IEEE IC Industry Consortium on Learning Engineering (ICICLE)

Industry Connections Activity Initiation Document (ICAID)

Version: 3.0, 25 October 2021

IC7-016-03 Approved by the IESS SMDC 13 December 2021

Instructions

- Instructions on how to fill out this form are shown in red. It is recommended to leave the instructions in the final document and simply add the requested information where indicated.
- Shaded Text indicates a placeholder that should be replaced with information specific to this ICAID, and the shading removed.
- Completed forms, in Word format, or any questions should be sent to the IEEE Standards Association (IEEE SA) Industry Connections Committee (ICCom) Administrator at the following address: industryconnections@ieee.org.
- The version number above, along with the date, may be used by the submitter to distinguish successive updates of this document. A separate, unique Industry Connections (IC) Activity Number will be assigned when the document is submitted to the ICCom Administrator.

1. Contact

Provide the name and contact information of the primary contact person for this IC activity. Affiliation is any entity that provides the person financial or other substantive support, for which the person may feel an obligation. If necessary, a second/alternate contact person's information may also be provided.

Chair Name: Michael Jay
Email Address: michael@matchmakeredlabs.net
Employer: Educational Systemics, Inc.
Affiliation:

Secretary Name: Jodi Lis
Email Address: jlis@intrahealth.org
Employer: Intrahealth
Affiliation:

IEEE collects personal data on this form, which is made publicly available, to allow communication by materially interested parties and with Activity Oversight Committee and Activity officers who are responsible for IEEE work items.

2. Participation and Voting Model

Specify whether this activity will be entity-based (participants are entities, which may have multiple representatives, one-entity-one-vote), or individual-based (participants represent themselves, one-person-one-vote).

Individual-based.

3. Purpose

3.1 Motivation and Goal

Briefly explain the context and motivation for starting this IC activity, and the overall purpose or goal to be accomplished.

Describe the motivation and goal.

The past 20 years have seen the emergence of many new tools, products, media formats, and technologies meant to support learning, education, and training. In recent years, the use of technology to support the way people learn in school, on the job, and on their own has accelerated dramatically. These technologies include learning management systems, MOOCS, authoring tools, mobile learning environments, serious games, simulations, applications of virtual and augmented reality, learning record stores, open badges, pedagogical agents (AI), online laboratories, and much more.

There is a significant engineering aspect to the development and deployment of these learning technologies that is supported by a portfolio of existing and planned standards. We have made great strides toward increasing conversation around Learning Engineering yet it has yet to coalesce into a generally accepted, coherent discipline. While Learning Science research has generated many of these new technologies, neither the scientific community nor the instructional designers who create new learning activities offer much guidance concerning the capabilities and limitations of the underlying technologies; how to use them to accomplish instructional goals; and how to evaluate the effectiveness of both the technologies and the various pedagogical innovations they allow. Motivated by the need to provide this guidance we propose an activity on Learning Engineering whose goals are to:

1. Represent the relationship between Learning Engineering and allied disciplines.

2. Evangelize Learning Engineering as an emphasis in allied disciplines and explore the emergence of Learning Engineering as its own discipline.

3. Convene Conferences/workshops/gatherings to cultivate a new IEEE community.

3.2 Related Work

Provide a brief comparison of this activity to existing, related efforts or standards of which you are aware (industry associations, consortia, standardization activities, etc.).

Describe the related work.

There are numerous activities in the IEEE LTSC, in other IEEE groups, and in other SDO's and industry associations that develop technical standards for learning systems and that touch on applications of technology to learning, education, and training. However, none is addressing the engineering problems of designing and developing learning systems that incorporate diverse forms of learning, that must interoperate with an increasingly large stack of other technologies, and that should conform to multiple standards,

potentially produced by multiple standards committees or SDOs. The continuation of the proposed IC will address this engineering problem which has become critical as learning systems and their architectures have diversified, and as such is synergistic with and will add value to the many related activities listed next (and to others not on the list):

