



The Open  
University

# Data-informed Learning Design for Future Schools

An AICFE '*Future Schools in 2030*' research project

Institute of Educational Technology, The Open University, UK

Advanced Innovation Center for Future Education, Beijing Normal University, PR China

School of Educational Technology, Beijing Normal University, PR China

UCL Knowledge Lab, University College London, UK

# THE OPEN UNIVERSITY

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Online Distance Education University  
Established 1969

Largest university (by student numbers) in the UK  
14th largest university (by student numbers) in the world

250,000+ students currently enrolled  
1,500,000+ students have completed an OU degree



Institute of Educational Technology

# PROJECT OBJECTIVES

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## Data-informed Learning Design for Future Schools

- To use learning analytics to investigate the efficacy of individual, and patterns of, learning (instructional) design activities in online courses, in order to inform the pedagogy and learning design of online learning in future schools.

RQ: What patterns of learning design lead to better outcomes?

- To investigate the applicability of learning design descriptors to the PR China context.

# BACKGROUND

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- By 2030, online technologies will play a major role in education.
- But current online courses tend to adopt a predominantly *content-centric approach* (e-text books and videos) (Zhang, Skryabin, & Song, 2016). They do not leverage the affordances of online interactive technologies.
- Effective online teaching and learning involves robust **learning design**, appropriate both to course objectives and to individual student motivations and skills



*“A methodology for enabling teachers/designers to make more informed decisions in how they go about designing learning activities and interventions, which is pedagogically informed and makes effective use of appropriate resources and technologies.”*

(Conole, 2012 p.121)

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LEARNING DESIGN

# LEARNING DESIGN

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At the OU, Learning Design is categorised by **activity**:

1. **Assimilative** (reading, watching, listening, thinking about, observing...)
2. **Finding and handling information** (analysing, collating, discovering, classifying...)
3. **Communication** (debating, discussing, sharing, collaborating, questioning...)
4. **Productive** (creating, making, designing, composing, synthesising...)
5. **Experiential** (practicing, experiencing, exploring, investigating, engaging...)
6. **Interactive/adaptive** (experimenting, trialling, modelling, simulating...)
7. **Assessment** (writing, reporting, demonstrating, critiquing...)

# LEARNING ANALYTICS

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- By using Learning Analytics (LA) techniques on student 'digital footprints' (activities and interactions), it becomes possible to understand the outcomes of learning design (LD).



*“Learning analytics is the measurement, collection, analysis and reporting of data understanding about learners and their contexts, for purposes of and optimizing learning and the environments in which it occurs” (Siemens & Long, 2011).*

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## LEARNING ANALYTICS



# LEARNING ANALYTICS

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## Educational Data

Activity logs of students  
(Macfadyen & Dawson, 2010)

Learning dispositions  
(Nguyen *et al.*, 2016)

Discussion forum  
(Wise *et al.*, 2017)

