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# Distributed Learning Technologies and Next Generation E- Learning

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National Research Council  
Canada

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# Agenda

→ EVENT LEADER: Stephen Downes, National Research Council Canada, Canada

→ DESCRIPTION: This workshop will give participants a map of the next-generation learning technology landscape. It will show how the major developments in new technologies relate to each other and how they will change the learning landscape over the next decade or more. It will offer an accessible and down-to-earth presentation of the concept of 'web3' as it has emerged from the decentralized digital currently community (ie., blockchain) and trace the relation between new and unfamiliar concepts such as hash-graphs, consensus, cloud architecture and machine learning and previous work in online and personal learning environments. And it will explore several new technologies piloted over the last year, including blockchain-based badges, identity graphs, and new types of open educational resources.

→ AGENDA:

09:00 – 10:30 Data and Cloud

Content: developing an understanding of dynamic and fluid data networks, how to access open data, and how to work with data in cloud-based resources. Hands-on activities: creation and consumption of RSS feeds, and access to and use of open data; exploration of a cloud environment.

10:30 – 11:00 Tea/Coffee Break

11:00 – 13:00 Graph and Resources

Content: new types of graph-based resources, including distributed knowledge networks. Hands-on activities: experience developing graphs, use of distributed resources such as Jupyter Notebooks, and exploration of graph-based content repositories.

13:00 – 14:00 Lunch

14:00 – 15:30 Identity and Recognition

Content: how we know who someone is, how we project ourselves on the internet, and how we can be safe and secure; how we know what someone has learned. Hands-on activities: in this section include the creation of 'identity graphs', creation of public and private keys, and creation of digital credentials, including securing them with blockchain.

15:30 – 16:00 Tea/Coffee Break

16:00 – 17:30 Experience, Community and Agency

Content: how to enable learning experiences based on hands-on practice and knowledge creation sufficient to support a rapidly evolving sense of community based on information exchange and consensus. Hands-on activities: an exploration of immersive learning and a consensus-based decision-making activity.

# The Learning Context

These are my perspectives. They represent the areas of expertise I have developed over the years. As I study new pedagogies and technologies, I ask questions from the following points of view:

<p>Ψ <b>Philosophy</b> My degrees are in philosophy and I specialized in philosophies of mind, science, knowledge and logic. I ask questions about the bases for arguments and claims, look for presumptions about meaning and value, and consider ways of sensing, comprehending and knowing.</p>	<p>🔔 <b>Education</b> I am interested in the processes of learning, inference and discovery on a practical level. I ask what it is to learn – why and how people learn - and what are the conditions for best learning outcomes. I am focused on learning experience and personal agency.</p>
<p>💻 <b>Computing</b> I took a few courses but have mostly taught myself computer programming over the years, learning a number of languages, and building websites, content management systems, and learning technology. I think of programming as a means of expression.</p>	<p>📰 <b>Media</b> Since my days as a newspaper carrier to my involvement in student journalism to my work today in online media I have worked on new and better means of conveying information, illustration and photography, community-building and interactivity.</p>

From a connectivist perspective, knowledge is the organization of connections between a set of entities, where the result of that organization is the capacity to *recognize* objects or states of affairs in the world. For all practical purposes, we can recognize anything: friends, pets, past events, future events, types, consequences, whatever. Moreover, there are different ways of recognizing: we can have a memory, imagine an object, exercise a certain skill, have some emotion or another.

## Designing Learning Experiences







1. Learning from Experts
2. Learning with Others
3. Learning through Making
4. Learning through Exploring
5. Learning through Inquiry
6. Learning through Practising
7. Learning from Assessment
8. Learning in and across Settings

[http://discovery.ucl.ac.uk/1475754/4/Luckin\\_SoTL\\_Luckin\\_Final.pdf](http://discovery.ucl.ac.uk/1475754/4/Luckin_SoTL_Luckin_Final.pdf)



# Data

This part of the workshop addresses two conceptual challenges: first, the shift in our understanding of content from documents to data; and second, the shift in our understanding of data from centralized to decentralized.

 <h3>From Document to Data</h3> <p>Storing our content as data makes it more flexible and more useful. One piece of data could be inserted into another piece of data, such as a template. Our perspective shifts from a <i>linear</i> organization to something more complex.</p>	 <h3>Learning with Data</h3> <p>Learning with data isn't the same as learning with books. It's interactive, immersive and engaging, a process of learning how to perceive and comprehend rather than to decode and store.</p>
 <h3>Application Interfaces</h3> <p>The central role played by platforms is diminished in favour of direct interactions between peers, that is, a distributed web, which communicate with each other by means of application programming interfaces (API).</p>	 <h3>Linked Data</h3> <p>Today we are seeing a trend toward decentralized linked data. This is the idea that each person can manage his or her own data, storing it wherever they want, and using it whenever they like.</p>

