Digital Transformation of Higher Education in Japan

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Today's agenda

- What is digital transformation and what is not?
  - Definition of DX in education / learning

- The digital transformation of education that took place under Covid-19

- Utilization of education data for each stakeholder
  - Software tools in Education DX
  - Template of "education / learning data utilization policy"

- Eco-system in education
  - IMS Global Activities
  - Cross-border or Lifelong learning information sharing

- Summary

Purpose of this talk: Mention the key perspectives of DX in higher education and clarify the interrelationships between the big picture and its components.
What is Digital Transformation (DX)?

- Definition: "The digital transformation can be understood as the changes that the digital technology causes or influences in all aspects of human life" (by Eric Stortermann, Umeå University, Sweden)
  - By making full use of digital technology,
    - Reconstructing the way of companies and management, and business processes
    - Changing the lives and working styles of workers

- "Digitalization"
  - Enhancing existing products, services, or business processes by leveraging digital technologies such as IoT, AI, and cloud to increase functionality and efficiency.
  - Not DX
  - DX is not the technical destination of digitalization
  - However, it is difficult to realize digital transformation without digitalization.

Definition of DX in education

Digitalization

The conventional informatization / ICT utilization has realized the efficiency improvement and value improvement of the already established industry.

On the other hand, digital transformation is defined as transforming the business model of the industry itself.

Ref: Information and Communication White Paper 2019, Ministry of Internal Affairs and Communications Japan
Unexpected realization with COVID-19

Due to the COVID-19, the delay in digitization of education becomes apparent.

Education has been continued by software tools such as on-demand systems and video conference systems, as well as the efforts of faculty members and students.

- Conducting network classes in various formats
  - Huge amount of educational data is collected and accumulated

How to make effective use of these?
- What kind of functions should LMS have?
- What kind of cooperation should be taken with the system around LMS?

How will this change education / how do we have to change education?

Digitalization

Digital Transformation
Not only face-to-face classes but also network classes

- Realization of a learning space that is not aware of the boundaries between face-to-face classes and network classes (physical-space and cyber-space)

Which class (how many times) should be held in what form?

Realization of education that transcends time and space

The need to collect data on all learning that is not constrained by time or space
Many available software tools

• Education support system
  – LMS
  – Teaching material distribution system

• Class support system
  – On-demand lesson (e-learning) system
  – Online class (meeting) system

• E-portfolio system
  – Digitization and database of conventional learning portfolio
    • Learning portfolio: A record of not only learning outcomes, but also overall activity outcomes inside and outside the university, such as school activities such as club activities and events, and qualifications for acquisition.

• Information exchange system
  – SNS: Facebook, Twitter, LINE, Instagram, LinkedIn, etc.
  – E-mail, Slack
  – Web page
  – Cloud storage: Dropbox, Box, OneDrive, Google Drive, etc.

Students can keep up, but teachers ...

The important thing is that you can collect data with any tool
Recommendation of data-driven education

- **For teachers**
  - Always review your data
    - From "education based on intuition and experience" to "education based on data and evidence"!

- **For students**
  - Always review your data
    - Get to know yourself

- **For faculties / departments**
  - Always review your data
    - Sharing lesson content
    - Curriculum improvement

- **For the IT department**
  - Always review your data
    - Providing a better educational support environment / tools
How to start data-driven education?

- Preparation of PC environment
  - Each student / faculty member has each PC
  - An environment where you can always connect to the network

- Preparation of learning support tools
  - Simple LMS is not enough
  - LMS logs alone may not be enough
  - LMS does not have the function to collect and use data / The contractor does not provide it

- The data can't be analyzed
  - Differences in teachers' IT literacy abilities
  - Recognition that it is just a COVID-19 measure

- Teachers do not use the data analysis results
- Educational data is personal data, so it is difficult to handle it.
Educational data handling outside Japan?

- **Family Educational Rights and Privacy Act (FERPA)(1974)**
  - Educational institution officials with good reason are allowed access to educational data without prior consent
    - Education improvement, university improvement
    - Dissertation writing is not applicable (separate student consent is required)
    - Data protection obligations occur at the same time
    - Universities in the United States formulate Student Records Policy

- **ISO/IEC TS 20748-4:2019**
  - Information Technology for Learning, Education and Training – Learning Analytics
    - Part 4: Privacy and data protection policies

But in Japan • • •
Some current activities of AXIES

- "Guidelines for formulating research data policies at universities" (2021.7.1)
- "Proposals for future improvement of information environment in universities" (2020.12.10)
- "Template of "Education / Learning Data Utilization Policy" " (2020.10.12)
- Promote the utilization of education/learning data in anticipation of the needs of CIOs and IT centers at universities, etc.