## Analytical techniques

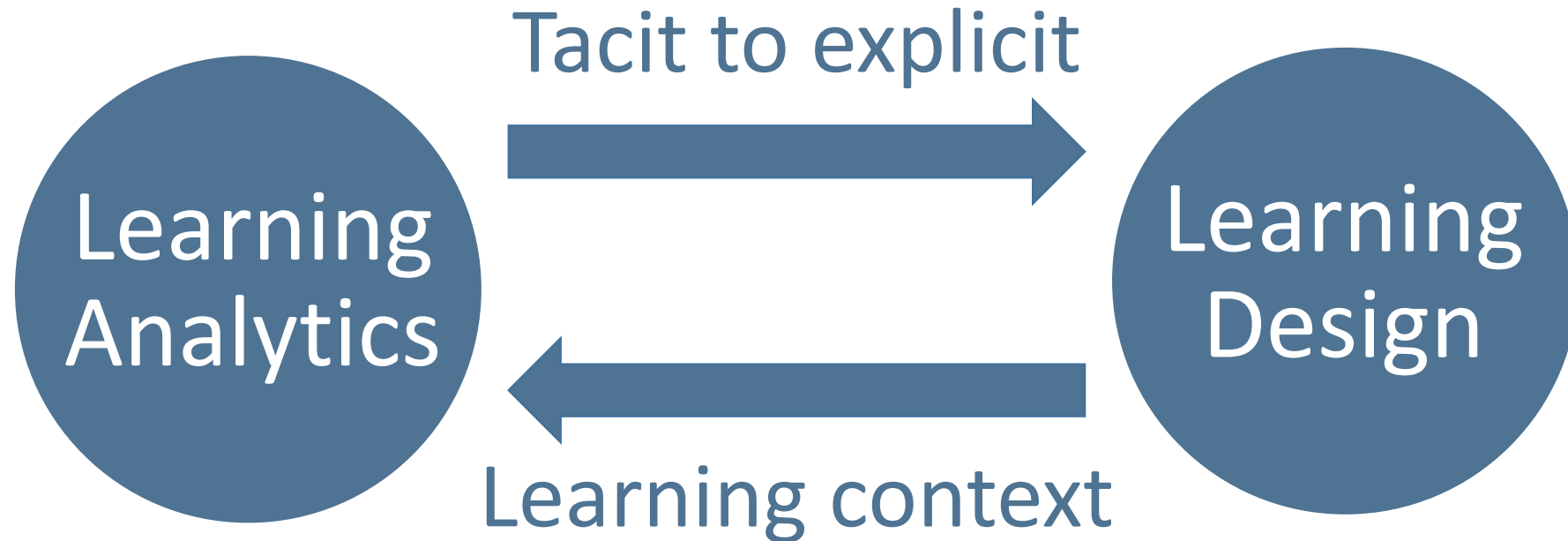
Predictive modeling  
(Tempelaar *et al.*, 2015)

Discourse analytics  
(Whitelock *et al.*, 2015)

Machine learning  
(Kuzilek *et al.*, 2015)

# ALIGNING LEARNING DESIGN AND LEARNING ANALYTICS

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(Lockyer et al., 2013; Lockyer & Dawson, 2011; Persico & Pozzi, 2015; Mor et al., 2015)

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# THE PROJECT

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- To ensure quality online provision in future schools, we need training data from current schools. But this data is not readily available because current schools rarely use online learning.
- However, at the OU we have robust fine-grained individual data for many thousands of students, plus robust data about the learning design activities used in their online modules.
- This project will use LA techniques to investigate the outcomes of LD decisions.

# METHODOLOGY: DATA

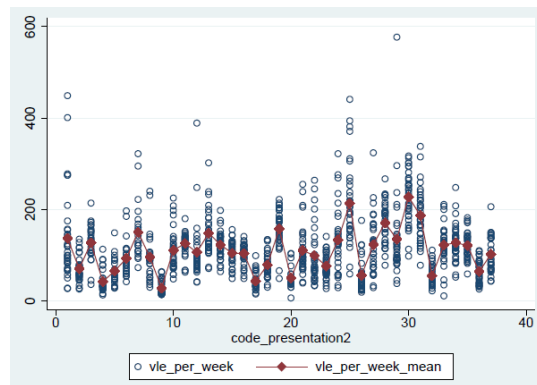
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LEARNING DESIGN	VLE	STUDENT DATA
Assimilative	Time spent per week	Demographics
Finding information	Time spent per visit	Assessments
Productive	Time spent per activity	Satisfaction
Interactive	Number of clicks	Pass rate
Experiential		Dropout
Communication		
Assessment		

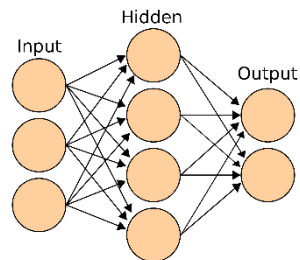
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# METHODOLOGY: ANALYSIS TECHNIQUES