## Resources

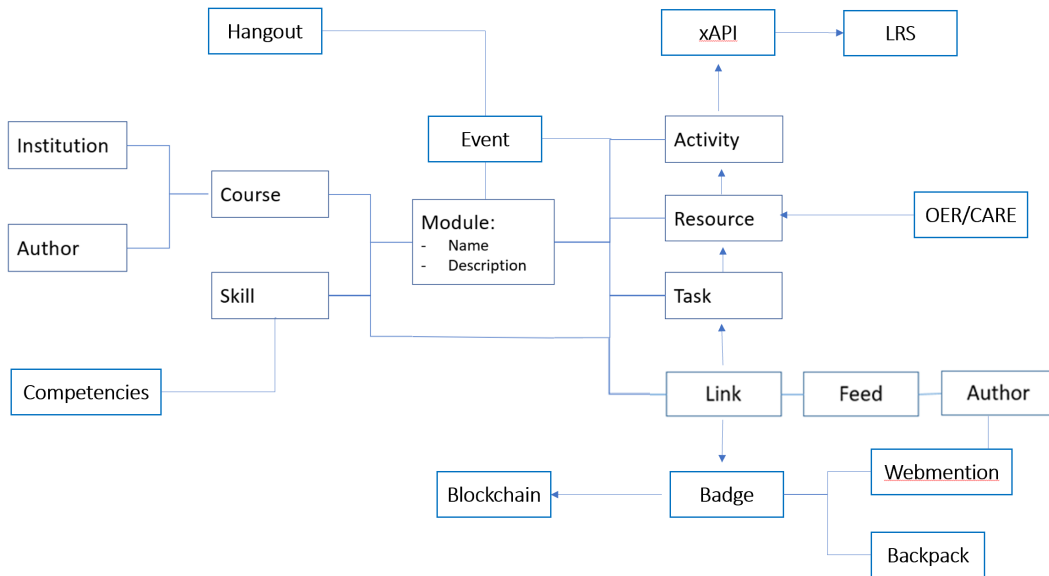
- Introduction to Linked Data. This slide show introduces linked data principles. [https://www.europeandataportal.eu/sites/default/files/d2.1.2\\_training\\_module\\_1.2\\_introduction\\_to\\_linked\\_data\\_en\\_edp.pdf](https://www.europeandataportal.eu/sites/default/files/d2.1.2_training_module_1.2_introduction_to_linked_data_en_edp.pdf)
- The Linked Open Data Cloud. John P. McCrae. This web page is the home of the LOD cloud diagram. <https://lod-cloud.net/>
- Open Government Portal: Enables access to open data on the government of Canada website. [https://open.canada.ca/data/en/dataset?res\\_format=JSON](https://open.canada.ca/data/en/dataset?res_format=JSON)
- Solid. Tim Berners-Lee. Solid (derived from "social linked data") is a proposed set of conventions and tools for building decentralized social applications. <https://solid.mit.edu/>
- IndieWeb. The IndieWeb is a people-focused alternative to the "corporate web". <https://indieweb.org/>
- An Increasingly Less-Brief Guide to Mastodon. Noëlle Anthony. GitHub. <https://github.com/joyeusenoele/GuideToMastodon/>



Feature Article: Data. <https://el30.mooc.ca/post/68416>

Featured Video: Conversation with Shelly Blake-Plock <https://el30.mooc.ca/event/80>

# The BIG Idea - Course(?) as Open Data



“Open Data is the idea that some data should be publicly available and usable, and this idea has engendered a growing movement that attempts to remove technical and legal barriers to the use of public data.” <https://www.worldbank.org/en/news/feature/2018/10/04/open-data-online-learning-for-producers-users-and-policymakers>

The course as decentralised: "Decentralized means that there is no single point where the decision is made. Every node makes a decision for its own behaviour and the resulting system behaviour is the aggregate response." <https://medium.com/distributed-economy/what-is-the-difference-between-decentralized-and-distributed-systems-f4190a5c6462>

The course as distributed: There is no one place where the course is. Resources and activities related to the course are on multiple servers, hosted by multiple individuals or institutions, and use multiple applications or systems.

## Working With Open Data: IFFTT

‘If This Then That (IFTTT) is a service that allows you to link data from different information sources.

Thus, for example, you could have IFTTT send you an email each time the fridge is opened. Or compile a spreadsheet of all your Twitter posts.

<http://www.ifttt.com>







# Activity - My Open Data Feed

Use this space to design a data flow for your course, thinking of different sources of data and how they might be applied.

# Cloud

Cloud computing involves using servers and infrastructure hosted by internet-based providers. You can then access these from any computer, and also link them together for advanced applications.

 <h3>Computing as Commodity</h3> <p>The conceptual challenge is that it doesn't matter whose computer it is, that it could change any time, and that we should begin to think of "computing" and "storage" as commodities, more like "water" or "electricity".</p>	 <h3>Direct Experience</h3> <p>Students are now able to edit and create new tools to create text, music and art. They will be able to directly experience the relation between algorithm and outcome, or between mathematics and music, as the case may be.</p>
 <h3>Virtualization</h3> <p>Server virtualization begins with applications such as VMWare or Parallels, and progresses through a range of increasingly sophisticated computing containers created using programs like Docker and run using services like Amazon Web Services.</p>	 <h3>New Possibilities</h3> <p>These new resources allow us to redefine what we mean by 'textbooks' and even 'learning objects'. By putting powerful applications into the hands of students we create new possibilities for manipulation, visualization and creativity.</p>

## Resources

- What is Cloud Computing in Simple Terms? Definition & Examples. Bojana Dobran. <https://phoenixnap.com/blog/what-is-cloud-computing>
- Cloud Adoption Strategy: 2018 update. Government of Canada. <https://www.canada.ca/en/treasury-board-secretariat/services/information-technology/cloud-computing/government-canada-cloud-adoption-strategy.html>
- Forget the File System: The Future of Scalable Cloud Storage Will Be Objects. Joab Jackson. <https://thenewstack.io/forget-file-system-future-scalable-cloud-storage-will-objects/>
- What is Docker? Docker containers explained. Serdar Yegulalp, InfoWorld. <https://www.infoworld.com/article/3204171/docker/what-is-docker-docker-containers-explained.html>



Feature Article: Cloud: <https://el30.mooc.ca/post/68440>

Featured Video: Conversation with Tony Hirst <https://el30.mooc.ca/event/81>



# The BIG Idea - Courses in Containers



How did the early MOOCs host hundreds of thousands of students? They used cloud technologies. As the demand for their course grew, they were able to scale up their databases and web servers in order to meet the demand.

Google Cloud - <https://cloud.google.com/>

IBM Cloud <https://cloud.ibm.com>

Microsoft Azure - <https://azure.microsoft.com/en-us/solutions/>

Amazon S3 - <https://aws.amazon.com/s3/>

Digital Ocean Spaces - <https://www.digitalocean.com/products/spaces/>

Dropbox - <https://www.dropbox.com/>

Alibaba Cloud - <https://www.alibabacloud.com/product/oss>

Oracle - <https://www.oracle.com/cloud/storage/object-storage.html>

Fuga - <https://fuga.cloud/academy/> (Open Stack)

Rackspace - <https://www.rackspace.com/cloud> (Open Stack) OwnCloud - <https://owncloud.com/overview/>

Heroku - <https://www.heroku.com/> - cloud application platform Min.io - <https://min.io/> (for S3)





Today, we can automate the creation and deployment of cloud containers. This means that a course can be created 'in a box' and then deployed when and where needed.