Dramatically strengthening education, research, and management using ICT in higher education and academic research institutes

Regular members: 140 institutions
Supporting members: 84 companies
(as of Jan. 1, 2022)

Since 2011

Downloadable from https://axies.jp/
Templete of "Education / Learning Data Utilization Policy"

8 principles for handling education / learning data

1. Clarify the purpose of use and do not use it for any other purpose
2. Clarify usage and analysis methods and their results
3. You can withdraw your consent at any time
4. We will comply with related laws and regulations such as the Personal Information Protection Law.
5. Make your data accessible at all times. We will provide a data analysis tool for this.
6. No individual is ever identified when it comes to publishing data analysis results
7. Take appropriate security measures for your data
8. Contribute to the well-being of humankind by sharing research results and data
[AXIES member university], as a higher education institution (representing Japan / contributing to the community), acquires, retains, and analyzes data on daily education and learning in a safe manner, and provides university education based on objective data. In addition to improving and supporting the learning of students, we will disclose the wisdom gained from the utilization of data and contribute to the well-being of the people and humankind.

Waseda University, as a higher education institution representing Japan, acquires, retains, and analyzes data on daily education and learning in a safe manner, and provides university education based on objective data.
Summary up to this point

Rapid progress of university education DX

- Practice of education that transcends time and space
- Data-driven educational practices

- Up to this point, closed into one university

- Can we go beyond the framework of one university?
  - "I want to take a lecture of University A at University B"
  - "I want to take a lecture of University A in Country X at University B in Country Y"
  - "I want to take a lecture of University A at High School B"

- In fact, it's difficult in Japan
  - Institutional problems
  - Teacher awareness issues
  - System problem

Realization of interoperability
Contribution of tools to the realization of educational DX

- How to collect high quality educational big data
- How to construct a realistic learning environment and learning process from the analysis results by AI etc.

Teachers and various learning support systems intervene between AI and learners

A variety of solutions that enable individual-friendly, optimal, and safe learning in a fair and sustainable manner

- Evolution of the eco-system and interoperability as its premise are indispensable
- Guaranteeing interoperability of education and learning systems

LMS plays the most important role (I think)
Evolution of LMS

1st. Gen.

1.5th. Gen.

2nd. Gen.

Eco-System

LMS Market Share For US & Canadian Higher Ed Institutions

Evolution of Learning Management Systems


Open Source

NGDLE

Eco-System

1st. Gen.

1.5th. Gen.

2nd. Gen.

All data from LISTedTECH LMS database under agreement with MindWires, LLC

The next generation digital learning environment

NGDLE

• Target
  – Multi-functional such as analysis, advice, learning evaluation, etc.
  – Personalization (both students and faculty members)
  – Cooperation / integration / collaboration of functions
  – Accessibility / universal design

• Cooperation of various education systems
  – Achieving high quality and diverse services by sustainable means
  – Eco-system: From a term in natural world to an IT term
  – If there is an existing service that can be used, share and reuse it ("open" is also one way)
  – Ensuring interoperability
  – Establishment of technical standards

What comes next to LMS?

IMS technical standard
IMS Global and its activities

- What is IMS Global?
  - Instructional Management Systems Global Learning Consortium
  - International standardization body for ICT utilization in education
  - 1997 Established as the Instructional Management System project of EDUCAUSE's National Learning Infrastructure Initiative
  - Based in US Florida
  - Membership fee
    - Contributing Member: Companies and Universities $ 5,000-55,000 depending on size
    - Affiliate Member and Alliance Member also exist
  - Expanding scale
    - 705 members in 25 countries (as of 2022.01.13)
- Japan IMS Association
  - For the purpose of disseminating IMS Global's businesses in Japan
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Eco-system example (MOOC related)
(limited to those provided by IMS)

- **Testing**
  - QTI (Question & Test Interoperability)

- **Contents**
  - CC/Thin CC (Common Cartridge)

- **Digital badge**
  - OB (Open Badges)
  - CLR (Comprehensive Learner Record)

- **LMS** (Learning Management System)
  - LTI (Learning Tool Interoperability)
    - LTI Consumer
    - LTI Provider

- **MOOC Tool** (Massive Open Online Courses)

- **SPOC Tool** (Small Private Online Courses)

- **LIS** (Learning Information Service)
- **OR** (OpenRoster)

- **Academic affairs system**

- **Caliper**
  - LRS (Learning Record Store)
Realization plan of unit compatibility using eco-system

Univ.A

Academic affairs system

LMS

LIS

Univ.B

LMS

Univ.W

LMS

LIS

Digital badge

OB (Open Badges)
CLR (Comprehensive Learner Record)

MOOC Tool (Massive Open Online Courses)

SPOC Tool (Small Private Online Courses)

LMS (Learning Management System)

LTI (Learning Tool Interoperability)

QTI (Question & Test Interoperability)

CC/Thin CC (Common Cartridge)

Testing

Contents

LTI Consumer

LTI Provider

LIS (Learning Information Service)

OR (Open Roster)

