



IMS GLOBAL[®]
Learning Consortium

Article Series on Learning Impact

Competency-Based Education and Extended Transcripts: IMS Global Learning Consortium Enabling Better Digital Credentialing

May 2016

Traditional educational models have placed great emphasis on educational processes and inputs such as strong curriculum development, effective student selection and enrollment, and excellent facilities. Increasingly, however, educational models are focusing on outcomes, the results of educational processes in the form of demonstrated competencies and graduates well-prepared for careers and contributions to society.

IMS Global Learning Consortium members, leaders in innovative educational models, are working collaboratively to understand and drive a focus on outcomes via the [IMS Digital Credentialing initiative](#). Progressive educational technology (edtech) solutions developed by members serve the needs of higher education writ large, advancing opportunities for continuous improvement and evolutions in practices. IMS initiatives in digital credentialing enable interoperable competency ecosystems and empower institutions to award credentials beyond the traditional transcript.

Attention to competencies has increased rapidly, fueled in part by students' expectations that their credentials prepare them adequately for careers, employers' complaints that graduates lack the competencies they need, and government and taxpayers' concerns about how higher education investments are serving our society and economy. For a concise overview on the topic of competency-based education (CBE), see the EDUCAUSE Learning Initiative brief, [7 Things You Should Know About Competency-Based Education](#).

In parallel, there is increased interest across sectors in documenting and valuing learning that takes place outside classrooms. The prevalence of informal and community learning on the web, a renewed appreciation for the value of service learning, and recognition of workplace and experiential learning are all expanding conceptions of what could/should be included in a person's learning record. One specific application of this concept is the extended transcript, which includes both more detailed

records of learning, such as specific competencies, and broader records of learning, such as co-curricular and prior learning. For a concise overview on the topic of extended transcripts, see the EDUCAUSE Learning Initiative brief, *7 Things You Should Know About the Evolution of the Transcript*.

IMS is directly addressing these issues through the collaborative development of technology interoperability standards and conceptual frameworks for managing competencies, transmitting learning outcomes, and extending academic transcripts. These innovations address real-world problems with real-world solutions.

Real-World Problems

CBE is a learning-centered model that gives students a more direct, flexible pathway to degree completion, allowing them to attain mastery at their own pace. A focus on learning outcomes and competency mastery can be beneficial for any educational program, and programs that are not dependent on “seat time” scheduling are particularly helpful for students who have prior learning, need to stop and start as they progress, or who need more or less time than average to achieve learning outcomes. For context on the benefits of focusing on competencies in all higher education programs, see the American Council on Education white paper *Communicating the Value of Competencies*.

While the benefits of CBE are promising, the reality is that institutions face significant challenges in effectively adopting, delivering, and scaling CBE programs. Technical issues are among the biggest barriers. For further background on the issues of technical barriers see the Educause Review article *Competency-Based Education: Technology Challenges and Opportunities*.

Without effective technology, students’ CBE experiences can be disjointed or impaired. Students depend on the institution’s systems to work together efficiently and smoothly. For example, Olivia Hafez (a fictitious persona) is enrolled in a CBE Nursing

Informatics program that lets her proceed through her academic work at her own pace, leading to a credential that will advance her hospital career. She needs the technology systems used to deliver her program to be efficient and effective. What if Olivia can’t see the framework of Nursing Informatics competencies or know which ones she’s mastered? Does her work in the learning environment get communicated to a dashboard that helps her understand her progress? Will the non-term based structure of the program impede her ability to get financial aid? Will she have a record of her competency achievements that she can share with her employer?

For a description of how these and other real technology operability problems can be addressed, see the sections below and the [video](#) by IMS and the Competency-Based Education Network ([C-BEN](#)).

The Role of IMS Global

Open Standards are a Key to the Future

The global challenge of enabling better education for the world’s citizens is critical for our futures. More effective educational models, access to digital resources, the ability to personalize learning specific to the needs of each individual, and timely information about progress all contribute to improving learning. To enable and support these advances, we need innovative technologies that are easy to adopt and integrate seamlessly together.

IMS Global Learning Consortium, the world leader in edtech interoperability and [Learning Impact](#), brings to market a set of open standards that make applications, content, and data “[plug and play](#)” in higher education and K12. After 10 years of dramatic growth, IMS has become one of the largest and most influential standards consortia in the world, with over [350 member organizations](#). Through the efforts and support of IMS’ members, the next generation of teaching, learning, and credentialing models is being realized, today.