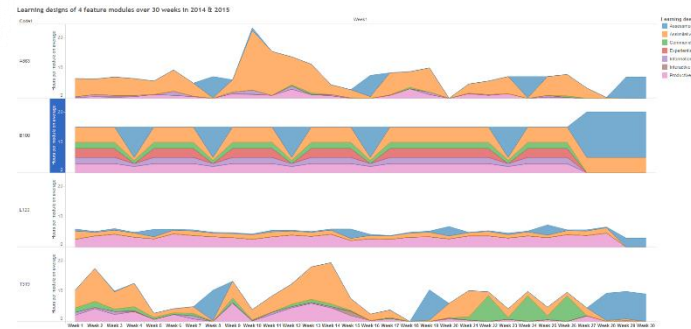
## Fixed effect model



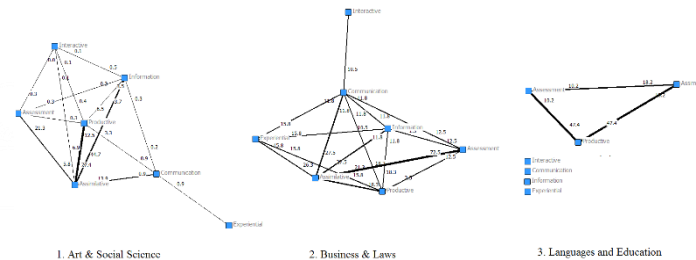