Academic affairs system

LRS (Learning Record Store)

Caliper

Higher education institutions other than universities, MOOCs, etc.
Standardization of digital badges in IMS

• Digital badge
  – Digitized degree, qualification, and transcript
  – Issued by the course or program provider for each graduate
  – Contains computer-processable information

• Open Badges: The Most Widely Used Digital Badges
  – Digital certificate issued in accordance with global technical standards
    • Mozilla project develops Open Badges 2.0
    • Certified as a global standard by the Global Learning Consortium of the Instructional Management Systems (IMS), an international standardization body for the field of ICT utilization in education.
  • Open source digital badge standard
Open badge

- Estimated to be issued over 100 million units worldwide
- It is possible to publish open badges, share them on SNS, etc., and prove their contents.
- Blockchain type open badges are difficult to forge or tamper with.
- Cooperation with ICT that is used daily in educational settings such as learning management system LMS and e-portfolio.
Included in Open Badges

• Proof of skill acquisition that shows the owner can do
  – Contains the following computer-processable information
    • Display format as a badge
    • Badge issuing organization
    • Personal information of batch holders
      – email address
    • Creation date and validity period
  – Encrypted using blockchain technology to prevent tampering

• When the holder gets a job or goes on to school, the person who received the badge can access the information contained in the badge to understand and judge the knowledge and skills of the holder in more detail.
Why is the education eco-system not widespread in Japan?

• University problems
  – Unrecognized university ordering system development
  – Japanese universities have a feeling of refusal for "credit transfer"
    • Example: Moodle has an open badge generation feature but it is not used

• Vendor problems
  – IT vendors want to create a tightly coupled total system
    • Cost calculation based on development scale
    • Obscuring the scope of responsibility due to reuse

• Social problems
  – No organization to pull
  – Few people want to participate in international standards
    • Fewer companies / universities participating in IMS Global
      – Japan IMS Association also struggled
    • Low awareness of standardization
    • English proficiency problems
To a further leap

If "realization of education that transcends time and space" is possible ...

Not only among universities in Japan, but also organizations, countries, cultures, values, etc. should be crossed!

- Can the border be crossed?
  - Education received at an overseas educational institution by studying abroad, etc.
  - Education run jointly with overseas universities
  - COIL type education
  - Electronic authentication of study history
    - Groningen Declaration Network

- Can educational organizations be crossed?
  - Education using comprehensive educational data from elementary school to graduate school and recurrent education
  - To see high school grades at university is possible
Lifelong learning history database (future image)

Educational background

- primary school
- junior high school
- high school
- university
- graduate school
- recurrent education

Reliable entry / reference of information on admission, study, graduation, etc.

Learning history DB

Cloud environment

Access management

Learner

Personal information / statistical information

- Educational institution
- Company (employer)
- Government
- Qualification body
- Researcher / policymaker
- Parents
The value of a lifelong learning history DB

• Building a society based on learning history data
• Changes in entrance exams and employment exams
  – See the learning process as well as knowledge and final grades
  – Various evaluation criteria can be applied
  – Correction of evaluator's subjective variation (big data analysis)
• Spread of lifelong education
  – Continuation of learning of working professionals
  – Relationship between various qualifications and ability evaluation and treatment
• Objective evaluation and improvement of the education system
  – Improvements based on scientific analysis such as education system and entrance examinations
  – Clarification of the relationship between educational reform as a society and its effects
• Improving educational power as a nation (cf. health data)

How to achieve this? Eco-system or badge?
Lifelong learning record

Comprehensive Learner Record: CLR

Ref: https://www.imsglobal.org/activity/comprehensive-learner-record
Spillover to data-driven research
~ Due to COVID-19 ~

Current status

- Conducting network classes in various formats
  - Huge amount of education contents are accumulated
  - Huge amount of educational data is collected and accumulated

Reflect analysis results in education
- Used in future classes

Learning Analytics:
To analyze and improve education scientifically based on data
- Shared by each university
- Large-scale educational DB connected by a network

From now on

- Used in data-driven research on education
- Extension to data-driven research
Summary
Digital Transformation of Higher Education in Japan

• Practice of education that transcends time and space
  – What kind of class should be held in what form?
  – The need to collect data on all learning that is not constrained by time or space

• Data-driven educational practices
  – From "education based on intuition and experience" to "education based on data and evidence"
  – The Importance of Learning Analytics

• Realization of education that transcends not only domestic universities but also organizations, countries, cultures, values, etc.
  – Evolution of the education / learning system ecosystem and guarantee of interoperability as its premise

• Breaking away from old-fashioned classes like a decade
  The biggest "wall" is the awareness of teachers
Thank you...

I am deeply grateful to everyone who gave me the opportunity to give this keynote, especially Professor Masahiro Inoue of Keio University.

If you have any questions or comments, please contact fukazawa@waseda.jp