IMS's capabilities to drive advances in edtech are unparalleled. Through its collaborative working group structure and ability to engage leading experts in academics, technology, and supplier markets, IMS creates a laboratory for practical innovations that improve teaching and learning for millions of students. For example, edtech advances like Learning Tools Interoperability® (LTI®) provide plug and play interoperability for learning apps, OneRoster™ eases student records administration and Caliper Analytics™ opens up the academy to the benefits of big data.

“Sustaining innovations in higher education requires collaborative agreements amongst educational providers and educational technology vendors. IMS is uniquely positioned to lead the definition of those innovations through visionary initiatives and collaborative working groups.”

– Jeff Grann, Academic Director of Assessment and Learning Analytics, Capella University

The Importance of Interoperability

The interoperability standards developed by IMS are critically important to continual innovations in educational models. The proliferation of ebooks, specialized lab platforms, simulations and gaming, integrated web meeting spaces, and adaptive learning platforms represent a fragmented and confusing arena without standards that enable interoperability. Educational institutions spend large sums of money and extensive human resources to implement and adopt technology systems. The ability to efficiently connect these solutions gives institutions more choice and flexibility, making it easier for them to select the right tool at the right time for the right constituents. With clear, strong interoperability among technology solutions, institutions are better able to apply their resources to creative academic and pedagogical approaches maximizing learning outcomes. Interoperability exponentially expands the market of new ideas.

A Practical Structure for Action

Guided Collaboration

Collaboration among IMS members is organized into working groups around specific topical areas such as Digital Curriculum, Learning Apps and Tools, Digital Credentialing and CBE, Educational Data and Analytics, and eAssessment. Working groups of suppliers and institutional members collaborate on specific problems to be solved, developing interoperability specifications that technology providers choose to adopt in their products and services. Each working group is facilitated by an IMS staff member and one or more member leaders.

Project proposals are initiated by members and researched through institutional communities of practice with emphasis on institutional market demand and the expected benefits to educators and learners. High-potential proposals are explored with technology suppliers interested in project development through the working group process. The working groups are comprised of volunteer members from a wide variety of suppliers and institutional stakeholders along with IMS facilitators and architects, coming together to create new and improved interoperability features for the benefit of the education community at large. Resulting projects (like those described below) for the CBE Specifications and Extended Transcript are the work of IMS members, a driven and passionate mix of visionaries with a practical bent, focused on delivery of common sense solutions for education.

Compliance Certification

Interoperability does not occur if products are not compliant with the relevant specifications. There are over 400 products currently listed as compliant in [IMS' Product Directory](#), where technology purchasers can go to find the latest product information and verification of conformance certification for all IMS-published specifications.

Compliance certification is a core value that IMS offers its membership. To ensure that a product is certified to be interoperable with others, the product is rigorously tested through the online compliance program that IMS has developed and offers for its member suppliers and institutions. Purchasers of new technology solutions should first check the IMS product directory to ensure the product of interest is certified.

Governance

IMS membership varies widely in organization size and financial resources. Members pay an annual fee to participate, and there are three membership levels, with Contributing Members (CMs) granted all privileges, including a vote on organizational affairs. Regardless of size, all CMs are equal in their ability to drive innovation by introducing and contributing to projects. Governance is provided by a membership board of directors, institutional executive boards for Higher Education and K-12, and a Technical Advisory Board (TAB) comprised of one representative from each CM and overseen by a TAB Executive Board. With quarterly meetings to discuss business, share the latest in creative application of specifications, and meet with working group peers face to face, the IMS community is a lively and unique laboratory for guided innovation.

Collective Impact

To expand its member and end-user benefits, IMS works collaboratively with numerous national and international organizations and initiatives to maximize collective impact. This helps to ensure that IMS specifications and practices have global relevance and a high level of applicability across domains.

For CBE and extended transcripts, IMS works with other organizations addressing different aspects of the same issues. IMS is not creating competency frameworks, assessments, or transcripts per se, nor the content for specific educational programs, as other organizations support these activities. IMS is developing the technical interoperability

specifications and services along with sample code to enable their implementation. Relevant organizations collaborating with IMS in this arena include:

American Association of Collegiate Registrars and Admissions Officers (AACRAO) is a higher education member organization that promotes best practices for records management, enrollment management, admissions, student services, and administrative information technology. IMS and AACRAO are doing related work on extended transcripts as comprehensive digital records of student achievement.

Competency Based Education Network (C-BEN) is a group of colleges and universities working together to address shared challenges to designing, developing, and scaling competency-based degree programs. IMS and C-BEN are collaborating to identify the technologies used for CBE programs and to address interoperability challenges.