## Artificial neural networks



## Visualisation



## Social network analysis

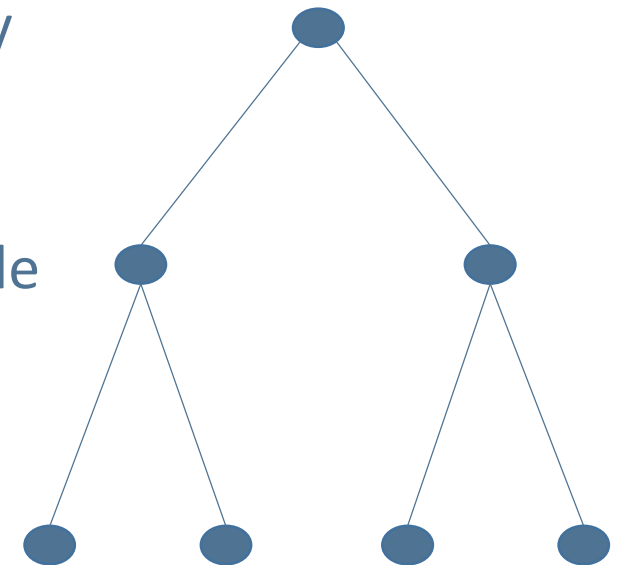


## Multi-level modelling

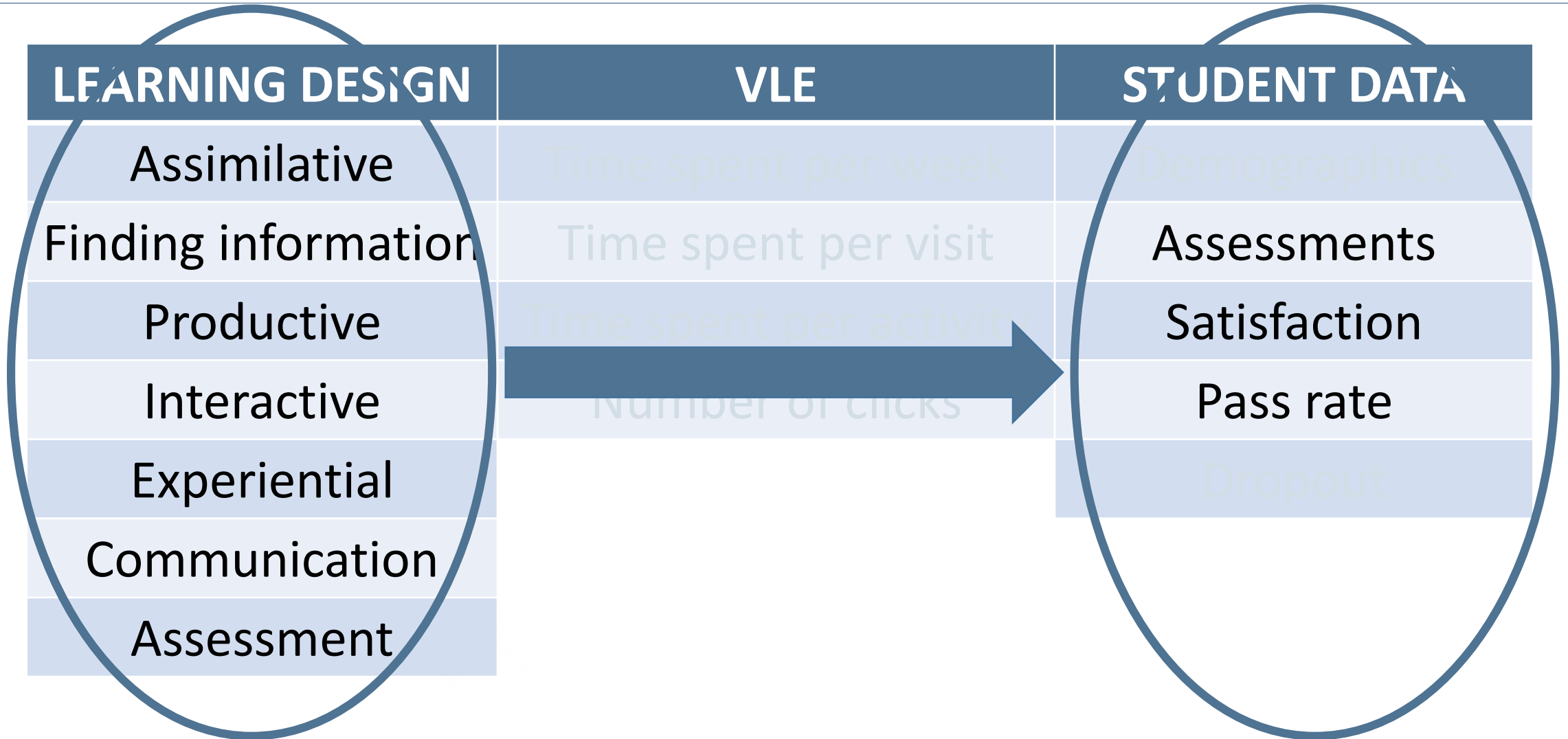
Faculty

Module

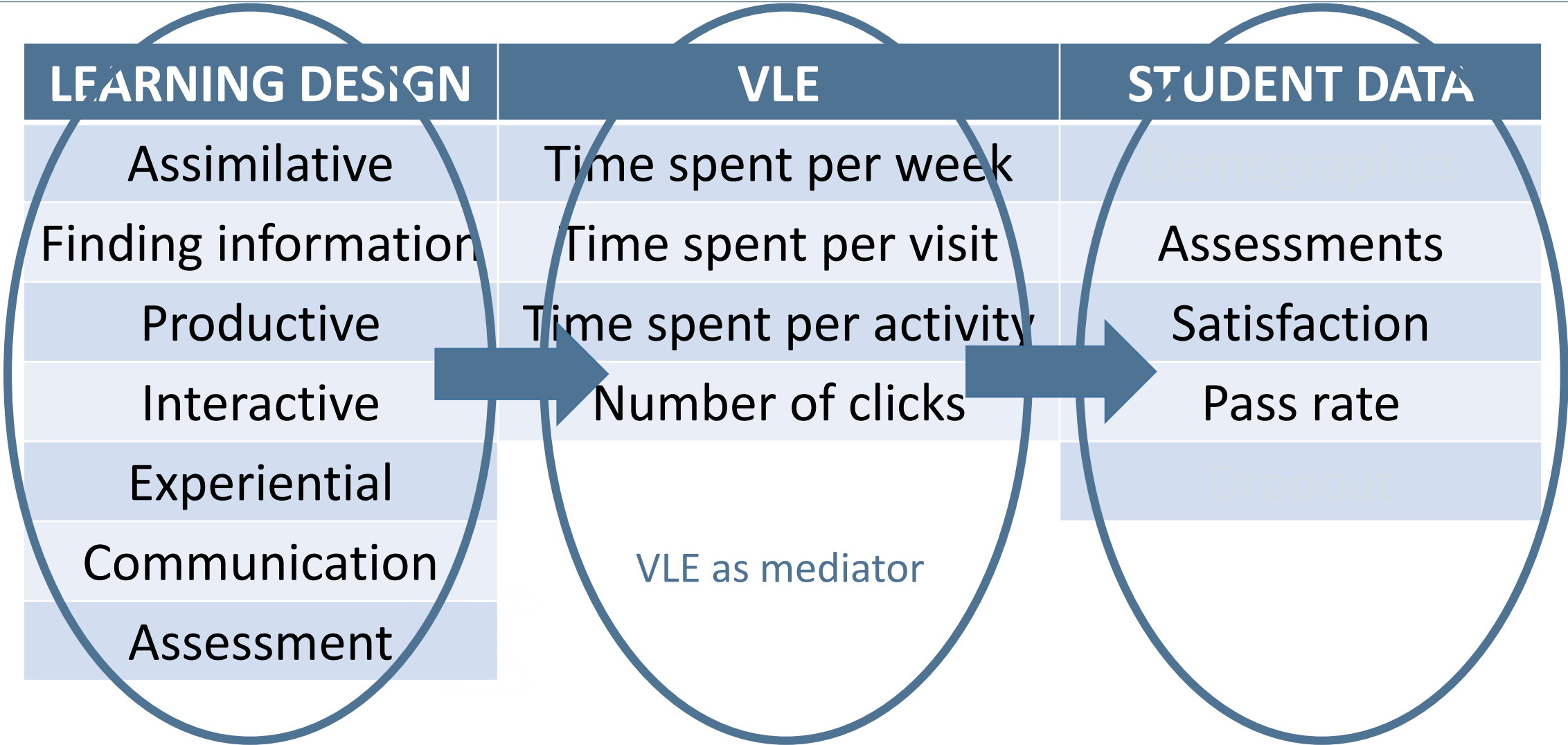