- IEEE Computer Society Learning Technology Standards Committee LTSC): multiple completed and in-progress standards activities including Learning Object Metadata (1484.12.1 – 2002); Augmented Reality (P1589, in ballot); and the current xAPI TAG.
- IEEE Child and Student Data Governance WG (P7004, sponsored by LTSC)
- IEEE Personal Data AI Agent WG (P7006)
- IEEE Standard on Networked Smart Learning Objects for Online Laboratories WG (P1876).
- IEEE Simulation Interoperability Standards Organization.
- The US Advanced Distributed Learning (ADL) Initiative's Shareable Content Object Reference Model (SCORM); Experience API (xAPI); and their current Total Learning Architecture research project.
- ISO/IEC JTC 1/SC 36, Information Technology for Learning Education and Training. LTSC has a Category C liaison with SC36, which has a large portfolio of related standards including: Metadata for Learning Resources, ...
- IMS Global Learning Consortium: Industry association with multiple related standards including content packaging, common cartridge, learning technology interoperability, Caliper, EPUB for Education, Competencies and Academic Standards Exchange, Open Badges.
- US Army Research Laboratory's work on the GIFT model for Intelligent Tutoring Systems.
- Society for Learning Analytics Research (SoLAR)
- W3C: Publishing Working Group: EPUB 3.1, Verifiable Claims, the Course community, and the newly started Educational and Occupational Credentials community
- The former Aviation Industry CBT Committee (AICC) produced a series of standards for Computer Managed Instruction including the recent CMI5 specification.
- Access for Learning Community: Student Information Framework (2015)
- LRMI Learning Resource Metadata Initiative (2011), Dublin Core and related schema.org efforts.
- Multiple organizations working on digital competency records, certification, credentials and badges (PESC, IMS CASE, Credential Engine, HR Open, IMS Open Badges, Medibiquitous, ...)
- The US National Science Foundation's Cyberlearning Program
- The new Masters of Educational Technology and Applied Learning Science (METALS) Program at Carnegie-Mellon University and other academic pioneers who are defining the field and training the first

generation of Learning Engineers.

In addition, both the IEEE Learning Technology Technical Committee and the IEEE Education Society have contributed in several related areas and have participated in this activity.

This list is not complete. There are efforts by multiple NATO countries to re-architect military training to incorporate advanced technologies, include the US Army's "Synthetic Training Environment" program and the US Navy's Sailor 2025 training re-design. Many trade associations provide guidance to designers and consumers of learning technology, including the Western Cooperative for Educational Technology, the eLearning Guild, the Online Learning Consortium, MERLOT, the Masie Consortium, EDUCAUSE, the ed-fi Alliance, Project UNICORN, and the Association for the Advancement of Computing in Education (AACE). Finally, there are several European Union projects that related direction to learning engineering (see for example, http://www.laceproject.eu/lace/, http://www.eunis.org/, https://www.geant.org/, http://www.ecis.eu/).

3.3 Previously Published Material

Provide a list of any known previously published material intended for inclusion in the proposed deliverables of this activity.

List the previously published material, if any.

Selected Learning Engineering articles published by ICICLE participants during the course of the last two years:

"As learning and performance support technology has continued to evolve, becoming more complex and increasingly more sophisticated, eLearning and digital learning professionals working in education, enterprises, and agencies have recognized their need for new, more sophisticated skill sets. Among these are data visualization, programming and coding, and techniques from learning science and data analytics." Learning Engineering: Making Education More "Professional" — A Q&A with Ellen Wagner, Campus Technology

"Despite exponential growth in the development of learning technologies, there has been relatively little support in terms of professional development for engineers designing, building, and deploying new learning technologies." ICICLE: A Consortium for Learning Engineering — EDUCAUSE Review

"The learning engineer' job title has started cropping up at several institutions, spurred in part by leadership from Carnegie Mellon University, which has a one-year master's program in learning engineering and has hired five of its own." Learning Engineers Inch Toward the Spotlight — Inside Higher Ed

"According to Ken Koedinger, Professor of Human-Computer Interaction at Carnegie Mellon University and chair of ICICLE's SIG on the Learning

Engineering Academic Curriculum: 'In ten years, learning engineering will be a core job in educational technology companies, K-12 schools, colleges and universities.'" Learning Engineering: Merging Science and Data to Design Powerful Learning Experiences — GettingSmart

Foundational Work:

Jim Goodell (editor), Learning Engineering Toolkit, 2022

eLmL 2021 Conference special track - Learning Engineering: Courseware Instrumentation and Learning Analytics track. Summit papers at https://www.iaria.org/conferences2021/eLmL21.html

Masie Consortium, 2002. Making Sense of Learning Specifications & Standards:
A Decision Maker's Guide to their Adoption (ftp://ftp.lotus.com/lotusweb/lspace/S3Guide.pdf).(ftp://ftp.lotus.com/lotusweb/lsp ace/S3Guide.pdf).

Learning, Training, and Assessments in Regulatory Compliance Thomas Jenewein, SAP Education Simone Buchwald, SAP SE
John Kleeman, Questionmark Mark Tarallo, SAP Education . 2014?

Bill Jerome.Bill Jerome. The Need For Learning Engineers (and Learning Engineering). Post to E-Literate blog, April 14, 2013.