Badge Alliance is “a network of organizations and individuals working together to build and support an open badging ecosystem, with a focus on shared values including openness, learner agency, and innovation.” As one of three members of the Badge Alliance Steering Committee, IMS Global along with Mozilla Foundation and the MacArthur Foundation are collaborating to evolve Open Badges to fit the needs of higher education institutions.

In addition, the IMS working groups contextualize their projects with numerous resources from other related initiatives and national organizations, including **Connecting Credentials** and the **Credential Transparency Initiative**, where IMS participates in technical advisory committees. For an overview of the relationships among different groups working on CBE, extended transcripts, and innovations in credentialing, see the “Collective Impact” section of the American Council on Education white paper *Quality Dimensions for Connected Credentials*. For a detailed inventory, see the Connecting Credentials *Landscape Review of Innovations in the U.S. Credentialing Marketplace*.

IMS CBE and Extended Transcript (eT) Working Groups

Initiating Collaboration

As more institutions adopt CBE, there have been many questions about CBE operations and requirements. Are competency results the same as grades? How will assessment results be assembled and scores calculated? How are results reported to students? Where are competencies and scores stored? How does CBE impact financial aid? How will transcripts document competencies? The frequency and urgency of these questions suggested that the market had matured to a point at which a focus on standards and interoperability was needed.

At the IMS 2014 CBE Summit, IMS members decided to address these questions directly through a digital credentialing initiative with focused working groups on extended transcripts and a CBE specification. The direction was to have the former inform the latter by identifying data needs for the transcript. Working groups were formed with volunteer participants from educational institutions, technology providers, IMS, and other edtech organizations, and included designers, architects, developers, academic institution administrators, IT professionals, and registrars.

“The IMS work on CBE and extended transcripts has the potential to provide better service to students by increasing the transparency and relevance of their educational experiences. Now we as registrars must look to technology and enterprise systems to be nimble and support this type of innovation in higher education.”

– Kelly Brooks, Registrar, Capella University

Competency Frameworks

Defining a common interoperability standard for CBE is counterintuitive to many who are struck by the differences amongst CBE programs. Indeed, CBE programs differ in their competency frameworks and even in their terminology: some use the term “competency,” and others use a variety of other terms such as “outcomes,”

“proficiencies,” “skills,” and “objectives.” These variations are a natural result of the history of competency-based programs, which developed at a few diverse institutions long before edtech products were critical for operations. Variations in terminology reflect variations in approaches, leading to confusion and making it harder for technology providers to address the needs of the market. Without reasonable consistency in practices, edtech providers have difficulty justifying investment in solutions to support CBE programs, because any particular approach provides value to only a small number of institutions. As a result, institutions are faced with many customizations, workarounds, and complex, expensive integrations among technology systems.

Early on the IMS working groups considered developing a CBE data dictionary as a way to standardize implementations, but eventually discarded this goal, recognizing it as complex and broader than the stated scope of the project. They kept the core purpose of such a dictionary for an extended transcript by holding true to the principles that a new type of transcript should provide for student portability of credit as well as institutional innovation and identity, which became premises for the CBE specification.

To be successful, a CBE specification needs to define a minimal data model that is sufficient to support common interoperability needs and also flexible enough to sustain local differences in terminology and approaches. The general idea is to focus on key interactions between IT systems and to separate the semantic from the functional. This sidesteps the need to standardize terminology and focuses on key exchanges of competency data between systems. For example, the higher-order curricular elements assessed at the end of a program are referred to as “program outcomes” at some institutions, while other institutions might call these “competencies.” Either way, the important commonality they share is the need for student outcomes data related to these elements to reflect the structure of the CBE program and resulting credential.

The CBE data model developed by the working group contained several attributes intended to support the diversity of CBE programs and extended transcripts. This model was used to define a JSON-LD web service supporting the transmission of a student's extended transcript. There are four key properties of the competency data model that support its flexibility for CBE interoperability within an institution as well as potential data integration schemes that go beyond the institution.

- **Competency hierarchy.** Most CBE curriculum models contain a hierarchical structure of competency statements. Some edtech products support hierarchical relationships, but they do so in idiosyncratic ways that are specific to each product. The data model supports competency hierarchies using simple parent-child relationships via “isChildof” and “hasChild” fields. Another key feature of the data model is the inclusion of a “reference hierarchy” entity that is envisioned to describe a particular competency in relation to common frameworks. By supporting competency hierarchies in the data model, edtech providers help institutions sustain coherent programming across many technology tools for student-level reporting.
- **Competency type.** CBE programs use inconsistent terminology across institutions. Edtech products have addressed this inconsistency by using very generic language in their products, which rarely supports any program well. The data model supports institution-specific terminology via a “type” field in the competency table. By supporting this feature of the data model, edtech providers empower institutions to control and clearly communicate their curricular models.
- **Competency code.** Many technology products have proprietary mechanisms for storing competency statements. Institutions utilizing multiple technology products for CBE programs often need to reference the same competency statement in different systems, such as when assessing students using one system and storing competency results in another system. The data model addresses this challenge by

using a “competency code” and versioning. A competency code is a logical reference to the full competency statement. It is analogous to a course code, such as PSY101 as a reference to an institution's introductory psychology course. Competency referencing via a competency code allows an institution to reference the same competency statement interoperably among systems without complex synchronization across unique ids and versions.

