.org/geo-code.html

- **SPEEDE Server** is an electronic data exchange server that allows free, open and secure exchange of education documents and data between institutions and solution providers. SPEEDE Server is utilized when partnering schools need a mechanism to safely and securely exchange education documents between them. What SPEEDE Server Includes: Known entity exchanges between registered SPEEDE users, Email notification when files are sent and received, Audit trail via system activity logs and notifications, and Transaction reporting. PESC with partners AACRAO, ARUCC, supports SPEEDE Server as a data exchange platform. https://www.pesc.org/technology-and-services.html

- **Student Loan Servicer Portfolio Detail Report** is for student loan servicing.

Schema.org
https://schema.org

Description of organization
Schema.org is a collaborative, community that creates, maintains, and promotes schemas for structured data on the Internet, on web pages, in email messages, and beyond. Webmasters and developers use a shared vocabulary to decide on a schema and get the maximum benefit for their efforts.

ILR-related activities, standards, and resources
Schema.org vocabulary can be used with many different encodings, including RDFa, Microdata and JSON-LD. These vocabularies cover entities, relationships between entities and actions, and can easily be extended through a well-documented extension model. Over 10 million sites use Schema.org to markup their web pages and email messages. Many applications from Google, Microsoft, Pinterest, Yandex and others already use these vocabularies to power rich, extensible experiences.

Founded by Google, Microsoft, Yahoo and Yandex, Schema.org vocabularies are developed by an open community process, using the public-schemaorg@w3.org mailing list and through GitHub.

- **EducationalOccupationalCredential (EOC)** is an educational or occupational credential. A diploma, academic degree, certification, qualification, badge, etc., that may be awarded to a person or other entity that meets the requirements defined by the credentialer. https://schema.org/EducationalOccupationalCredential

- **Learning Resource Metadata Initiative (LRMI)** is a project co-led by the Association of Educational Publishers (AEP) and Creative Commons to build a common metadata vocabulary for educational resources. LRMI addresses those metadata properties that distinguish content when it is deliberately used for learning. https://schema.org/docs/kickoff-workshop/sw1109_Vocabulary_LRMI.pdf

World Wide Web Consortium (W3C)

https://www.w3.org/standards/

Description of organization

World Wide Web Consortium (W3C) leads the World Wide Web to its full potential by developing protocols and guidelines that ensure the long-term growth of the Web. W3C standards define an Open Web Platform for application development that has the potential to enable developers to build interactive experiences, powered by data stores that are available on any device. Although the boundaries of the platform continue to evolve, industry leaders speak nearly in unison about how HTML5 will be the cornerstone for this platform. But the full strength of the platform relies on many technologies that W3C and its partners are creating, including CSS, SVG, WOFF, the Semantic Web stack, XML, and a variety of APIs. W3C develops these technical specifications and guidelines through a process designed to maximize consensus about the content of a technical report, to ensure high technical and editorial quality, and to earn endorsement by W3C and the broader community.

ILR-related activities, standards, and resources

- **Decentralized identifiers (DIDs)** are a new type of identifier for verifiable, decentralized digital identity. These new identifiers are designed to enable the controller of a DID to prove control over it and to be implemented independently of any centralized registry, identity provider, or certificate authority. DIDs are URLs that relate a DID subject to means for trustable interactions with that subject by way of a DID document. DID documents are simple documents that describe how to use that specific DID. Each DID document may express cryptographic material, verification methods, and/or service endpoints. These provide a set of mechanisms which enable a DID controller to prove control of the DID. Service endpoints enable trusted interactions with the DID subject. https://w3c.github.io/did-core/

ONTOLOGIES/FRAMEWORKS

Ontologies/frameworks can generally be described as a set of terms and relationships that represent the structured content of a topic. Ontologies help communities develop trust through shared understandings.[4]

For example, an ontology related to a specific occupation might describe both the skills needed in the field and explicit relationships between the "work roles," "tasks," and "knowledge, skills, and abilities." This type of ontology facilitates occupational workforce communications, mappings to other fields, and machine-actionable representations (i.e., schemas) that applications could support.

Format for ontologies/frameworks entries:

- Type/topic
- Owner
- Details

CASE Network
https://casenetwork.imsglobal.org/cfdoc/

Type/topic
Competency statements, learning outcomes, frameworks, and associated rubrics

Owner
IMS Global Learning Consortium

Details
CASE Network enables better support for aligned instruction and competencies across the digital learning ecosystem via a free public digital registry that includes standards for all 50 U.S. states and the Common Core. Currently, it includes full sets of English Language Arts and Mathematics standards in CASE format that can be downloaded or accessed by an authenticated API by registered users. CASE Network is based on IMS Global's CASE open standard to publish, align and share skill and competency frameworks and data across organizations, learning records and learner-held digital credentials. For example, connecting an educator-published curriculum with a framework of job roles such as those in the new JDX JobSchema+.

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[4] White Paper on Interoperable Learning Records

CASE provides a format for digitally expressing competency statements, learning outcomes and associated evaluation rubrics so a broader ecosystem of digital credentials systems can easily access and integrate this information.

See Competency and Academic Standards Exchange (CASE) in the Data Standards section of this inventory.

Competency Model Clearinghouse (CMC)
https://www.careeronestop.org/competencymodel/careerpathway/cpwoverview.aspx

Type/topic
Workforce, competency models

Owner
U.S. Department of Labor, Employment and Training Administration (ETA)

Details
The goal of the Clearinghouse is to inform the public workforce system about the value, development, and uses of competency models. The CMC website offers two interactive on-line tools to help businesses, educators, and workforce professionals achieve their talent development goals: the Build a Competency Model Tool and the Build a Career Ladder/Lattice Tool.

Degree Qualifications Profile (DQP)
http://degreeprofile.org/

Type/topic
Learning outcomes

Owner
National Institute for Learning Outcomes Assessment (NILOA), Institute for Evidence-Based Change (IEBC), Lumina Foundation

Details
The Degree Qualifications Profile is a learning-centered framework for what graduates should know and be able to do to earn the associate, bachelors or master's degree in any field of study. There are five broad categories of proficiencies which provide a profile of what degrees mean in terms of specific learning outcomes. Through focusing on broad areas of learning and the application of that learning, the DQP illustrates progressively challenging performance expectations for all students.

Emsi Open Skills Library

https://skills.emsidata.com/

Type/topic
Skills library

Owner
Emsi

Details
Emsi curates nearly 30,000 skills from hundreds of millions of job postings, resumes, and professional profiles into a skills library to serve as a common language between people looking for work, employers, and educational programs. In Emsi's Open Skills library, a skill is anything that defines or describes someone's knowledge and experience. Emsi releases a new version of the library every two weeks. Each release contains new skills and updates to how existing skills are identified.

Available to the public through Emsi Skills API.