## Activity - Create a Cloud-Based Service

Use this space to design the architecture of a cloud-based online course. What services would you need? How would you provide them?

# Graph

When we connect things together we have created a graph. A graph has two types of component: the entities being connected (sometimes called nodes), and the connections between those entities (sometimes called edges).

 <h2>Philosophy</h2> <p>In connectivism we have explored the idea of thinking of knowledge as a graph. Yet, what <i>makes</i> it knowledge? In the Semantic Web, we are faced with a similar question. What is the “source of truth” of a distributed representation in the Semantic Web? What grounds ontologies, or assertions of trust in the Web of Trust?</p>	 <h2>Education</h2> <p>It helps learners understand that each idea connects to another, and it’s not the individual idea that’s important, but rather how the entire graph grows and develops. It protects us from categorization errors and helps prevent things like confirmation bias.</p>
 <h2>Computing</h2> <p>The data structures we can build using these technologies have created a new type of content. One example is <u>BitCoin</u>, based on the recording of transactions in a blockchain, which is essentially a has chain. Another example is the collection of updated versions of software stored in GitHub.</p>	 <h2>Media</h2> <p>As repositories of knowledge, graphs enable the same data to be viewed from a variety of perspectives. Manipulations of and <u>inferences</u> from these data structures allow us to draw conclusions and make new connections - drawing associations between similar entities, for example</p>

## Resources

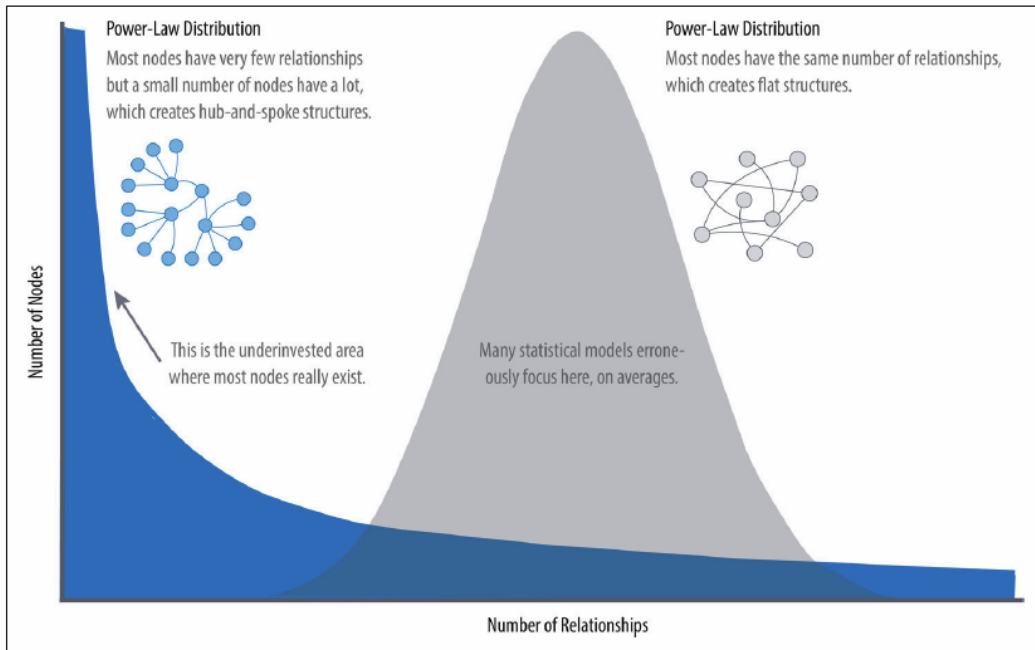
- A Gentle Introduction To Graph Theory. Vaidehi Joshi. <https://medium.com/basecs/a-gentle-introduction-to-graph-theory-77969829ead8>
- The Neural Network Zoo. Fjodor van Veen. Neural Networks are types of graphs. <http://www.asimovinstitute.org/neural-network-zoo/>
- Graph Data Structure And Algorithms. This page has a very brief description of a graph data structure and then a long list of things that can be done with graphs - cycling, sorting, spanning, searching. <https://www.geeksforgeeks.org/graph-data-structure-and-algorithms/>
- GQL Is Now a Global Standards Project alongside SQL. <https://gql.today/>
- Social Network Analysis. Philip Leifeld. <http://www.bearnetwork.ca/wp-content/uploads/2018/10/slides-leifeld-bear.pdf>



Feature Article: Graph. <https://el30.mooc.ca/post/68472>

Featured Video: Conversation with Ben Werdmuller <https://el30.mooc.ca/event/82>

# The BIG Idea - Graph, Not Story



All events are complex events and all disciplines are complex disciplines. Yet we have the urge to represent events and disciplines from the perspective of a narrative, or a story. The narrative focuses us toward one thing - a key figure in history, a single rule, a specific case.

We are seeing the flaws of the narrative approach in contemporary journalism. “The ultimate bias in journalism is not political. It’s toward controversy, gaffes, and scandal—shiny new things that get ratings and shares and downloads.” It trends toward a power-law understanding of the world, with a focus on a small and narrow set of interests and priorities.

<https://www.vanityfair.com/news/2019/01/how-the-media-can-prevent-2020-from-becoming-2016>



## Urban Resilience Discourse Analysis

By mapping the graph of topics discussed by authors in a set of journal articles researchers can obtain a ‘map’ of the field, helping them instantly perceive trends and relations of ideas. This gives students multiple entry points into the study.