Time



# METHODOLOGY: ANALYSIS

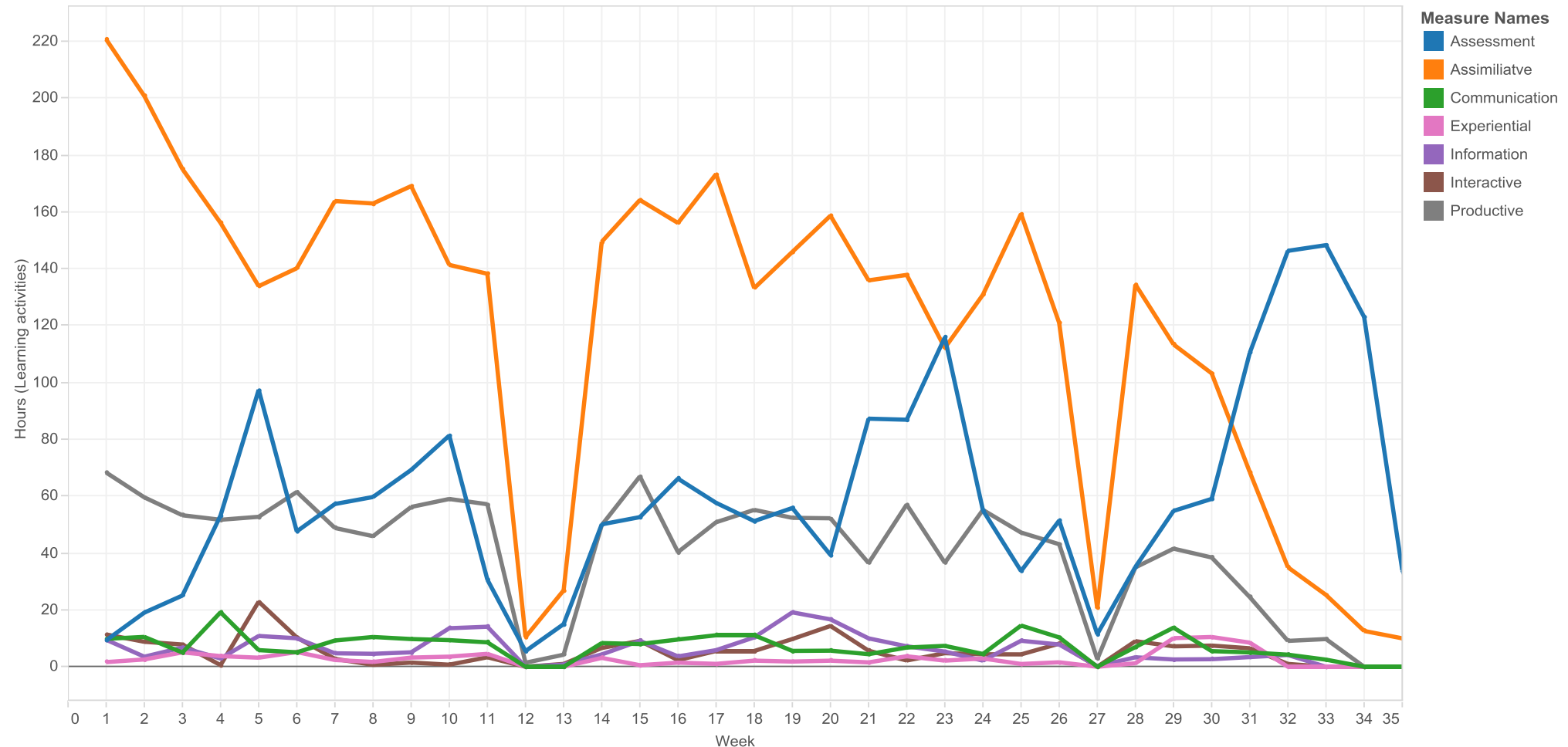
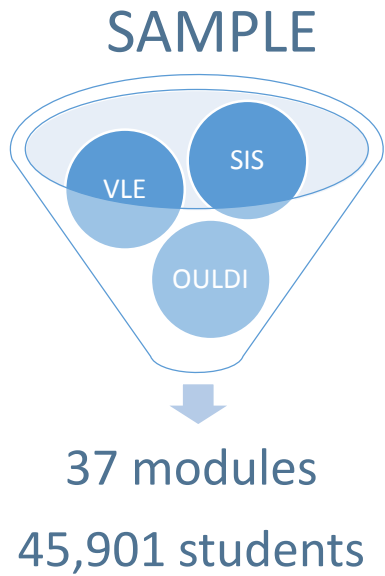