National Initiative for Cybersecurity Education (NICE) Cybersecurity Workforce Framework

https://www.nist.gov/itl/applied-cybersecurity/nice/resources/nice-cybersecurity-workforce-framework

Type/topic
Taxonomy and lexicon for cybersecurity work and workers

Owner
National Institutes of Standards and Technology (NIST)

Details
The NICE Framework, NIST Special Publication 800-181, is a national focused resource that categorizes and describes cybersecurity work. The NICE Framework establishes a taxonomy and common lexicon that describes cybersecurity work and workers irrespective of where or for whom the work is performed. The NICE Framework is intended to be applied in the public, private, and academic sectors.

O*NET

https://www.onetcenter.org/overview.html

Type/topic
Occupational taxonomy

Owner
The Occupational Information Network (O*NET) is developed under the sponsorship of the U.S. Department of Labor/Employment and Training Administration (USDOL/ETA) through a grant to the North Carolina Department of Commerce.

Details
The O*NET Program is the nation's primary source of occupational information. Valid data are essential to understanding the rapidly changing nature of work and how it impacts the workforce and U.S. economy. From this information, applications are developed to facilitate the development and maintenance of a skilled workforce. Central to the project is the O*NET database, containing hundreds of standardized and occupation-specific descriptors on almost 1,000 occupations covering the entire U.S. economy. The database, which is available to the public at no cost, is continually updated from input by a broad range of workers in each occupation.

O*NET information is used by millions of individuals every year, including those taking advantage of O*NET Online, My Next Move, and other publicly and privately developed applications.

- **O*NET Content Model** describes the distinguishing characteristics of an occupation**.** Every occupation requires a different mix of knowledge, skills, and abilities, and is performed using a variety of activities and tasks.
  https://www.onetcenter.org/content.html

- **O*NET-SOC Taxonomy** defines the set of occupations across the world of work**.** It is based on the Standard Occupational Classification and currently includes 974 occupations which currently have, or are scheduled to have, data collected from job incumbents or occupation experts. To keep up with the changing occupational landscape, the taxonomy is periodically revised; the last revision was in 2010. https://www.onetcenter.org/taxonomy.html

Standard Occupational Classification (SOC)

https://www.bls.gov/soc/

Type/topic

Workforce, occupational categories

Owner

Office of Management and Budget and the Standard Occupational Classification Policy Committee (SOCPC) which includes representatives from several federal agencies.

Details

The 2018 SOC system is a federal statistical standard used by federal agencies since 2000 to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. All workers are classified into one of 867 detailed occupations according to their occupational definition. To facilitate classification, detailed occupations are combined to form 459 broad occupations, 98 minor groups, and 23 major groups. Detailed occupations in the SOC with similar job duties, and in some cases skills, education, and/or training, are grouped together.

IMPLEMENTATIONS, PILOTS, AND IMPLEMENTATION SUPPORT NETWORKS

Implementations and pilots are examples of how secure delivery platforms, data standards, and/or ontologies/frameworks come together in the education and workforce ecosystem. Implementations are those examples that are being integrated or that are in development. Pilots are test cases.

Implementation support networks are organizations that are actively working to implement ILR solutions to the workforce and education ecosystem.

Format for implementations, pilots, and implementation support entries:

- Organization(s) or partners
- Overview of the effort
- Maturity or status
- Details

ACE Learner Success Lab

https://www.acenet.edu/News-Room/Pages/Statement-on-ACE,-Strada-Launch-Innovative-Learner-Success-Initiative.aspx

Organization(s) or partners
ACE and Strada Education Network

Overview of the effort
A 2.5-year initiative to help colleges and universities align learning and workforce opportunities to improve student success. Strada's $1.5 million grant will allow ACE to research, develop, and pilot a Learner Success Lab that will provide opportunities for postsecondary institutions to strategize and implement effective policies and practices that help students meet the demands of today's workforce.

Maturity or status
Announced September 2019

Details
As part of this initiative to develop student-centered solutions, ACE will leverage Strada's education consumer survey database of more

than 340,000 Americans to understand individuals' perceptions on the value, relevance, reputation, and quality of their education to career and life experiences.

The model for the Learner Success Lab will be ACE's Internationalization Lab, which brings together campus leaders and faculty to advance campus-wide internationalization and global engagement. Once the Learner Success Lab is launched, teams of higher education administrators and faculty will participate in a 12-month strategic planning process with the goal of developing policy and practice strategies at their own institutions to integrate higher education learning and academic credentials with workforce-ready skills.

As part of the initiative, ACE will also convene a National Task Force on the Transfer of Credit. Its members will undertake a comprehensive review of the research on credit for prior learning , competency-based education, and military training, coupled with an assessment of successful credit transfer practices and recommendations to improve the transfer and award of credit that benefit learners and institutions. The task force's work is made possible by grants from Strada and the Charles Koch Foundation.

Advanced Distributed Learning (ADL) Initiative
https://adlnet.gov

Organization(s) or partners
- Defense ADL Advisory Committee, which comprises U.S. Department of Defense distributed learning organizations (e.g., Army University, Naval Education and Training Command, Air Education and Training Command, Marine Corps College of Distance Education and Training, Joint Staff J7 Joint Knowledge Online, DoD Chief Learning Officer (for Civilians), Defense Health Agency, and DoD Intel/Security Human Capital Management Office)
- Office of Personnel Management's USALearning
- DoD Chief Management Office, CIO for Defense Business Systems (leader for DoD Digital Learning Modernization reforms)
- Coalition military partners involved with distributed learning (e.g., NATO Training Group's task group for Individual Training and Educational Developments, Partnership for Peace Consortium's ADL working group, and the ADL Global Partnership Network with bilateral agreements with defense institutions, e.g., Canadian, Norwegian, and Serbian Armed Forces)
- Professional standards organizations, such as the IEEE Learning Technology Standards Committee

Overview of the effort
Founded November 1997, the U.S. Government's ADL Initiative conducts research, development, testing, evaluation, and policy stewardship to enhance distributed learning. (See Program Element 0603769D8Z.) By mandate, the program works with Defense stakeholders and other Federal agencies as well as Coalition military partners, industry, and academia. The program is known for efforts such as its development of SCORM and the Experience Application Programming Interface (xAPI), release of the 2019 book Modernizing

[Learning: Building the Future Learning Ecosystem](#), and oversight of [DoD Instruction 1322.26 ("Distributed Learning")](#). The program's three major lines of effort are R&D for distributed learning modernization, distributed learning policy and technical guidelines, and implementation support and collaboration.

Maturity or status
The ADL Initiative is a mature and enduring program. It conducts various research efforts and pilot projects relevant to the ILR initiative. The ADL Initiative's [Total Learning Architecture (TLA) project](#) is most aligned. The TLA is a collection of specifications for accessing and making use of learning-related data. That is, the TLA defines the larger library of specifications and the technical infrastructure needed to make them interoperate; these specifications include (a) activity-related specifications (e.g., enterprise course catalog), (b) enterprise learner record specifications (e.g., federated identity, universal learner records), (c) learning event tracking (lower-level tracking of learner performance, e.g., micro-behaviors, paradata on learning experiences), and (d) competency specifications across jobs, personal capabilities, and learning experiences.