<https://www.mdpi.com/2071-1050/10/12/4431>

# Activity - My Model Graph





## Instructions

1. Create a model graph of some aspect of this workshop (it doesn't have to be an actual graph, only a representation of what an actual graph might look like. We've already seen, eg., graphs on the relations between people in the workshop. Could there be other types of graphs?
2. In your model, consider how the states of the entities in that graph might vary. Consider not only how nodes might vary (eg., a person might have a different height over time) but also how the edges might vary (eg., a person might have a different strength of relation (calculated how?) with another person over time).
3. In your model, consider how knowledge about the changes in states in the graph might be used.

Optional: Create your graph using an online service like <https://www.draw.io/>

# Resources

Learning resources have traditionally been things like textbooks and media, but now learning resources can be anything from video to virtual reality to application. How we describe these, and access them, is changing.

 <h2>Philosophy</h2> <p>Since the early days the web has been increasingly locked down, and the once-seamless interaction between people and data has been locked more and more behind paywalls and content silos. Web3 is to a large degree a reaction against this</p>	 <h2>Education</h2> <p>Content Addressable Resources for Education create mechanisms for the creation of resource graphs linking data, media, software and people, redefining our idea of an open course (and open pedagogy) .</p>
 <h2>Computing</h2> <p>We have already seen more transitional contents, such as books, media and music, being distributed through IPFS. Similar technologies support more complex content, for example, distributed applications (dApps), subscriptions and lists, contract networks, and even distributed organizations.</p>	 <h2>Media</h2> <p>The concept of Content Addressable Resources for Education addresses the question of the sustainability of open educational resources. These resources will be packaged and distributed across a content-addressable network, whereupon they become <i>permanently</i> open</p>

## Resources

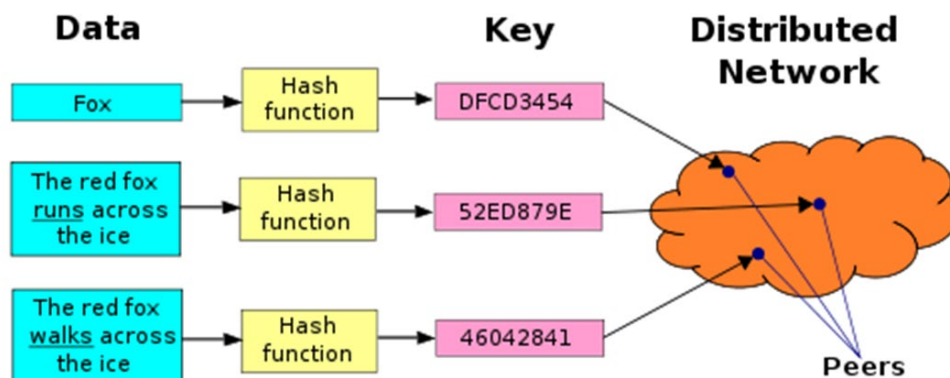
- OER World Map. A couple years or so ago UNESCO launched an OER mapping project. <https://oerworldmap.org/>
- Introducing the Dweb. Dietrich Ayala. The “d” in “dweb” usually stands for either decentralized or distributed. <https://hacks.mozilla.org/2018/07/introducing-the-d-web/>
- Distributed Hash Table. Type of decentralized distributed system. [https://ipfs.io/ipfs/QmXoypizjW3WknFiJnKLwHCnL72vedxjQkDDP1mXWo6uco/wiki/Distributed\\_hash\\_table.html](https://ipfs.io/ipfs/QmXoypizjW3WknFiJnKLwHCnL72vedxjQkDDP1mXWo6uco/wiki/Distributed_hash_table.html)
- Beaker. Beaker brings peer-to-peer publishing to the Web. <https://beakerbrowser.com/> Inter Planetary File System. IPFS is the Distributed Web, a peer-to-peer hypermedia protocol. <https://ipfs.io/>
- A Look at the Future of Open Educational Resources. <https://www.ijoer.org/a-look-at-the-future-of-open-educational-resources/>



Feature Article: Resources. <https://el30.mooc.ca/post/68554>

Featured Video: Conversation with Sukaina Walji and Cheryl Hodgkinson-Williams <https://el30.mooc.ca/event/84>

# The BIG Idea - Content Addressable Resources for Education



## Distributed Hash Table

Each piece of content has a unique address, which is a hash of its content

Open educational resources in the future:

- New models of open educational resources will be more like tools that students use in order to create their own learning content, which they will then consume or use for some other purpose.
- The learning happens not through the consumption of the content but through the use of the content.
- Licensing fades to the background as most resources are created and used only once. The resource taps into current data and may be localized or adapted to the content consumer.
- Technologies such as encryption, hashing and blockchain create a record of ownership and provenance of any resource.

Our understanding of the concept of the 'open educational resource' changes from a definition based on the concepts and metaphors of textbooks and libraries, and toward one based on the concepts of data-processing networks, cloud services and applications, decentralized encryption-based ledgers, and AI-assisted design and information processing.

# Activity - My OER

## Instructions:





Design a scenario where students could obtain content or data, revise or remix that content or data, and create a new learning resource for their own use.

- Bonus: try downloading and using the Beaker browser



# Identity

In this workshop we look at identity relatively narrowly, asking how we know who someone is, how we project ourselves on the internet, and how we can be safe and secure.

 <h2>Philosophy</h2> <p>Instead of demographics being about <u>quantity</u> we will now have access to a rich tapestry of data and relations. <u>Instead</u> of grades or scores our self-assessments will be based on the quality of the experience. The “quantified self” will give way to the “qualified self”.</p>	 <h2>Education</h2> <p>Should we think of identity from the outside in or from the inside out. Can we <u>teach</u> 'identity'? is 'identity' something that can be done to us or for us? Or is it inherent in our nature, something we <i>bring</i> to education as course participants, something that <u>informs</u> how we see and how we learn?.</p>
 <h2>Computing</h2> <p>Much of the technological discussion of identity looks at it relatively narrowly, asking how we know who someone is, how we project ourselves on the internet, and how we can be safe and secure. In a wider sense, however, what we are developing is a mechanism for the creation of a <i>digital identity</i>.</p>	 <h2>Media</h2> <p>We were the <u>client</u>, we were the <u>product</u> - are we, at last, the content? We are the thread that runs through an otherwise disconnected set of data. Knowledge about ourselves will create an underlying fabric against which the value and relevance of everything else will be measured..</p>