Bror Saxberg. Why We Need Learning Engineers. The Chronicle of Higher Education. 2015. (http://www.chronicle.com/article/Why-We-Need-Learning- Engineers/229391)

Tawfik, Mohamed; Salzmann, Christophe; Gillet, Denis; Lowe, David; Saliah-Hassane, Hamadou; Sancristobal, Elio, & Castro, Manuel (2014). Laboratory as a Service (LaaS): a Model for Developing and Implementing Remote Laboratories as Modular Components. *International Journal of Online Engineering (iJOE), 10* (4). http://r-libre.teluq.ca/906/1/REV2014-LaaS_Tawfik_et_al_R-Libre.pdf

B.Fattouh, H. Saliah-Hassane, "Pedagogical Engineering Fundamentals to Build Robust Software Components", "The International Conference on Engineering Education and Research "; iCEER 2004, 27-30 July 2004, Olomuc, Czech Republic.
(https://www.researchgate.net/publication/229049784_Pedagogical_Engineering_Fundamentals_to_Build_Robust_Software_Components_for_Online_Laboratories)

3.4 Potential Markets Served

Indicate the main beneficiaries of this work, and what the potential impact might be.

Describe the potential markets.

The increasing number of products designed to help teachers, students, administrators, and publishers can best be viewed as serving to general markets:

The Education Market:

- Schools, school districts, colleges, universities, and adult education programs (in as much as they develop or purchase learning systems)
- Professional education (e.g. medical, legal, ...)
- Educational technology vendors (and the suppliers of the devices and services needed to support these products)
- Educational publishers and service providers who develop, maintain, or aggregate learning technologies and systems.

The Corporate and Military Training Market:

- Training and talent management organizations (inasmuch as they develop or purchase learning systems)
- Training technology vendors
- Training content and service providers who develop, maintain, or aggregate learning technologies and systems.

The Consumer Market:

- Increasingly youth and adults are turning to non-traditional learning products. They may subscribe to online services for their own use and work independently or in less formal groups to acquire new knowledge and skills both for their own edification or to receive digital badges that can be applied to earn certifications

3.5 How will the activity benefit the IEEE, society, or humanity?

ICICLE has contributed to the awareness throughout the learning technology and learning science communities among industry, academia, and government of the IEEE's unique place and the significance of IEEE learning technology and data standards on the development and sustainment of the profession of learning engineering.

ICICLE's inaugural conference brought over 200 leading thinkers in the field together and formalized a working definition of learning engineering necessary to build out the competencies of the profession and the credentialing requirements of the academic pathways that will support its development through curricula and research. The activity of this community is fostered by ICICLE and by extension, the IEEE-SA and in fostering this community, the IEEE is earning the professional trust and is benefiting from the valuable intellectual capital of the key constituent in the development of next-generation learning technologies. Already, standards activity within the IEEE LTSC is at its highest point in years. It is not a coincidence that ICICLE's constituency of SIGs represents fields currently activated in standards activity.

4. Estimated Timeframe

Indicate approximately how long you expect this activity to operate to achieve its proposed results (e.g., time to completion of all deliverables).

Expected Completion Date: 12/2023

IC activities are chartered for two years at a time. Activities are eligible for extension upon request and review by ICCom and the responsible committee of the IEEE SA Board of Governors. Should an extension be required, please notify the ICCom Administrator prior to the two-year mark.

5. Proposed Deliverables

Outline the anticipated deliverables and output from this IC activity, such as documents (e.g., white papers, reports), proposals for standards, conferences and workshops, databases, computer code, etc., and indicate the expected timeframe for each.

Specify the deliverables for this IC activity, please be specific.

1. Develop a competencies framework for Learning Engineering that can be used as the basis for academic programs, certifications, and developing job descriptions.

2. Evangelize Learning Engineering as an emphasis in allied disciplines and explore the emergence of Learning Engineering as its own discipline.

3. Convene Conferences/workshops/gatherings to grow this IEEE community.

5.1 Open Source Software Development

Indicate whether this IC Activity will develop or incorporate open source software in the deliverables. All contributions of open source software for use in Industry Connections activities shall be accompanied by an approved IEEE Contributor License Agreement (CLA) appropriate for the open source license under which the Work Product will be made available. CLAs, once accepted, are irrevocable. Industry Connections Activities shall comply with the IEEE SA open source policies and procedures and use the IEEE SA open source platform for development of open source software. Information on IEEE SA Open can be found at https://saopen.ieee.org/.

Will the activity develop or incorporate open source software (either normatively or informatively) in the deliverables?: No

6. Funding Requirements

Outline any contracted services or other expenses that are currently anticipated, beyond the basic support services provided to all IC activities. Indicate how those funds are expected to be obtained (e.g., through participant fees, sponsorships, government or other grants, etc.). Activities needing substantial funding may require additional reviews and approvals beyond ICCom.

Specify funding requirements and sources, if any.