Details
The TLA project is intended to form the technical foundations for the "future learning ecosystem," i.e., the data-driven system-of-systems intended to support talent development in the future. The TLA specifications are already being used by ADL Initiative partners in pilot projects, e.g., the Air Force Learning Services Ecosystem and DoD (Intel/Security) Talent Development Toolkit. This work also supports and aligns with the DoD Chief Management Officer's IT/Business System reform for "Digital Learning Modernization."

Development of the TLA is conducted in collaboration with stakeholders from across the defense community, professional standards organizations, and commercial industry. The ADL Initiative hosts a [working group for the TLA](#), which includes subcommittees focused on Universal Learner Records, Competency Management, Content and Activity Metadata, and DoD xAPI Profiles.

Note: xAPI is a mature specification for encoding, transferring, and storing syntactically and semantically interoperable learner performance data. Standardization of the specification by the IEEE Learning Technology Standards Committee is expected in 2020.

American Council on Education – Credly Transcript

https://resources.credly.com/blog/post/american-council-on-education-credly-launch-new-digital-credential-program-to-recognize-workforce-training

Organization(s) or partners
American Council on Education and Credly

Overview of the effort
Participants in ACE's College Credit Recommendation Service (CREDIT®) are able to issue digital credentials through Credly, making it easier for working professionals to request academic credit for workplace training and to share evidence of their achievements online.

Maturity or status
In place since January 2017

Details
The collaboration between the American Council on Education and Credly allows organizations that offer training recommendations for college credit to be issue secure, portable, and data rich digital badges that recognize professional and academic achievements in addition to an ACE official transcript. Credly's Acclaim platform transforms knowledge, skills, and achievements into digital credentials that empower individuals to capture opportunities and organizations to measure impact.
- **Create**—build an organization's digital credentials using Credly's Credential Dashboard
- **Issue**—bulk issuing and enterprise-class scalability allow organizations from higher education to corporate training and development to professional associations to reliably issue credentials.
- **Promote**---earners can then share their credentials across various social media platforms, with their contacts, and the greater community enhancing their profile, as well as that of the issuing organization.
- **Analyze**—comprehensive reports include: badge earning, sharing and display activity, earner achievements, identity leading influencers, and earner interests
- **Benefits**—increased engagement, improved satisfaction for both individuals and organizations, and a higher happiness quotient

Competency-Based Education Network (C-BEN) CLR Initiative
https://www.cbenetwork.org/collaboratory/

Organization(s) or partners
Competency-Based Education Network members

Overview of the effort
Project 3 under the C-BEN Collaboratory

Maturity or status
Complete

Details
Participants were selected through an application process in the summer of 2018. The most important qualification for participation was the ability to work effectively with a diverse team, and to appropriately balance institutional or individual interests with a broader commitment to supporting a healthy field of practice. Successful applicants have committed to practicing and advancing the competencies of servant leadership, including self-awareness, the desire to listen closely, an ability to catalyze the energy and intelligence of others, and the willingness to work in service of progress for the field of CBE. Through this project, the Standardized Components for a Competency-Based Educational Record has been released. https://www.aacrao.org/events-training/event/2019/09/17/default-calendar/the-standardized-components-for-a-competency-based-educational-record

Comprehensive Learner Record (CLR) Initiative
https://www.aacrao.org/signature-initiatives/comprehensive-learner-record

Organization(s) or Partners
Partners: Association of Student Affairs Professionals (NASPA), American Association of Collegiate Registrars and Admissions Officers (AACRAO), National Institute for Learning Outcomes and Assessment (NILOA), Lumina Foundation, colleges, and universities

Overview
The goal of the comprehensive learner record (CLR) is to showcase student learning from a variety of experiences, including academic courses, co-curricular engagements, and other opportunities. NASPA, AACRAO, and NILOA, with support from Lumina Foundation, are partnering to help institutions create digital records that will help students describe the depth and breadth of their learning.

Maturity or status
The pilot phase of the project concluded in November 2017 with 12 institutions developing records that included e-portfolios, co-curricular transcripts, and badges (download the report here). Through grant support from Lumina Foundation, the second phase of the project began in December 2017 and will reach up to 150 more institutions through regional workshops to show groups of institutions how to create these records.

Details
Participating Educational Institutions' Models:
- Borough of Manhattan Community College (BMCC) - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/borough-of-manhattan-community-college
- Brandman University - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/brandman
- Dillard University - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/dillard-university
- Elon University - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/elon-university

- Indiana University: Purdue University Indianapolis (IUPUI) - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/indiana-university-purdue-university-indianapolis
- LaGuardia Community College - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/laguardia-community-college
- Stanford University - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/stanford-university
- University of Central Oklahoma (UCO) - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/university-of-central-oklahoma
- University of Houston Downtown (UHD) - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/university-of-houston-downtown
- University of Maryland University College (UMUC) - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/university-of-maryland-university-college
- University of South Carolina (USC) - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/university-of-south-carolina
- University of Wisconsin: Extension and Wisconsin Colleges - https://www.aacrao.org/signature-initiatives/comprehensive-learner-record/university-of-wisconsin-extension-and-wisconsin-colleges

Dallas County Community College: Texas – SPEEDE Transcripts

https://www.dcccd.edu/services/onlineservices/transcripts/pages/speede.aspx

Organization(s) or partners
Dallas Community College system and Greenlight Credentials

Overview of the effort
Dallas County Community College District (DCCCD) issues electronic transcripts that can be sent to over 100 participating institutions for free through SPEEDE, which is a blockchain-based platform.

The present and future work of addressing talent pipeline shortages requires new technologies that work horizontally across schools, colleges, government agencies, non-profits and employers in order to facilitate seamless collaboration and remove frictions to success.

DCCCD in partnership with GreenLight Credentials is helping to:
- Reduce barriers for individuals to access higher education and employment.
- Provide secure, simple, instant sharing and validation of records for academic admissions and transfers, internships, scholarships, and job applications.

- Work closely with major DFW area academic institutions, Dallas Promise, P-Tech and businesses.
- Transform the college application process and employer recruitment methods.

Maturity or status

At DCCCD alone, over 15,000 students have taken ownership of their records and shared their transcripts with over 500 colleges nationwide. Since all of these records are entered into the blockchain by the institutions, the receiving parties can instantly verify the authenticity of the records. This speeds up application processing, improves accuracy and reliability, and reduces costs.

Details

The goals of the initiative are to:
- Drive equity in college, workforce and economic mobility across the country.
- Create a market place that allowed colleges, internship opportunities, apprenticeships and jobs to find students, not the other way around.
- Address the talent gap by connecting employers to talent based on skills.
- Allow students to own and manage their on credentials & skills.
- Allows students to share those records without having to contact the sending institution.
- Interface with multiple organizations and institutions especially employers.