# METHODOLOGY: ANALYSIS



# PREVIOUS WORK: HOW TEACHERS DESIGN THEIR COURSE

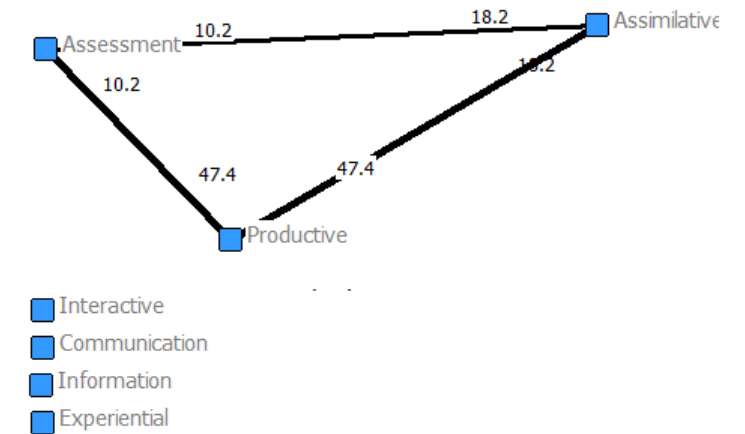
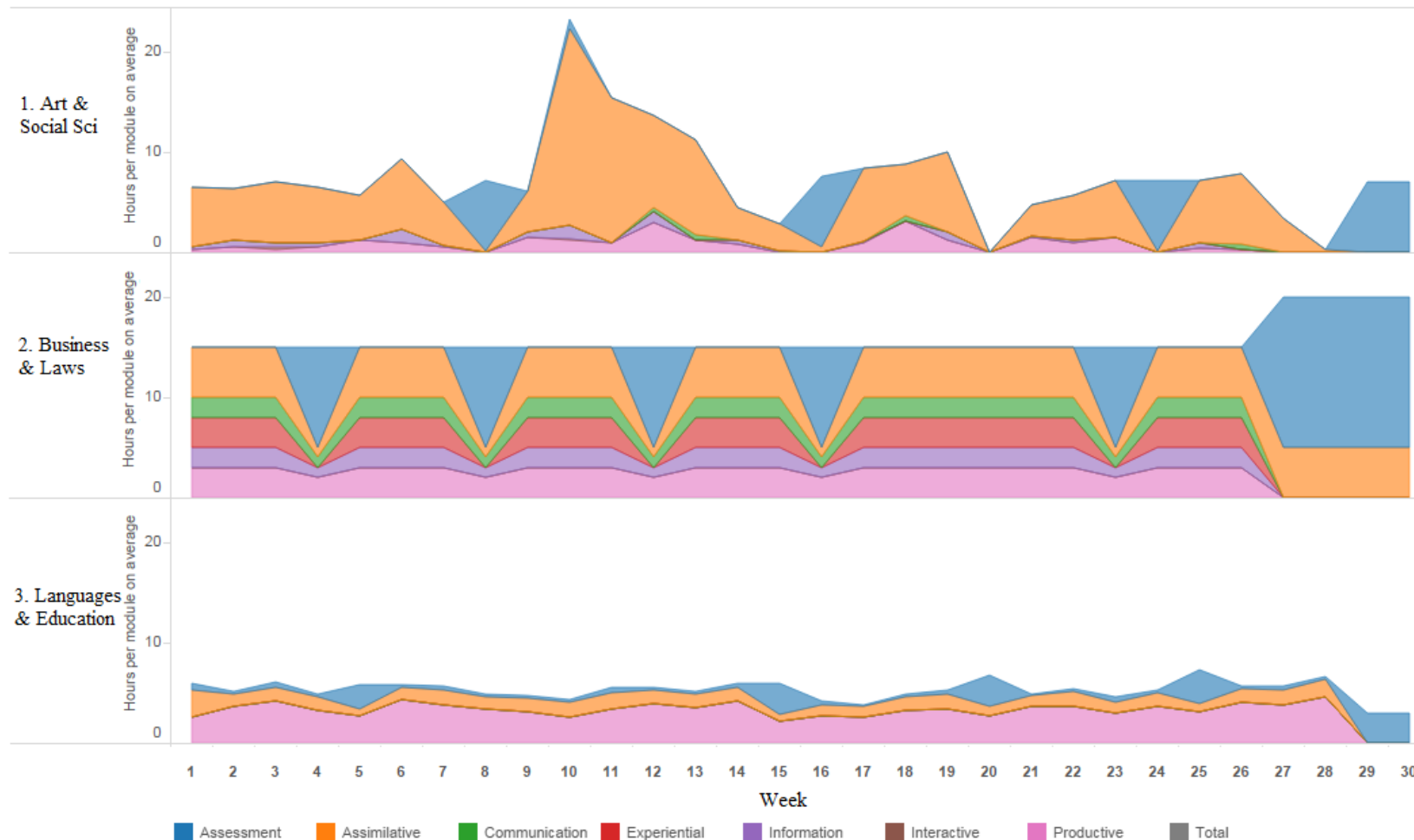
Visualization of the learning design of 37 modules over 34 weeks