- **Competency scores.** CBE programs need to aggregate student-level data for particular competencies across multiple assessments and over time. The data model supports such aggregation via a competency score table indexed by a “competency_offering_map” table. This approach enables institutions to report student-level competency scores based on the institution's assessment strategy and results calculation definition for each competency. For example, one competency may be assessed in multiple courses, whereas another competency may be assessed in only one specific course. The competency score table supports competency-specific calculation methods to provide program flexibility.

Framework for Extended Transcripts

The eT working group set out to answer the question, “What initial, basic competency information is needed to support an extended transcript for CBE as well as general interoperability among higher education institutional systems that are being used to deliver or support CBE?” The overarching goal is to enable new ways to evidence students' learning journeys. The project included a functional track and a technical track in an iterative process to develop an eT prototype in conjunction with the CBE specification. The team took into account interoperability requirements across numerous edtech systems, including enrollment and admissions, curriculum design, learning management systems (LMS), assessment systems, student information systems (SIS), financial aid, document management systems, student accounts/billing, and others.

Academic transcripts, as verifiable, official

documents, need to be considered in the context of existing guidelines and constraints. Therefore the project took into account a number of academic and business requirements, because transcripts need to be:

- Registrar controlled
- Issued by an institution
- Constructed in accordance with AACRAO guidelines
- Secure and private
- Authentic, unalterable

Additional business requirements to meet contemporary needs include:

- The transcript should be a digital-first document (electronic) but also printable in PDF format
- The transcript should be shareable by the student via a secure link to the e-document(s) wherever they are housed

These considerations were combined with guidelines for implementation that are in keeping with a future-focused, 21st-century relevant, technologically rich CBE record and transcript:

- Machine readable
- Digitally signed or verified
- Adopting standards of the semantic web for linked data (JSON-LD)
- Leveraging IMS standard vocabulary for enrollment, curriculum, instruction, assessment, and student records already adopted by hundreds of technology suppliers
- Compliant with the Open Badge Specification and IMS' Open Badge Extensions for Education
- Backward-compatible with SPEEDE EDI TS130 and XML for data exchange through existing private institutional data exchange networks

Extended Transcript Prototype

Emerging CBE ecosystems need modern, relevant transcripts, and that need is approaching real implementation. IMS, working closely with registrars and encouraged by AACRAO, has led

development of a prototype extended transcript designed to support competency-based programs. This prototype is web-based, flexible enough to support the descriptive nature of competency reporting, and designed to meet the needs of learners, registrars, and employers. It represents a secure, student-centered digital record for the 21st century.

The **working prototype** is an example of how an extended transcript may be rendered in a web browser. Each institution will have the flexibility to design their own preferred user experience. The IMS common data specification, based on the linked data standard JSON-LD, will enable the student to securely share view-access to their credentials via the web, without the need to make a physical copy, simply by sharing a secure link.

This prototype and related eT work will rapidly evolve through 2016 in parallel with the work of AACRAO and **NASPA** to develop a new model for a comprehensive student record. Several IMS institutional members are collaborating to produce a preliminary extended transcript for pilot in the fall of 2016.

“In an era where micro-credentials, digital credentials, and new learning models like CBE are gaining traction, the work of the IMS community to re-imagine a new type of record to better serve students, universities, and employers is exhilarating! Developing a comprehensive, digital, student record to better articulate what students know and can do speaks to the needs of 21st century employers.” - Joellen Shendy, Associate Vice Provost & Registrar, University of Maryland University College

Defining Solutions for Real-World Problems

Based on **research** conducted with 35 C-BEN institutions, the IMS working groups addressed five use cases in prototypes, each representing critical barriers to the effective implementation of technology systems for CBE.

This work represents a coherent flow of processes critical for student success in CBE programs:

- Managing competencies
- Tracking evaluation results
- Exchanging financial aid program information
- Measuring interaction between faculty and students
- Generating a competency or extended transcript

Defining and implementing solutions to address these barriers significantly helps institutions adopting, delivering, and scaling CBE programs. While there are many cultural, regulatory, financial, and other barriers to be addressed, reducing the technical barriers to implementation of CBE opens up many opportunities.