Normal staff support and some help organizing a conference are the only needs we see. We have plans for a late summer/early Fall conference in both 2022 and 2023, workshops built around a new seminal book produced through collaboration between many of ICICLE's active members, and collaboration with other organizations (i.e. OLC). Both existing LTSC funds raised as part of the 2019 ICICLE conference and external funding for these activities will be obtained as required.

7. Management and Procedures

7.1 Activity Oversight Committee

Indicate whether an IEEE Standards Committee or Standards Development Working Group has agreed to oversee this activity and its procedures.

Has an IEEE Standards Committee or Standards Development Working Group agreed to oversee this activity?: Yes

If yes, indicate the IEEE committee's name and its chair's contact information.

IEEE Committee Name: Learning Technology Standards Committee
Chair's Name: Richard Tong
Chair's Email Address: richard@yixue.us

Additional IEEE committee information, if any. Please indicate if you are including a letter of support from the IEEE Committee that will oversee this activity.

IEEE collects personal data on this form, which is made publicly available, to allow communication by materially interested parties and with Activity Oversight Committee and Activity officers who are responsible for IEEE work items.

7.2 Activity Management

If no Activity Oversight Committee has been identified in 7.1 above, indicate how this activity will manage itself on a day-to-day basis (e.g., executive committee, officers, etc).

Briefly outline activity management structure.

ICICLE has two tiers of oversight:

- The Executive Committee and the Steering committee. The Executive committee consists of the ICICLE officers (chair, vice-chair, secretary, and treasurer). The exec committee meets in the first week of each month and reviews pressing issues related to the progress of ICICLE toward

meeting its stated goals. This group generates the agenda for the steering committee and begins to identify guest speakers for the Community call later in the month.

- The Steering committee consists of all the members of the executive committee, leads of ICICLE Special Interest Groups (SIGs) and Market Interest Groups (MIGs), and those who are driving any mission critical works including those that involve expenditure of funds. This group discusses issues identified by the Exec Committee and makes recommendation as to how these issues can be addressed. This group meets in the second week of every month and sets the agenda for the Community call which is normally held in the 3rd full week of the month.

7.3 Procedures

Indicate what documented procedures will be used to guide the operations of this activity; either (a) modified baseline *Industry Connections Activity Policies and Procedures,* (b) Standards Committee policies and procedures accepted by the IEEE SA Standards

Board, or (c) Working Group policies and procedures accepted by the Working Group's Standards Committee. If option (a) is chosen, then ICCom review and approval of the P&P is required. If option (b) or (c) is chosen, then ICCom approval of the use of the P&P is required.

Specify the policies and procedures document to be used. Attach a copy of chosen policies and procedures.

Modified baseline *Industry Connections Activity Policies and Procedure*

8. Participants

8.1 Stakeholder Communities

Indicate the stakeholder communities (the types of companies or other entities, or the different groups of individuals) that are expected to be interested in this IC activity, and will be invited to participate.

Specify types of entities or groups of individuals.

Education and training technology vendors; textbook and eLearning media publishers; corporate HR/training departments; digital platform vendors (PC, tablet, phone, VR, AR); related industry associations; educational institutions; curriculum standards and competency publishers; and government agencies

8.2 Expected Number of Participants

Indicate the approximate number of entities (if entity-based) or individuals (if individual-based) expected to be actively involved in this activity.

Number of entities or number of individuals.

50-100 (estimate)

8.3 Initial Participants

Provide a number of the entities or individuals that will be participating from the outset. It is recommended there be at least three initial participants for an entity-based activity, or five initial participants (each with a different affiliation) for an individual-based activity.

Use the following table for an individual-based activity:

Individual	Additional Representatives	Employer	Affiliation
Michael Jay	Brandt Redd	MatchMaker Education Labs	
Jessie Chuang		Classroom Aid	
Jodi Lis		IntraHealth International, Inc.	
Shelly Blake-Plock		Yet Analytics, Inc.	
Aaron Kessler		MIT	
Emily Marasco		University of Calgary	
Erin Czerwinski		Carnegie Mellon University	
Brandt Dargue		Boeing	

As of October 2019, over 100 people have contributed to 8 ICICLE Special Interest Groups (SIGs) and Market Interest Groups (MIGs). ICICLE has 65 entity members and over 600 people subscribe to ICICLE's mailing list. Over 200 people attended ICICLE's inaugural conference on Learning Engineering.

8.4 Activity Supporter/Partner

Indicate whether an IEEE committee (including IEEE Societies and Technical Councils) has agreed to participate or support this activity. Support may include, but is not limited to, financial support, marketing support and other ways to help the Activity complete its deliverables.

Has an IEEE Committee agreed to support this activity?: Yes

If yes, indicate the IEEE committee's name and its chair's contact information.

IEEE Committee Name: Committee Name
Chair's Name: Full Name
Chair's Email Address: who@where

Please indicate if you are including a letter of support from the IEEE Committee.