## Resources

- Identity Graphs: how online trackers follow you across devices. Robert Heaton. <https://robertheaton.com/2017/11/24/identity-graphs-how-online-trackers-follow-you-across-devices/>
- What Is Identity? OpenLearn. Read through the first part of this short course. <https://www.open.edu/openlearn/people-politics-law/politics-policy-people/sociology/identity-question/content-section-1.1>
- Identity as Evolving, Dynamic, Contextual. Maha Bali. <https://blog.mahabali.me/writing/identity-as-evolving-dynamic-contextual-el30/>
- Keybase.io - Downes. This is my Keybase page. <https://keybase.io/downes>
- The Basics of Decentralized Identity. Kames. <https://medium.com/uport/the-basics-of-decentralized-identity-d1ff01f15df1>
- Decentralized Identifiers. A new World Wide Web Confortium (W3C) specification. <https://w3c-ccg.github.io/did-spec/>



Feature Article: Identity. <https://el30.mooc.ca/post/68516>

Featured Video: Conversation with Maha Bali <https://el30.mooc.ca/event/83>







# Activity - My Identity Graph

## Instructions

- Create an Identity Graph: We are expanding on the marketing definition of an identity graph. It can be anything you like, but with one stipulation: your graph should not contain a self-referential node titled 'me' or 'self' or anything similar
  - Think of this graph as you defining your identity, not what some advertiser, recruiter or other third party might want you to define.
  - Don't worry about creating the whole identity graph - focusing on a single facet will be sufficient. And don't post anything you're not comfortable with sharing. It doesn't have to be a real identity graph, an identity graph, however you conceive it.
- Optional: consider some of these questions about your identity graph:
  - What is the basis for the links in your graph: are they conceptual, physical, causal, historical, aspirational?
  - Is your graph unique to you? What would make it unique? What would guarantee uniqueness?
  - How (if at all) could your graph be physically instantiated? Is there a way for you to share your graph? To link and/or intermingle your graph with other graphs?
  - What's the 'source of truth' for your graph?

# Recognition

How do we know a course has been successful? How do we know what someone has learned? How can we know whether to trust in the education of our mechanics, doctors, engineers and pilots.

 <b>Philosophy</b> There is not clear agreement on what counts as success. Different outcomes from learning events can be tracked and measured in any number of ways. And there is the danger of bad actors - of those who cheat on tests, fake certificates, or misrepresent their qualifications.	 <b>Education</b> There are numerous competency definition standards, everything from Australia's National Competency Standards to the NIH's Nursing Competency standard. Activity tracking has been formalized by xAPI and records are stored in Learning Record Stores (LRS).
 <b>Computing</b> Actual AI-based assessment of competent performance will be used to create competency models that can inform AI-based speech-raters, competency systems, and professional evaluation. Actual authentic tasks designed (or contributed) by humans may be needed to balance the possibility of biased algorithms..	 <b>Media</b> The certificate of the future will be a job offer. Software is being developed to map directly from a person's online profile to job and work. These today are unreliable and superficial, but with trustworthy data from distributed networks we will be able to much more accurately determine the skills - and potential - of every individual.

## Resources

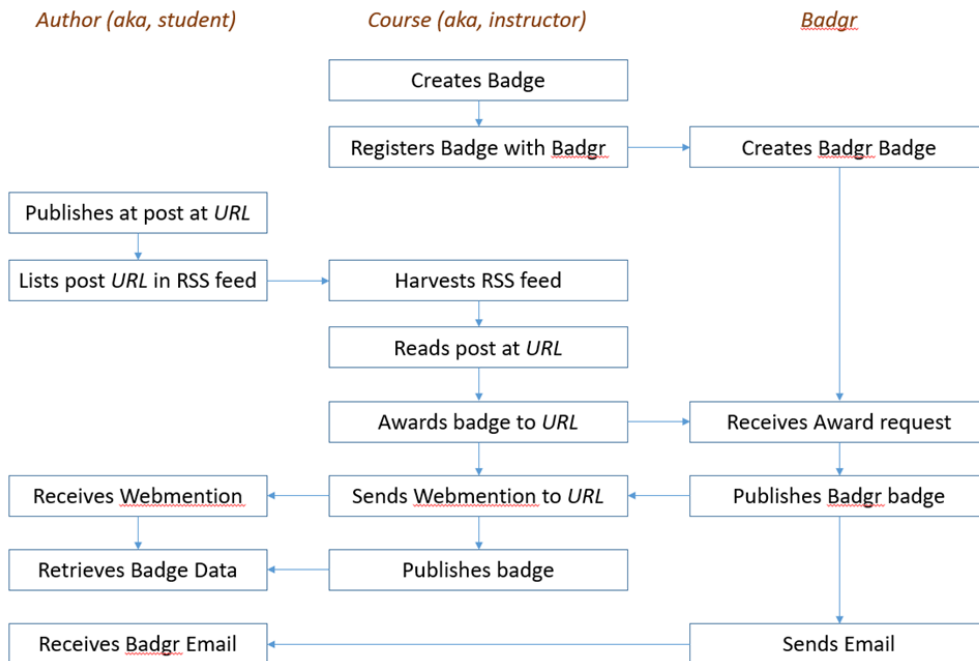
- China's Social Credit System: A Mark of Progress or a Threat to Privacy? <https://piie.com/publications/policy-briefs/chinas-social-credit-system-mark-progress-or-threat-privacy>
- Open Badges. General information page about badges. <https://openbadges.org/>
- Competency & Skills System (CaSS). Advanced Distributed Learning. <https://adlnet.gov/projects/cass>
- An Experience API for learning everywhere (also in virtual worlds). Roland Legrand. <https://www.mixedrealities.com/2018/10/25/an-experience-api-for-learning-everywhere-also-in-virtual-worlds/>
- 2018 Technical Report on xAPI. IEEE LTSC TAGxAPI. <https://www.tagxapi.org/ieee-technical-report/>



Feature Article: Recognition. <https://el30.mooc.ca/post/68595>

Featured Video: Conversation with Viplav Baxi <https://el30.mooc.ca/event/85>

# The BIG Idea - AI-Based Learning Recognition



xAPI lets you capture (big) data on human performance, along with associated instructional content or performance context information...