Developing a Connected Work and Learn Ecosystem

https://credentialengine.org/2019/11/22/guide-to-key-initiatives-for-the-connected-learn-and-work-ecosystem/

Organization(s) or partners

36 efforts supported by over 30 funders

Overview of the effort

The ever-shifting work and learn landscape has made selecting an education and training program a more high-stakes choice for students and workers than ever before. With hundreds of thousands of credentials available in the U.S. alone, and little easily-accessible data available about the majority of them, the credential marketplace is confusing and chaotic. While many initiatives are working hard to bring order and understanding to this key piece of the nation's economy, coordination among efforts has been challenging to track. To improve coordination and collaboration, the Guide to Key Initiatives for the Connected Learn and Work Ecosystem covers 36 efforts supported by a total of over 30 funders that consider key questions about the credential marketplace.

Maturity or status
Projects are in various stages of development.

Details
See guide

Indiana

Organization(s) or partners
State of Indiana with various partners

Overview of the effort
Several efforts described in detail below

Maturity or status
Varies by project

Details

- **The Indiana e-Transcript Program** was developed in 2005 by the Indiana Commission for Higher Education (ICHE) and the Indiana Department of Education (ICOE). e-Transcripts provide notification of when each transcript is sent and received, provide more precise information about where students are in the admissions process, result in quicker admissions decisions, and allow students to order transcripts at their convenience, 24/7 online. Indiana was the first state in the Midwest to adopt e-Transcript and now at least six other states have followed their lead. The e-Transcript Program has resulted in a statewide, common high school transcript that each high school is capable of sending as a data file compliant with national, open consensus standards, the Postsecondary Electronic Standards Council (PESC) XML eTranscript schema. Fields are being added that describe student achievements and competencies beyond those in a conventional academic transcript: project-based, work-based, and service-based learning experiences; industry certifications; and apprenticeships. https://www.in.gov/che/4626.htm

- **The Comprehensive Learner Record (CLR)** project is extending the Indiana e-transcript program to postsecondary. This project is in partnership with AACRAO/NASPA. The CLR will also link electronically, through the Credential Registry, to information about the credential the learner has earned, revealing, among other things, the generic competencies all credential earners should have mastered.

- **Scale-Up of Credential Engine** in Indiana represents the first state to have all certificate and degree programs at all levels from all public two- and four-year institutions on the Credential Registry. Tuition and fee information is available for each of the over 3,000 included credentials. Data on how much graduates earn one, five, and ten years after graduation should be added in the near future. Competencies for all community college associate degrees have already been added to the Registry, while competencies for other programs will be added in the future. https://www.in.gov/che/4782.htm

- **Aligning competencies** cultivated in education and non-traditional training programs with competencies sought by employers is a priority in Indiana. This focus on alignment is embodied in other statewide initiatives, such as NextLevel Jobs, Skillfull Indiana, and the state's engagement with the U.S. Chamber of Commerce Foundation's T3 Innovation Network and the JDX initiative, all of which provide an employer perspective on desired competencies in Indiana's workforce.

- **Connecting Indiana's Learn & Work Ecosystem** has two phases of work. The Phase I workshops will result in a multi-year Phase II proposal to support state-level guidance on how to break down data silos between education and workforce and empower policymakers with the information they need to make strategic and programmatic investments as well as provide students and workers with the data to make informed decisions about their learning and career pathways. Credential Engine was awarded a grant in September 2019 from the National Science Foundation (NSF) to support a partnership with the Indiana Higher Education Commission and Lumina Foundation to identify and build critical data exchanges between education and workforce systems in Indiana. This work is part of NSF's Convergence Accelerator, a new capability within NSF to accelerate use-inspired, convergence research in areas of national importance via partnerships between academic and non-academic stakeholders.

- **Skillfull**, a non-profit initiative of the Markle Foundation, is dedicated to enabling all Americans – particularly those without a four-year degree – to secure good jobs in a changing economy. In partnership with Microsoft and others, Skillful is developing skills-based training and employment practices in collaboration with state governments, local employers, educators, and workforce development organizations. A skills-based approach to hiring reduces bias and creates a more equitable job market that "screens in" for skills and clarifies credential requirements. Skillful and its partners are working to create a labor market in which skills are valued, and people can more easily access the information and education they need to keep pace with technology's impact on work.

International Association for K-12 Online Learning (iNACOL)
https://www.inacol.org/our-work/

Organization(s) or partners
iNACOL is a non-profit organization focusing on research, developing policy for student-centered education to ensure equity and access,

developing quality standards for emerging learning models using competency-based, blended and online education, and supporting the ongoing professional development of school and district leaders for new learning models.

Overview of the effort
The mission of iNACOL is to catalyze the transformation of K-12 education policy and practice to advance powerful, personalized, learner-centered experiences through competency-based, blended and online learning.

Personalized learning opens student pathways, optimizes instruction, and encourages student voice and choice in their education. Data-rich personal learning plans inform student-centered instruction and progression upon mastery.

Competencies are defined by explicit learning objectives that empower students. Students receive timely, differentiated support, and they advance by demonstrating evidence with meaningful assessments via mastery, not seat time.

Job Data Exchange™ (JDX) Pilot
https://www.uschamberfoundation.org/sites/default/files/JDX_FAQs_January%202019.pdf

Organization(s) or partners
The JDX™ is a set of open data resources, algorithms, and reference applications for employers and their HR technology partners to use in improving how employers communicate competency and credentialing requirements for in-demand jobs. The JDX is the vehicle employers need to move in a scalable, sustainable way towards competency-based hiring.
Partners: https://www.uschamberfoundation.org/jdx/pilot-partners

Overview of the effort
The JDX, and the data standard it employs, help employers and their HR partners break down a job description into specific skill and hiring requirements. Open-source, non-proprietary, and free to use, the JDX collects that hiring data in a structured, machine-readable way and then makes that data available to the education and workforce partners that are helping students and job seekers prepare for the workforce.

Maturity or status
Phase 1 of the JDX pilot is complete as of October 2019. The eight pilot partner teams, across seven states and the District of Columbia, used the pilot to improve job descriptions and share them with their talent sourcing partners. Phase 2 will work to further refine the JDX and to incorporate the standard into HR vendor platforms.

Details
The JDX will:
- Develop competency-based job descriptions.
- Provide employers with feedback and recommendations on how to make improvements to job descriptions and postings.
- Validate job descriptions across an industry.
- Distribute job postings to education and workforce partners in real time.

Mastery Transcript Consortium (MTC)
https://mastery.org/

Organization(s) or partners
The Mastery Transcript Consortium™ (MTC) is made up of a growing network of public and private high schools who are co-designing the Mastery Transcript.

Overview of the effort
The Mastery Transcript is a high school transcript that supports mastery learning and reflects the unique skills, strengths, and interest of each learner. In the coming years, the MTC hopes to change the way students prepare for college, career, and life. The MTC model is substantively different from the traditional model of crediting and transcript design that is typically oriented around content-oriented courses, Carnegie unites for credits, and grades.