These are opportunities for institutions, but more importantly, for students who benefit from CBE programs. Students like Olivia Hafez depend on the institution's systems to work efficiently and smoothly together. When the barriers above are addressed, Olivia has the flexibility, visible record of progress, and evidence of learning to achieve her goal of a Nursing Informatics credential that will advance her hospital career. The IMS work yields real, specific benefits for students:

- The institution can define and manage a well-organized framework of competencies as part of a CBE program. Olivia can see the competency framework and know exactly what's required in her program of study. As she progresses through learning activities and assessments that are aligned with these competencies, she can see her progress, find additional resources aligned to specific competences as needed, and decide what to do next.
- The institution can track evaluation results across environments so that everyone has a clear, accurate record of progress. As Olivia masters competencies, this information is communicated from the learning environment or assessment system to a dashboard that helps her understand her progress.
- The institution can transmit CBE program information from the SIS to financial aid systems to manage non-term structures. This information helps the institution meet the

requirements for Olivia to receive her financial aid without problems.

- The institution can collect necessary records of faculty-student interactions efficiently and in many cases automatically. These means that Olivia's instructors can spend more time working with her and less time record-keeping.
- The institution can include the competencies Olivia has mastered in a verified, digital, extended transcript. They can even include verified evidence of her learning, providing click-throughs from the transcript to examples of Olivia's work. Olivia is very proud of her competency transcript, and she has shared it with her employer even before she's finished with the program. The verified record of competencies and evidence of learning helped her get higher pay and more responsibility in her current job, and she's already talking to HR at the hospital about what opportunities could be available for her when she finishes the program.

Olivia's success is, in many very tangible ways, supported by the definition and implementation of solutions developed through the IMS working groups.

"The IMS working groups provide unparalleled opportunities to work with diversely talented people on challenging, interesting, and valuable solutions to real-world problems. I'm particularly excited to contribute to IMS teams working together on problems that are just starting to grow into critical needs-- looking to the future and helping to shape that future."

– Deborah Everhart, VP Design & Innovation,
Learning Objects

Collaborating into the Future: A Call to Action

This is ongoing work. In 2016, the CBE and eT working groups are drilling down into CBE assessment results reporting and eT live pilot projects. By the end of the year, real students will be using solutions that include their competencies in their transcripts.

These projects are the early steps in a long term effort to expand the learner's role in their education and help them align their academic credentials to the needs of an ever-evolving career landscape. Methods, models, and technologies have progressed in recent years, making it possible for learners to collect all of their credentials-- social, professional, and academic- in secure, verifiable digital forms. This capability enables learners to leverage these high value assets to their maximum advantage. Digital credentials and their management is a foundational component of **Next Generation Digital Learning Environments**. Achieving this reality for learners and their faculty and institutions will require technology providers to achieve certified

compliance with key interoperability standards, such as those under development by the members of IMS Global.

The IMS digital credentialing work is important to institutional administrators and leaders as well as IT professionals, and we encourage everyone to contribute. IMS is a member-based organization comprised of hundreds of K-20 institutions and solution providers. Through the work of its members, IMS is making the vision of next-generation teaching and learning a reality. There is much to be done, and your organization's involvement is welcome and needed. Help lead the future of education technology-- **join IMS. Contact IMS** to learn more.

About IMS Global Learning Consortium (IMS Global)

IMS Global is a nonprofit organization that advances technology that can affordably scale and improve educational participation and attainment. IMS members are leading suppliers, institutions and government organizations that are enabling the future of education by collaborating on interoperability and adoption initiatives. IMS sponsors the Learning Impact Leadership Institute, a global program focused on recognizing the impact of innovative technology on educational access, affordability, and quality while developing the people and ideas that are going to help shape the future of educational technology. For more information visit www.imsglobal.org or contact info@imsglobal.org.



Citation to reference this article: IMS Global (2016). *Competency-Based Education and Extended Transcripts: IMS Global Learning Consortium Enabling Better Digital Credentialing*. IMS Global Learning Consortium Series on Learning Impact. May 2016 from www.imsglobal.org/articles/SLI19-051616.pdf Deborah Everhart, (Learning Objects), Jeff Grann (Capella University), Mark Leuba (IMS Global), Joellen Shendy (University of Maryland University College)

Copyright © 2016 by IMS Global Learning Consortium, Inc.

All Rights Reserved. Trademark information: www.imsglobal.org/copyright.html