WORKSHOP

Learning Analytics for Learning Communities in MOOCs

• Research possibilities within Extension School courses or with its data

• Methods to study learning communities in MOOCs. A case study

• Discussion & Concluding remarks
Research possibilities within Extension School courses or with its data

07 December 2022, Selma van Esveld
Extension School

Offer technical and engineering online courses and short programs

Equip people with skills needed to find solutions for today’s global challenges.

Data Types overview

- edX data
  - Demographics
  - Grades
  - Enrollment type
  - Teamwork
  - Course structure
  - Forum
  - Role in course
  - Course elements accessed
  - Language
  - Course accessed
  - Language

- Database data
- Event data
  - Logfiles
  - Mouse clicks

- Qualtrics surveys
  - Evaluations

- Coachview data
  - Financial, administrative, ...

- ESsupport data
  - Course runs, portfolio, Themes, ...

- Other data
  - Materials from learners, Anecdote(s), tools, extra surveys

Information edX data content: [link]
Research collaborations

In principle there are two types of research projects:

1. Projects in which the Extension School shares data after course run ends

2. Intervention projects:
   1. Researchers have an additional element for the course (e.g. a tool or survey). The Extension School incorporates this extra element in the course environment
   2. After the course run ends, Extension School shares data to analyse the effect of the extra element
Examples of previous research collaborations

1. Do learners follow designed paths, or take their own path through the MOOCs?

2. learners exposed to the Learning Tracker are more likely to complete the course due to changes in their behaviour.
Starting a Research Collaboration

Contact research-es@tudelft.nl with your idea and receive a proposal form.

- Proposal filled
  - Novelty
  - Relevance
  - Research Design
  - Ethics & privacy
  - Learner impact
  - Approval course owner
  - Feasibility of course implementation and data delivery
  - Outcomes open access

- Assessment

- Proposal approved
  - For example:
    - Extra survey questions
    - New tool to be tested
    - Consent messages

- Provide research elements
  - Preparation:
    - List datafile to collect
    - Add research elements, such as survey links and course implementations, to the course

- Course run
  - Process data for delivery
  - Pseudonymize

- Data delivery

- Data analysis
  - Communicate to target audiences
  - Presentation for the Extension School team

- Results & Conclusions

1-8 weeks

1-4 weeks

Contact research-es@tudelft.nl with your idea and receive a proposal form.
Why are we interested in research collaborations?

They are a valuable two-way exchange:

- Data is shared to support the execution of research projects
- The outcome and insights from research can be used to improve teaching and learning practices.

The increased access to both data and results further supports a common vision for open education.
Research interests for coming years

- Learning Networks
- Credentials
- Digital Assessment
- Open Education
- Learners needs
- Impact on society

Feel free to contact us with novel ideas also when you are uncertain if they fall within one of the above categories.
Do not hesitate to contact me (research-es@tudelft.nl) with any novel idea.

We are open for collaborations!
Methods to study learning communities in MOOCs. A case study

Plan for today;

1. Background
2. My PhD project
3. Overview of using Social Network Analysis (SNA) to study networked learning in MOOCs
4. Case study
5. Discussion
1. Background

I am a **psychologist** who loves data, AI, and new technologies (And of course COFFEE).

I have a long list of **UNSUCCESSFUL** startups in my CV.
2. My PhD project

Professional Learning Networks and Lifelong Learning in the Era of Transition

‘...there is a knowledge gap between the people who know how to design and maintain the systems, and those who know how to make the best use of the data. Learning networks can help in closing this gap, by allowing professionals to share knowledge, to learn together, to innovate together.’
3. Overview of using Social Network Analysis to study networked learning in MOOCs

- Growth in online education
- Online discussion forums play an important role in collaborative networked learning

**Benefits of Collaborative Networked Learning**

- **Students/Experts**
  - Allow them to connect, build and refine ideas
  - Stimulate deeper reflection
  - Perform intellectually at a much higher level of thinking

- **Teachers/Researchers**
  - Providing information about the quality of learning and teaching
  - What has been learned and investigate the challenges
  - Building a diagnostic assessment model to improve education
What is Social Networks?

Social Networks are formally defined as a set of actors which are tied by one or more types of relations. These relations are represented by the edges in the network connecting the actors and may have a direction indicating the flow from one actor to the other.
Why SNA?

1. Because MOOCs data is too large and cannot be assessed manually by teachers and researchers.

2. Most of online learning providers do not provide information about the participation of students and structure of interactions in discussion threads.

SNA is a Method for obtaining information about relations, fundamental structural and collaborative patterns.
Social network analysts argue that causation is not located in the individuals, but in the social structure.