We can also gather data *outside* the school or program, looking at actual results and feedback from the workplace.

- What will be assessed? There are ways to assess coursework directly and recognize achievements with badges, creating 'stackable credentials'. Alternatively, we may opt to assess for competencies as defined (?) by some standards-based organization. Ultimately, we may be assessed broadly, as a whole person, via our own online presence.
- How will we be assessed? Today we use rules and rubrics. But we already know that in high-stakes assessment, we depend on recognition by an expert. We know AI systems can already recognize simple forms of expertise, for example, by marking papers.

# Activity - My Identity Graph

## Instructions





- Use this space to design your badge, clearly identifying different data elements:
  - create a badge and give it a name, criteria, design
  - award it to yourself or describe how it would be awarded.
  - use a blog post on your blog as the 'evidence' for awarding yourself the badge
  - place the badge on the blog post.

## Optional

- Define how your digital badge connect to or ties in to your identity graph
- If you have internet access, create a free account on a Badge service (<https://badgr.com/> , <https://www.openbadges.me/> , <https://openbadgefactory.com/> ).

# Community

The fundamental challenge to community is to make decisions on matters affecting everybody while leaving to individuals, companies and institutions those matters not effectively managed by consensus.

<p> <b>Philosophy</b> The traditional concept of community was built on sameness, on collections of people from the same family, speaking the same language, living in the same place, believing the same things. This was challenged by social and political reforms through the last few centuries.</p>	<p> <b>Education</b> What is required for learning to work is not merely control, but <i>agreement</i> on the part of the members of the community. Underlying this is a respect for law, institutions and processes, and when these break down, and when consensus is lost, it is very difficult to restore..</p>
<p> <b>Computing</b> Digital currencies such as Bitcoin and Ethereum use a “proof of work”. Other types of content create other types of consensus: “proof of stake” relies on guarantees of resources or assets; “proof of authority” depends on certification or validation.</p>	<p> <b>Media</b> The critical literacies include not just being able to <i>communicate</i> with each other, but to be able to build and create. Consensus, ultimately, is a question of stigmergy, and we will look not only how it is created, but also how it is undermined (think, for example, of ‘dark patterns’).</p>

## Resources

- The Byzantine Generals Problem - <https://lamport.azurewebsites.net/pubs/byz.pdf>
- Trust, Truth, Consensus and Community on the distributed web - Jenny Mackness <https://jennymackness.wordpress.com/2018/12/09/trust-truth-consensus-and-community-on-the-distributed-web/>
- How Does Distributed Consensus Work? Preethi Kasireddy. Distributed systems and consensus. <https://medium.com/s/story/lets-take-a-crack-at-understanding-distributed-consensus-dad23d0dc95>
- What is Blockchain? Lucas Mostazo, YouTube. Blockchain explained in plain English. <https://www.youtube.com/watch?v=3xGLc-zz9cA>
- Education Blockchain Market Map. HoloniQ. <https://www.holoniq.com/blockchain>
- ConsensusPedia: An Encyclopedia of 30 Consensus Algorithms. Consensus algorithms are the basis of all the blockchains/DAGs. <https://hackernoon.com/consensuspedia-an-encyclopedia-of-29-consensus-algorithms-e9c4b4b7d08f>



Feature Article: Community. <https://el30.mooc.ca/post/68638>

Featured Video: Conversation with Pete Forsyth

<https://www.youtube.com/watch?v=1Urc4EW9hiE>







# Activity - My Community





## Instructions

- As a community, create an assignment the completion of which denotes being a member of the community. For the purposes of this task, there can only be one community for the entire workshop.
- Use the space above to contain your contribution to the community.
- For each participant, your being a member of the community completes the task.

Note: in the workshop, you may be presented with the 'Byzantine Generals Problem' and left to consider how you, as a community of communities, might solve it.

# Experience

It is a truism that we learn from experience, and yet creating a role for experience in learning has been one of the most difficult problems in education. And so much of education continues to rely on indirect methods depending on knowledge transfer - reading, lectures, videos - rather than hands-on practice and knowledge creation.

 <b>Philosophy</b> No experience is inherently meaningful. What a new experience means depends on previous experience. And experience is active. "Observation alone is not enough. We have to understand the significance of what we see, hear, and touch." This is determined by us, as recognition.	 <b>Education</b> Just as multiple authors can edit Wikipedia articles or work on code in GitHub, participatory learning media enables learners to interact creatively without management or direction; the outcome is a consensus determined not by voting but by participation.
 <b>Computing</b> New technology is beginning to <i>combine</i> the ability of teachers and role models to model and demonstrate successful practice and the need for learners to practice and reflect on their learning in that environment. Live streaming events are transforming real-world events into hands-on learning experiences..	 <b>Media</b> The <i>creation</i> of the content becomes a part of the content itself. We see this with the recent self-shredding art by Banksy or the inside look at how the single-scene time-lapse sequence was filmed. Some artists have made working openly part of the act - Deadmau5, for example, showing how electronic music is produced. .

## Resources

How to Be an Artist. Jerry Saltz. Good advice that could be applied not only to art but to anything.

<https://www.vulture.com/2018/11/jerry-saltz-how-to-be-an-artist.html>

Openness to Experience and Creative Achievement. Scott Barry Kaufman, Scientific American.