Maturity or status
Ongoing

Details
The Mastery Transcript model is organized around performance areas (rather than academic departments), mastery standards and micro-credits (rather than grades). Each micro-credit applied to a transcript signifies complete mastery of a specific skill, knowledge block or habit of mind as defined by the crediting high school. The MTC schools are supported by a technology platform that allows the complete record of a student's credits and submitted evidence to be submitted to college admission offices and professional organizations for evaluation.

This electronic Mastery Transcript allows college admission officers to dive deep within a transcript to see the specific credits of the sending high school and actual evidence of student work and mastery, thus giving depth and transparency to the student's work record. The MTC network will draw upon the collective strength of their member schools, Advisory Council and Board, Higher Ed Working Group, and other partners to change the college and career preparation model for all high schools.

MILGEARS by the U.S. Department of Defense

Coming soon to the U.S. Navy COOL site: https://www.cool.navy.mil/usn/index.htm

Organization(s) or Partners

DoD with military branches and private contractor.

Overview

MILGEARS is a soon-to-be-released tool (powered by Credentialing Opportunities On-Line or COOL) that assists service members connect their military occupation, career goals, interests and credentials to chart a customized career pathways. The Navy is now deploying MILGEARS with other service branches to follow.

Maturity or status

In beta version. Not yet released to the public. Release expected soon.

Details

MILGEARS allows service members, their families, and the general public to explore career pathways and credentials. Users can browse the content or can upload or manually enter their military service history and experience, transcripts, and other personal information to personalize the experience.

Navy Research and Development and Training Transformation

https://www.onr.navy.mil/en/our-research/naval-research-framework

Organization(s) or Partners

Partners: Credential Engine and the U.S. Navy

Overview

The U.S. Navy is partnering with Credential Engine based on the recognition that the Navy may be able to use the Credential Transparency Description Language as a typology to update its internal systems and publish its linked credentials to the Credential Registry.

Maturity or status

This R&D work is guided by a Cooperative Research and Development Agreement (CRADA) signed by the Navy's Research & Development Unit. As this work succeeds in aligning to competency and credentialing systems, Credential Engine will able to incorporate Navy-linked credentials into the Credential Registry; the Navy can update its internal systems using a common credentialing language;

civilian organizations can better understand Navy-linked credentials; and veterans leaving the service can transition more easily into civilian jobs.

Details
The partnership is: 1. Completing a gap analysis between the CTDL and Navy Task Classification Taxonomy; 2. Mapping the CTDL to Navy specs that support data linked to various components of its training artifacts; 3. Linking the CTDL with all Navy KSAOs in its linked data classification and curriculum (e.g., "courses"); and 4. Connecting the CTDL to KSAOs in the Navy's maintenance task analysis.

Office of Personnel Management (OPM) Employee Digital Record
https://www.performance.gov/OPM/FY2019_sept_OPM_Enable_Federal_Employees.pdf

Organization(s) or Partners
Office of Personnel Management with other federal partners

Overview
The Employee Digital Record (EDR) is a single, comprehensive view of the data of an employee's Federal Government career. The EDR is being developed with Government-wide human resource experts and industry experts to ensure information is secured, standardized, and accessible. Once implemented, the EDR will provide employees, HR experts, and other authorized users a common language (data standard) so that human capital activity is exchanged seamlessly with the right context.

Maturity or status
Early stages. Working on development of data standards.

Details
No additional details at this time.

OpenCLR Lab

Organization(s) or Partners
Broward County Public Schools (BCPS), IMS Global, Amazon Web Services, Public Consulting Group

Overview
Demonstrate, document, and share how personalized, competency-based, and blended learning can leverage the draft IMS Global CLR specification to support BCPS graduates as they transition into post-secondary degree completion, industry certifications, NCAA

athletics, and other professional licensure fields. The specific projective objectives include the BCPS CASE server, the Florida Comprehensive Learning Record, and a roadmap to leverage interoperability standards to enable competency-based, blended learning.

Maturity or status
In planning phase

Details
No additional details at this time.

T3 Innovation Network: Open Data Standards – Map and Harmonize Data Standards
https://www.uschamberfoundation.org/t3-innovation/pilot-projects

Organization(s) or Partners
Partners: T3 Innovation Network members

Overview
Develop methods and tools for mapping and harmonizing existing data standards for improving interoperability and search and discovery on the web.

Maturity or status
- Confirmed commitments from data standards organizations (PESC, IMS Global, HR Open, CEDS).
- Convened the Open Data Standards Work Group and developed a work plan and charter.
- Released a data standards landscape survey to data standards organizations.
- Began working with data standards organizations to map Comprehensive Learner/Worker/Military Record data standards for gap analysis.

Details
Visit site for details and updates.

T3 Innovation Network: Open Data Standards – Employment and Earnings Records Standards
https://www.uschamberfoundation.org/t3-innovation/pilot-projects

Organization(s) or Partners
Partners: T3 Innovation Network members

Overview
Develop public-private standards for employment and earnings records to improve data quality and utilization and reduce reporting costs.

Maturity or status
Kicked off July 23, 2019.
- HR Open Standards Consortium established a work group to develop employment and earnings record standards.
- Hosted a T3 Network stakeholder forum in Washington, DC to discuss use cases
- Developed approach for estimating costs and benefits of enhanced employment and earnings records for federal reporting systems.

Details
Visit site for details and updates.

T3 Innovation Network: Open Data Standards – Comprehensive Learner/Worker/Military Records Standards
https://www.uschamberfoundation.org/t3-innovation/pilot-projects

Organization(s) or Partners
Partners: T3 Innovation Network members

Overview
Align and pilot-test the use of data standards to enable individuals to better manage and use competencies documented in their records to pursue career and educational opportunities.

Maturity or status
Kicked off July 24, 2019.

- Convened the CLWMR Advisory Group and developed a work plan and charter.
- Convened a CLWMR "Use Case Task Group" that developed five prioritized use cases along with a use case template and corresponding diagrams.

Details
Visit site for details and updates.

T3 Innovation Network Pilot: Open Data Standards – Public-Private Adoption of Open Data Standards
https://www.uschamberfoundation.org/t3-innovation/pilot-projects

Organization(s) or Partners
Partners: T3 Innovation Network members

Overview
Improve public and private collaboration in the development and use of data standards.

Maturity or status
Roundtable on Public-Private Standards Development and Use by Government held on September 17, 2019.
- Developed an inventory of: (1) leading data standards organizations, (2) data standards and development processes, (3) and government policies and practices for the development and use of data standards.
- Drafted a background paper on "Public-Private Standards Development and Use By Government" and held a roundtable discussion in Washington, DC to receive feedback on the draft paper.
- Release a final report in December 2019 on "Principles and Practices for Public-Private Standards Development and Government Participation."

Details
Visit site for details and updates.

T3 Innovation Network Pilot: Competency-Based Learning & Hiring – Competency Data Collaborative
https://www.uschamberfoundation.org/t3-innovation/pilot-projects

Organization(s) or Partners
Partners: T3 Innovation Network members

Overview
Develop an open-source infrastructure that can be used to better connect and link machine-actionable data from competency frameworks and repositories.