Social Network Analysis

- Student interaction network
- Dynamic analysis
- Term Co-occurrence Network

**Centrality measures:** to find actors with the most prestige, influence, prominence or to detect the outlier actors.

The general statistics such as, **the density** i.e. proportion of possible ties that actually exist in the network, or the clustering coefficient, i.e., how many actors tend to group together.
Students Interaction Network

It summarizes all the interactions that occurred during the course.

The instructor can **monitor the structure** of these interactions, examine which students are the leaders, and who are the peripheral students.

Consequently, students could be **ranked explicitly in a concentric centrality graph** in which the more central/powerful the node is, the closer it is to the center.
Dynamic analysis

Students’ interaction network can be performed in consecutive timestamps. It shows how the interactions, the students’ roles and the collaboration groups are changing over time. Particularly, the dynamic analysis of the ranking of students illustrates changes in the roles and the activeness of students during the course.
Term Co-occurrence Network

In this network, nodes are terms and edges are their co-occurrence in the same context, i.e. same sentence.

Nodes represent noun phrases, edges their co-occurrence, and the thickness of an edge corresponds to the fraction of times they have been used in the same sentence.
Case Study
Using Social Network Analysis to explore learning networks in MOOCs discussion forums.

Ali Soleymani\textsuperscript{a}, Laure Itard\textsuperscript{b}, Maarten de Laat\textsuperscript{c}, Manuel Valle Torre\textsuperscript{a}, Marcus Specht\textsuperscript{a}.

\textsuperscript{a} Centre of Education and Learning, Delft University of Technology, Delft, the Netherlands.

\textsuperscript{b} Department of Management in the Built Environment, Faculty of Architecture and the Built Environment, Delft University of Technology, Delft, the Netherlands.

\textsuperscript{c} Centre for Change and Complexity in Learning, University of South Australia, Australia.
Case study

Changes in Energy Management Systems in the buildings
- Developing more people friendly systems
- Digital building examination and development
- More advanced data analytics tools
- Progress in self diagnosing systems

The need for workforce development

Professionalisation
- Development of new employees
- Retraining

Learning Network
Methods

- Three discussion forums from three MOOCs.
- Part of the “Buildings as Sustainable Energy Systems professional certificate program” on the EdX platform provided by researchers at TU Delft, the Netherlands.
- Participants: Course 1 had over 6500 participants and courses 2 and 3 were smaller by around 5000 participants.
methods

• Two type of participants: Audit and Paid (7-10 %).
• Participants from high school students who are interested in indoor energy systems to senior HVAC-designers who want to update or upscale their knowledge.
• A Python script was used to extract three variables, discussion id, discussion creator, and discussion poster.
• Using NodeXL software to run our SNA
Results

1. Network measures of all participants

<table>
<thead>
<tr>
<th>Network Metrics</th>
<th>MOOC 3</th>
<th>MOOC 2</th>
<th>MOOC 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of replies to peer posting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of participants in the forum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>number of replies that someone receives for the post</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>number of replies that someone gives to someone else post</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indegree range</td>
<td>0-14</td>
<td>0-12</td>
<td>0-89</td>
</tr>
<tr>
<td>Outdegree range</td>
<td>0-30</td>
<td>0-30</td>
<td>0-57</td>
</tr>
<tr>
<td>Reciprocated edge ratio</td>
<td>0.04</td>
<td>0.06</td>
<td>0.09</td>
</tr>
</tbody>
</table>
Results

2. Network measures of Audit and Paid participants

<table>
<thead>
<tr>
<th>Network Metrics</th>
<th>MOOC 3</th>
<th>MOOC 2</th>
<th>MOOC 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not certified</td>
<td>Certified</td>
<td>Not certified</td>
</tr>
<tr>
<td>Vertices</td>
<td>9</td>
<td>52</td>
<td>24</td>
</tr>
<tr>
<td>Total edges</td>
<td>10</td>
<td>91</td>
<td>41</td>
</tr>
</tbody>
</table>

Number of replies to peer posting
Number of participants in the forum
Discussion

Our design elements suggestions for future MOOCs in the technical field like energy management systems in the buildings:

1. Simple contribution request
2. Mediators
3. Peers who have more similar professional roles, work contexts, or experience
Discussion

Focus on not only the quantity of interactions but also the quality of exchanges.

• High quality and meaningful interaction can be considered as an exchange that stimulates the **intellectual curiosity** of learners.

• Exchanging the information which is **directly relevant** to the learners’ real-life situation and applied to similar culture or applied setting.

• Providing **clear guidelines for discussions and interactions**

• and **setting or defining the expectations of learners**, both in formal and informal learning context.
Thank you for your attention
Are you active in any form of educational forums? Why?