<https://blogs.scientificamerican.com/beautiful-minds/openness-to-experience-and-creative-achievement/>

Twitch. A global community of millions who come together each day to create their own entertainment. <https://www.twitch.tv/>

Jupyter Notebooks. <https://jupyter.org/>

Binder. <https://mybinder.org/>



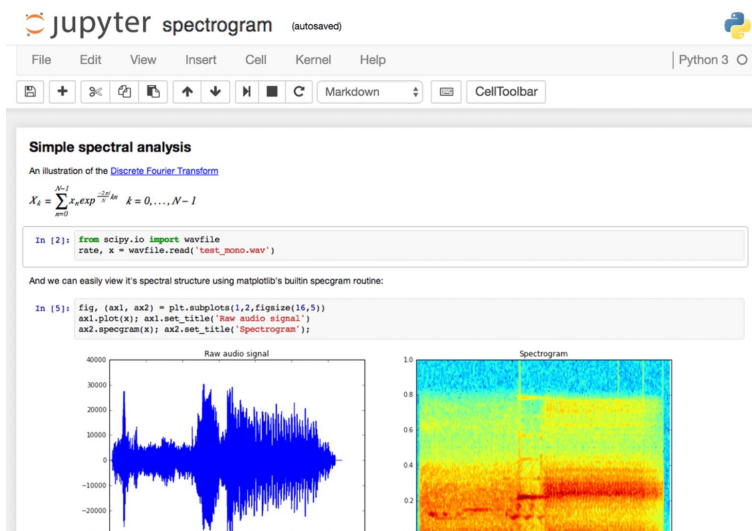
Feature Article: Experience. <https://el30.mooc.ca/post/68683>

Featured Video: Conversation with Amy Burvall <https://el30.mooc.ca/event/87>

# The BIG Idea - Content and Creation Combined

New technology is beginning to combine the ability of teachers and role models to model and demonstrate successful practice and the need for learners to practice and reflect on their learning in that environment. Content distribution networks and live streaming are transforming real-world events into hands-on learning experiences.

A good example of this is the live-streaming platform Twitch and especially games like Fortnite, in which players become spectators, and back again, ver and over. And using applications like xSplit or Open Broadcaster Software individuals can make their experiences part of the learning experience shared by others.



For example, Jupyter Notebook combines data and code in a document. In the JupyterLab Environment - work with code, data, and the Jupyter notebook format.

A Gallery of interesting Jupyter Notebooks:

<https://github.com/jupyter/jupyter/wiki/A-gallery-of-interesting-Jupyter-Notebooks>

Binder - <https://mybinder.org> - runs Jupyter Notebooks in a

web browser, eg. Jupyter for kids -

<https://mybinder.org/v2/gh/mikkokotila/jupyter4kids/master>

## Tools for Creating

- Twitch <https://www.twitch.tv/> live-streaming site for game playing, game-watching, and chat
- Filmora and Filmore Go <https://filmora.wondershare.com> video creation, editing, upload
- Tiktok <http://www.tiktok.com> social video meme and sharing
- Turtle <http://turtle.audio/> make music - see also [https://www.youtube.com/watch?v=lg\\_LKkMx2FE](https://www.youtube.com/watch?v=lg_LKkMx2FE)
- Glitch <https://glitch.com/> make apps, remix others
- Livecaster <https://intrsection.com/2017/04/8396/> make webcasts
- Open Broadcaster <https://obsproject.com/> stream desktop
- Workbench <https://www.dataquest.io/blog/jupyter-notebook-tips-tricks-shortcuts/> free and open source data journalism





# Activity - My Community

## Instructions

- Be creative! Using the medium of your choice, create a representation of your experience of this workshop. Optional: post your creation (or post a link to your creation) on your blog.
- Here's a good example of the sort of thing you could create, by Kevin Hodgeson:  
<http://dogtrax.edublogs.org/2018/12/12/el30-a-visual-sense-of-community-connected/>
- If you need inspiration, visit the DS106 Assignment Bank and select one of the assignments, and then interpret it in the light this workshop. <http://assignments.ds106.us/>

# Agency

This part of the workshop addresses two conceptual challenges: first, the shift in our understanding of content from documents to data; and second, the shift in our understanding of data from centralized to decentralized.

 <b>Philosophy</b> McLuhan said that technology is a projection of ourselves into the world. Our senses are amplified by virtual and augmented reality, our cognitive capacities extended by machine vision and AI, and our economic and social agency is represented by our bots and agents.	 <b>Education</b> Learning therefore demands more than just the transmission or creation of knowledge. Our learning will need to emphasize and promote individual agency as much as they need to develop the tools and capacities needed to support social, political and economic development.
 <b>Computing</b> What we learn, and what makes learning successful, depends on <i>why</i> we learn. Four key elements of the new technological framework: security, identity, voice and opportunity. These elements are in turn what consensus-based decentralized communities are designed to augment.	 <b>Media</b> How do we ensure that what we project to the world is what we want to project, both as teachers and learners? As content and media become more sophisticated and more autonomous, how do we bind these to our personal cultural and ethical frameworks?