Maturity or status
Kicked off August, 2019.
- Developed a work plan and charter.
- Developed a tool for reading competency framework publications in a range of formats and output machine actionable data (Competency Framework Extraction Module).
- Organized a Technical Work Group (TWG) to develop draft specifications and protocols for an open, linked network of registries and repositories of machine actionable competency data.

Details
Visit site for details and updates**.**

T3 Innovation Network: Competency-Based Learning & Hiring – Competency Translation & Analysis
https://www.uschamberfoundation.org/t3-innovation/pilot-projects

Organization(s) or Partners
Partners: T3 Innovation Network members

Overview
Analyze, compare, and translate competencies within and across industries using artificial intelligence and machine learning.

Maturity or status
Kicked off August, 2019.
- Assisted in the kick-off of the Competency Data Collaborative and Technical Work Group.
- Released a competency translation and analysis survey to the full T3 Network as an environmental scan of the current tools, resources, and datasets being used in the talent marketplace.
- Begin to create a T3 Network webpage to share landscape and gap analysis information and resources from the survey.

Details
Visit site for details and updates.

T3 Innovation Network: Empowering Learners & Workers – Data Collaborative for Individual-Level Data

https://www.uschamberfoundation.org/t3-innovation/pilot-projects

Organization(s) or Partners
Partners: T3 Innovation Network members

Overview
Promote best practices for managing public and private data, allowing for increased access while ensuring privacy and security.

Maturity or status
Kicked off August, 2019.
- Developed a work plan and charter.
- Identified a priority list of shared technical issues faced by data collaboratives for individual-level data.

Details
Visit site for details and updates.

T3 Innovation Network: Empowering Learners & Workers – Management and Use of Individual-Level Data Records

https://www.uschamberfoundation.org/t3-innovation/pilot-projects

Organization(s) or Partners
Partners: T3 Innovation Network members

Overview
Develop open, self-sovereign protocols and data management guidance for learner, worker, and military records.

Maturity or status
Kicked off August, 2019.
- Developed a work plan and charter.
- Worked with Comprehensive Learner/Worker/Military Record Standards project to prioritize use cases and identify cases with self-sovereign implications.

Details
Visit site for details and updates.

U.S. Department of Education Blockchain Action Network
https://tech.ed.gov/blockchain/

Organization(s) or Partners
Department of Education Office of Educational Technology, educators, administrators, parents, students, and technology developers

Overview
As blockchain technologies and their associated networks evolve, this network will feature a diverse range of projects — those the community has highlighted as having the greatest potential to impact the national educational landscape.

Maturity or status
Holding working group meetings and awarding grant money in 2020.

Details
The recent and rapid evolution of distributed computing and blockchain technology has pushed the Department of Education to rethink and reimagine many of the foundational aspects of the traditional systems of education. Concepts like trust, value, privacy, and identity are all coming into question as we usher in a new suite of technologies. Through this transition, the Office of Education Technology is convening stakeholders across the learning continuum to ensure we equitably shape the ever-evolving technological landscape of the American education system. All partners are invited to work collectively to learn, influence, and equitably shape the ways in which these new technologies affect our shared future.

U.S. Department of Education SLDS Program
https://nces.ed.gov/programs/slds/

Organization(s) or Partners
U.S. Department of Education and grantees

Overview
Better decisions require better information. This principle lies at the heart of the Statewide Longitudinal Data Systems (SLDS) Grant Program which is administered by the National Center for Education Statistics. Through grants and a growing range of services and

resources, the program has helped propel the successful design, development, implementation, and expansion of K12 and P-20W (early learning through the workforce) longitudinal data systems. These systems are intended to enhance the ability of States to efficiently and accurately manage, analyze, and use education data, including individual student records. The SLDSs should help states, districts, schools, educators, and other stakeholders to make data-informed decisions to improve student learning and outcomes; as well as to facilitate research to increase student achievement and close achievement gaps.

Maturity or status
Ongoing

Details
As authorized by the Educational Technical Assistance Act of 2002, Title II of the statute that created the Institute of Education Sciences (IES), the SLDS Grant Program has awarded competitive, cooperative agreement grants to states since 2005. These grants extend for three to five years for up to twenty million dollars per grantee. Grantees are obligated to submit annual reports and a final report on the development and implementation of their systems. All 50 states, five territories, and the District of Columbia are eligible to apply. In November of 2005, the first year of the grant program, IES awarded SLDS grants to 14 states (FY 2006 grantees). SLDS grants were awarded to 12 additional states and the District of Columbia in June 2007 (FY 2007 grantees), 27 states in March 2009 (FY 2009 grantees), 20 states in May 2010 (FY 2009 ARRA grantees) and 21 states, the District of Columbia, Puerto Rico, and the Virgin Islands in May 2012 (FY 2012 grantees). The latest grantees were announced in September 2015 (FY 2015 grantees)—a total of 16 grants were awarded and included 15 states and first-time grantee, American Samoa.

In addition to the grants, the program offers many services and resources to assist education agencies with SLDS-related work. Best practices, lessons learned, and non-proprietary products/solutions developed by recipients of these grants and other states are disseminated to aid state and local education agencies.

University of Central Oklahoma STLR
http://sites.uco.edu/central/tl/stlr/

Organization(s) or Partners
University of Central Oklahoma

Overview
UCO's Student Transformative Learning Record (STLR) is like a second transcript that records students' growth and Transformative Learning across the other five of UCO's Central Six Tenets pictured below. Students reflect on their experiences, then receive feedback

from a trained faculty or staff member. Students display these experiences on their STLR Snapshot pages and in different versions of ePortfolios that they can share with potential employers, graduate schools, or others to highlight their most employable strengths.

Maturity or status
Active

Details
For example, students might:
- Learn how to work well in teams with people whose opinions differ from their own.
- Develop leadership skills as president of a student organization.
- Improve their ability to interact positively and appropriately with co-workers, customers, and others from different countries and cultures in their classes.
- Find out how to contribute as productive citizens to their local communities, the nation, and the world through volunteering.
- Practice solving unscripted problems and devise creative solutions while doing independent research.

Assessment of Transformative Learning at the University of Central Oklahoma is accomplished with the STLR Rubric. Faculty and professional staff intentionally create learning activities and environments designed to expand students' perspectives about themselves and others so that they understand the benefits of developing perspectives and life skills while they are in college and afterwards as life-long learners. The trained faculty or staff supervisor uses the STLR Rubric to evaluate the student's progress in the associated Central Six Tenet(s). The assessment helps guide a standardized rating of the student's achievement towards Transformative Learning and is documented in their Transformative Learning record.

The STLR Rubric is based on VALUE rubrics created by the Association of American Colleges and Universities, where possible. Rubrics for *Health & Wellness* and *Leadership*, for which no VALUE rubrics exist, have been constructed in a similar fashion and with the same rating scale as for VALUE rubrics. The VALUE rubrics were developed by approximately 200 faculty from around the U.S., from many disciplines, and from many different institutions. The STLR Rubric was developed by 20 UCO faculty and assessment personnel.