# PREVIOUS WORK: HOW LEARNING ACTIVITIES INTERACT

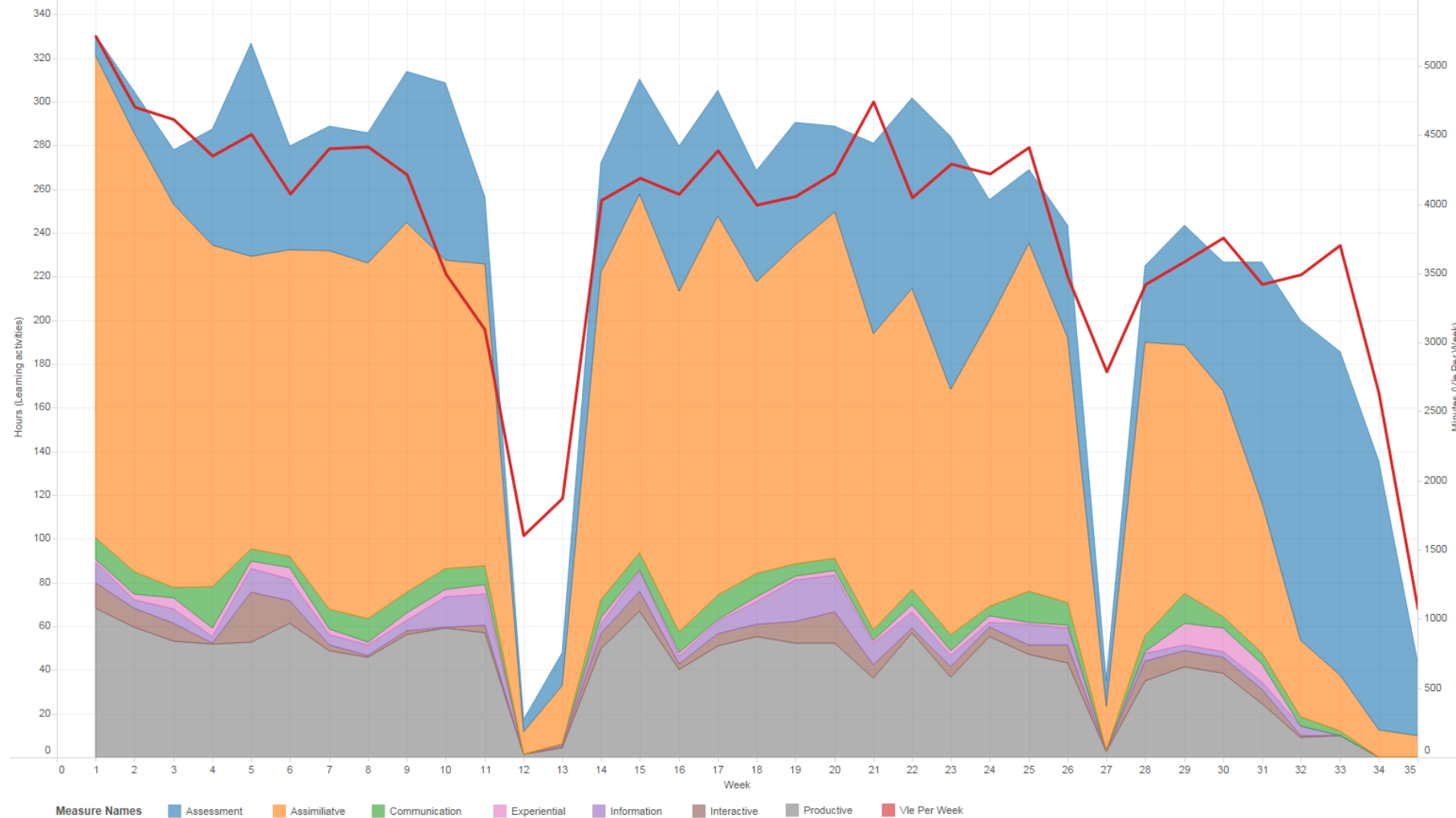
Module. Faculty



3. Languages and Education

# PREVIOUS WORK: LEARNING DESIGN & VLE ENGAGEMENT

Visualization of the learning design & VLE engagement of 37 modules over 34 weeks



Nguyen, Q., Rienties, B., Toetenel, L., Ferguson, F., & Whitelock, D. (Submitted). The impact of assessment design on student behaviour, satisfaction and performance. *Computers in Human Behavior*.

# PROJECT SUMMARY

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## Data-informed Learning Design for Future Schools

- OU big and fine-grained data will be used to inform online learning in future schools.
- **Learning Analytics (LA)** techniques (e.g fixed effect models, visualisations, and social network analysis) will be used to identify **patterns of learning designs** that lead to better learning outcomes.
- The OU learning designs will be mapped to the PR China context, to understand how LA might inform online learning in Chinese future schools.

# Data-informed Learning Design for Future Schools

An AICFE *'Future Schools in 2030'* research project

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