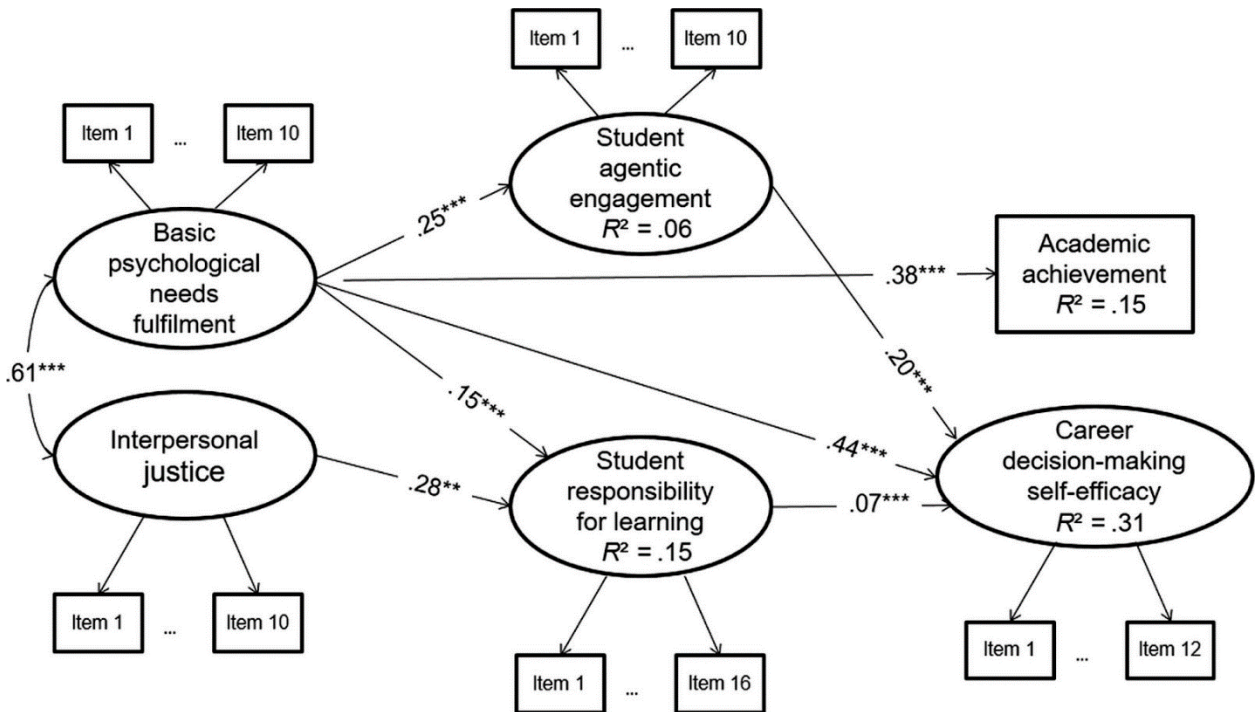
## Resources

- The Three Dimensions of Inclusive Design. GitHub. <https://handbook.floeproject.org/TheThreeDimensionsPartOne.html>
- Social Justice Repair Kit. Inclusive Design Research Centre. <https://sojustrepairit.org/>
- Self-efficacy beliefs of medical students: a critical review - Klassen & Klassen - <https://link.springer.com/article/10.1007/s40037-018-0411-3>
- Agency and responsibility in adolescent students: A challenge for the societies of tomorrow - <https://onlinelibrary.wiley.com/doi/full/10.1111/bjep.12215>
- APA Good Practices Guide - <http://dailynews.com/2019/09/19/apa-publishes-good-practices-guide/>
- Digital Wellbeing, BBC - <https://www.bbc.co.uk/rd/projects/digital-wellbeing>



Featured Video: Conversation with Silvia Baldiris and Jutta Treviranus  
<https://el30.mooc.ca/event/88>

# The BIG Idea - Redefining Success



Each of the major developments in the internet - from the client-server model to platform-based interoperability to web3-based consensus networks - has been accompanied by a shift in agency. The relative standing of the individual with respect to community, institutions, and governments was shifted, for better or worse.

Each stage in technological development is inspired by social, political and economic aspirations, and understanding the next generation of learning and technology requires understanding the forces that shaped them. So we close our enquiry with a consideration of issues related to power and control, to peace and prosperity, to hopes and dreams.

McLuhan said that technology is a projection of ourselves into the community, so we need to consider how human capacities are advanced and amplified in a distributed and interconnected learning environment. Our senses are amplified by virtual and augmented reality, our cognitive capacities extended by machine vision and artificial intelligence, and our economic and social agency is represented by our bots and agents.

‘Success’ in the future will not be defined by employment opportunities, by competencies, by skills and expertise, but by agency - can the learner learn, think and do for themselves in a rapidly changing and complex environment?

# Activity - My Definition of Success

## Instructions

- Using the space below or one of the many online tools at your disposal, consider what success - in this workshop, in your career, in life - looks like to you.

# Articles / Presentations by Stephen Downes

A Look at the Future of Open Educational Resources. 2019. International Journal of Open Educational Resources, Volume 1, Issue 2, Spring/Summer, American Public University System. <https://www.ijoer.org/a-look-at-the-future-of-open-educational-resources/>

The Third Wave: the Next Generation of Distributed Learning Technology. 2019. Canadian Network for Innovation in Education, Vancouver. <http://www.downes.ca/presentation/505>

Future Learning in an Advanced Decentralized Learning Ecosystem. 2019. Individual Training and Education (IT&E) Symposium, Canadian Forces Base Borden. <https://www.downes.ca/cgi-bin/presentation/504>

Vision 2030: Redesigning Education for the Future. 2018. The 3rd Asbar World Forum 2018, Riyadh. <https://www.downes.ca/files/2018%2010%2028%20-%20Vision%202030.pdf>

Online Learning and MOOCs: Visions and Pathways. 2018. China International Distance Education Conference, Beijing. <https://www.downes.ca/files/Visions%20and%20Pathways.pdf>

Modernised learning delivery strategies: The Canada School of Public Service technology integration project. 2018. Journal of Applied Learning & Teaching, Vol.1 No.2 15-25, Kaplan Singapore. <http://journals.sfu.ca/jalt/index.php/jalt/article/view/17/17>

Quantum Leaps We Can Expect in Teaching and Learning in the Digital Age: a Roadmap Research Report. 2017. Contact North, World Conference on Online Learning, Toronto. <http://onlinelearning2017.ca/en/special-series-of-contact-north-i-contact-nord-insight-reports/>

Open Learning, Open Networks - 开放学习、开放网络. 2017. Distance Education in China, 2017 - 10 36-4. <http://kns.cnki.net/kcms/detail/11.4089.G4.20171019.1052.008.html>

New Models of Open and Distance Learning. 2016. Open Education: from OERs to MOOCs, Editors: Mohamed Jemni, Kinshuk, Mohamed Kouthair Khribi., 1-22, Springer. <http://link.springer.com/book/10.1007/978-3-662-52925-6>

Applications, Algorithms and Data: Open Educational Resources and the Next Generation of Virtual Learning. Education Ouverte: Ressources Educatives Libres et Ingenierie de Formation, Hammamet. <http://www.downes.ca/presentation/481>

All: <https://www.downes.ca/publications.htm>  
<https://www.downes.ca/presentations.htm>