Visual Experiential Transcript
https://www.parchment.com/wp-content/uploads/RodneyParks_UC2016.pdf

Organization(s) or Partners
Elon and Parchment

Overview
Experiential transcripts paint a different picture of candidates/applicants than academic transcripts. Started as a case study with Elon, experiences and academic performance combine to provide what Parchment called "a complete picture" of the student journey, including skills and competencies earned. The document was designed to breathe life into the co-curricular transcript and pave the way for further innovation.

Maturity or status
Ongoing

Details
The co-curricular transcript is a record of a student's co-curricular and/or extra-curricular activities as defined by the institution. Elon has tracked and certified co-curricular experiences since 1994.

WGU/EMSI Skills Mapping Project

https://www.wgu.edu/about/competency-based-education.html
https://www.economicmodeling.com/2019/07/24/wgu-creates-value-by-mapping-curriculum-to-skills/

Organization(s) or Partners
Partners: WGU and EMSI

Overview
The goal was to develop an innovative methodology for translating curriculum to skills, and seeing how those skills align with employer demand. The analysis involved comparing the taught skills represented in WGU's learning outcomes to the sought skills represented in employer job postings.

Maturity or status
The skills gap analysis was delivered via Excel in two versions. WGU plans to build off of the results for future courses. The vision is for their programs to be so well-aligned to industry needs that the skills employers value most are the learning outcomes for WGU's programs—and students get maximum return on investment from each and every course they take.

Details
Emsi's first step was identifying the target occupations for WGU's business and data management and analytics programs. While the National Center for Education Statistics (NCES) provides a general purpose program-to-occupation crosswalk, Emsi's team of data scientists and economists wanted to produce a more targeted analysis, specific to WGU's alumni.

To achieve this, the consulting team leveraged Emsi's profile analytics, a unique data set of over 120 million professional profiles, which helped them identify the actual occupations that WGU grads are now working in. Complementing this with Emsi's traditional labor market data, the list was further refined to emphasize only those occupations that show robust growth projections over the next 10 years. After manual vetting and a cross-check with the NCES mapping, WGU and Emsi had a list of relevant, high-growth target occupations for the two programs of interest.

Target occupations are a solid start, but not detailed enough for the kind of mapping that WGU wanted to create. To dig deeper, Emsi consultants analyzed millions of job postings to detect the actual language employers use to describe their hiring needs. This started with identifying the most frequently requested skills in the target occupations. After additional statistical and manual vetting to prioritize only the most relevant skills, the initial list of almost 20,000 was whittled down to about 1,000 in-demand, marketable skills for each program. This step provided critical insight into the vocabulary employers use to describe their talent needs.

Employer demand was only the first half of the equation WGU was looking to solve. The other half was assessing how their course content aligned with the signals they were seeing from employers. This step presented a new challenge: WGU's curriculum is defined in terms that may not necessarily have a one-to-one correlation with the numerous skills that employers list in job postings.

To overcome this language barrier between educators and employers, the consulting team used Emsi's skill taxonomy to translate learning competencies for WGU's business core and data management and analytics programs into the language of the labor market. Doing so enabled Emsi to map WGU's learning competencies to corresponding skills that appear in job postings.

The heart of the analysis involved comparing the taught skills represented in WGU's learning outcomes to the sought skills represented in employer job postings. This provided three key areas of insight for WGU: where WGU curricular competencies are well-aligned with market needs (taught skills = sought skills); where there are gaps between market needs and curricular content (sought skills that did not show up in taught skills); and where there are skill "surpluses" (taught skills that do not appear to be in-demand in the labor market)

Though this analysis was largely a proof of concept for future work, it's already having an impact on the two programs analyzed in the pilot project. For example, the findings are informing a refresh of WGU's business programming, helping ensure that the courses and competencies they include are aligned to skills that are in high demand in industry.

PRODUCTS AND SERVICES

Market-facing ILR-related tools.

Format for products and services entries:

- Company overview
- Details on product or services offered

Burning Glass
https://www.burning-glass.com/

Company overview
Burning Glass Technologies delivers job market analytics that empower employers, workers, and educators to make data-driven decisions. Burning Glass is reshaping how the labor market works, with data that identify the skill gaps that keep job seekers and employers apart and tools that enable both sides to bridge that gap and connect more easily. The company's artificial intelligence technology analyzes hundreds of millions of job postings and real-life career transitions to provide insight into labor market patterns. This real-time strategic intelligence offers insights, such as which jobs are most in demand, the specific skills employers need, and the career directions that offer the highest potential for workers.

Details on product/services offered
Burning Glass' applications drive practical solutions and are used across the job market: by educators in aligning programs with the market, by employers and recruiters in filling positions more effectively, and by policy makers in shaping strategic workforce decisions. At the same time, Burning Glass' data-driven applications for workers and students help them choose career goals and build the skills they need.

Certified Electronic Diploma by Paradigm Corporation
https://www.paradigm-corp.com/digital-credentials-cediploma-cecertificate/

Company overview
Paradigm, Inc. is a full-service credential provider, both paper and digital, for higher education. Paradigm is proud to service nearly 1,000 institutions.

Details on product/services offered

The CeDiploma by Paradigm is the only credential that carries a unique identifier validated by the issuing Institution. It is digitally secure with additional assurance of authenticity using a tamper-evident signature. It also allows for unlimited sharing as it allows graduates to share credentials with potential employers on social media.

Concentric Sky

https://www.concentricsky.com/

Company overview

Software design and development studio that builds end-to-end solutions.

Details on product/services offered

- **Badgr** delivers fully verifiable credentials to users around the world. The Badgr Pathways app allows institutions to design stackable, cross-disciplinary learning pathways that build off prior learning assessments, industry certifications, and other external credentials.

- **Program Mapper** helps students visualize their program options in the context of expected employment outcomes. The program features an interactive, pathway-based visualization of the traditional course catalog alongside career data.

- **Micro-credential platform** allows educators to earn competency-based recognition for their professional learning and share the results with colleagues. Educators can access and earn hundreds of micro-credentials on a variety of pedagogical topics, from computational thinking and learning differences to Deeper Learning. Backed by Badgr, the platform creates a true digital credential marketplace that allows any organization to submit and market their digital credentials to teachers around the world.

Connecting Credentials Framework

http://connectingcredentials.org/framework/

Company overview

Connecting Credentials campaign, a joint partnership of the Lumina Foundation, the Corporation for a Skilled Workforce (CSW), and 121 cosponsors.

Details on products/services offered

This beta framework can be used to identify the competencies underpinning credentials, educational programs and work, establishing common language and delineating levels of proficiency to describe what people who have mastered these competencies know and are

able to do. One goal of this work is to make the competencies associated with a given credential, program, or job description explicit rather than implicit – including colleges aligning more precisely their program requirements with the mix and levels of competencies needed by relevant employers.

Core Learning Exchange (CLX)

https://www.corelearningexchange.com/

Company overview
Core-LX was formed in 2015 by an ed-tech veteran to improve competency-based, personalized, and blended learning while promoting student equity and equal access to quality education. At the root of this challenge is the ability to verify that an individual has mastered a skill set. While other badging technologies are available, only Core-LX offers an open content development and delivery platform that enables teachers and trainers to target and support those students who chose to pursue the middle skills path.

Details on product/services offered
CLX is focused on solving the labor shortage for middle skills jobs by providing a verifiable Career Technical and mastery-based learning platform.

Core-LX serves K-12 sector, CTE high schools and trade schools, and professional development leadership training organizations. The white label version of the marketplace enables corporations to build and distribute proprietary, certification-related educational content.

The Core-XL platform includes a 21st Century, student-centered digital record of each learner's experience through the use of a Comprehensive Learner Record (CLR). The CLR captures and communicates a learner's journey in a verifiable, digital format. Because the CLR is holistic, it showcases both learning experience and achievements through the accurate reflection of a student's range of knowledge, sills, and abilities. This tool enables students to express their qualification sin a more detailed and complete way for districts, prospective employers, and community colleges and higher education institutions.

Credential Registry by Credential Engine

https://credentialengine.org/about/credential-registry-overview/

Company overview
Credential Engine is a non-profit whose mission is to create credential transparency, reveal the credential marketplace, increase credential literacy, and empower everyone to make more informed decisions about credentials and their value.

Details on product/services offered

The Credential Registry is a cloud-based library that collects, maintains, and connects information on all types of credentials, from diplomas to apprenticeships and from licenses to PhDs. The Registry holds detailed information on credentials in an easily-accessible format. Individuals can explore competencies, learning outcomes, market values, and career pathways and reference data on modern credential attainment and quality assurance at schools, professional associations, certification organizations, military, etc.

Using technology and Credential Transparency Description Language (CTDL), the Credential Registry captures, links, updates, and shares up-to-date information about credentials so it can be organized and centralized within the Registry, made searchable by the Credential Finder, customized applications and linked to from anywhere on the open Web.

Data in the Credential Registry is publicly available for non-commercial use, and publishing to the Registry is free for any credentialing organization.

Desire 2 Learn (D2L) – Achievement Standards Network (ASN)

https://www.d2l.com/achievement-standards-network/

Company overview

The Achievement Standards Network (ASN) is one of the largest open-access collections of curriculum objectives. It helps facilitate standards-based course development.

Details on product/services offered

ASN provides access to over 700,000 learning objectives published by education agencies, organizations, and governments across the globe – including Common Core State Standards. It helps instructors and course designers align their content to published learning objectives.

edX – Transferrable Learner Record (TLR)

https://www.edx.org/

Company overview

edX is a nonprofit online education platform founded in 2012 by Harvard University and MIT, with more than 22 million learners and 140 institutional partners offering more than 2,600 online courses.

Details on product/services offered
In order to help learners more easily pursue education and employment opportunities, edX created a secure, transferrable learner record (TLR). Learners on edX.org who have earned at least one course completion certificate for a course that is part of a multicourse program can opt to share a link to their TLR with any other person, university, or employer.

A learner's record contains information about the courses completed, grades received and date of certification. Future iterations of the TLR will likely contain additional attributes such as learning objectives, competencies and skills acquired, and associated professional certifications, credit hour and continue education units.

The TLR link is directly accessed by learners with login credentials on edX.org from their profile or program progress page. For courses on edX.org that are associated with Master's degree programs, such as edX's MicroMasters® programs, edX streamlines the credit application process for Master's degree programs by sending a secure TLR link to the university on behalf of the learner.

Emsi Data and Analytics
https://www.economicmodeling.com/

Company overview
Emsi uses data to drive economic prosperity.

Details on product/services offered
Emsi provides labor market data available to professionals in higher education, economic development, workforce development, talent acquisition, and site selection. The data covers nearly 100 percent of the workforce and is compiled from a wide variety of government sources, job postings, and professional profiles. Emsi data is used to align programs with regional needs; equip students with career visions; understand regional economic and workforce activity; and find and hire the right talent.

ETS
https://www.ets.org/about/what/

Company overview
ETS works with education institutions, businesses and governments to conduct research and develop assessment programs that provide meaningful information they can count on to evaluate people and programs.

Details on product/services offered
They design their own assessments with research with the goal of helping education and workplace communities make informed

decisions. Their assessments, research and customized products and services are designed to improve teaching and learning, expand opportunities for learners and communities, inform education and policy, and advance the field of educational measurement.

Their work falls into five broad areas of expertise: research, assessment development, test administration, test scoring, and providing instructional products and services.

Greenlight Credentials
https://www.glcredentials.com/

Company overview
Greenlight Credentials is a private company offering credential sharing and verification services.

Details on product/services offered
Greenlight is a blockchain-based platform that stores academic achievements, credentials, work experience and recommendation letters in the user's GreenLight Locker. The Locker holds a "life transcript" that represents all the skills and competencies that user has acquired, and for which they have been certified, in some manner, with the granter of the certificate tracked in a verifiable manner. The skills, competencies, and credentials can be easily accessed and shared with any third-party without the need to contact each institution on the user's behalf.

National Student Clearinghouse (NSC)
https://studentclearinghouse.org/

Company overview
The National Student Clearinghouse® helps education go further with innovative solutions that meet reporting, research, verification, transcript, and data exchange demands across the K-20 to workforce continuum.

Details on product/services offered
The NSC provides services for:
- Students to order transcripts, obtain verification of in-school status, find money-saving student discounts, and more.

- High schools to receive continuing collegiate enrollment and degree information on their alumni. The NSC offers transcript services and education research services to help high schools and districts improve college readiness and success.

- Colleges to navigate growing compliance, administrative, student access, accountability, and analytical needs. The NSC offers data exchange, financial aid, research, and verification services.

- Educational organizations, including state and local agencies, to assess the efforts of K-20 schools and outreach programs that help students succeed in higher education.

- Workforce companies and organizations to take the guesswork out of confirming academic credentials. The NSC offers industry-based solutions that leverage education data resources.

Parchment Credential Profile
https://www.parchment.com/about/

Company overview
Parchment is a digital credential service, allowing learners, academic institutions, and employers to request, verify, and share credentials in simple and secure ways. The platform has helped millions of people and thousands of schools and universities exchange more than 30 million transcripts and other credentials globally.

Details on product/services offered
With credential profiles, individuals can manage all of their hard-earned lifelong achievements in one place, accessible from any device at any time.

Tallo
https://tallo.com/

Company overview
Tallo is an online platform that brings all stakeholders together: talent, educators, companies, organizations, governmental agencies, states and more. It allows students to display their skills, and puts organizations in front of talent.

Details on product/services offered
Employers micro-target talent with criteria including career interests, college major interests, demographics, locations, test scores, work experiences, etc. Students can upload their classes, work, band, projects, and videos to ensure employers, colleges, and companies can find them when searching for candidates. Companies and colleges send students direct messages about opportunities that fit their skills and interests.