Interdisciplinary Research at the London Knowledge Lab

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Weaving Communities of
Practice Dissemination Event
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londonknowledgelab

London Knowledge Lab
www.lkl.ac.uk

- Joint interdisciplinary collaboration between Birkbeck's department of Computer Science (DCS) and the UCL Institute of Education (IoE)
- Aims to explore the ways in which digital technologies and new media are shaping the future of learning and knowledge
- About 50 academic staff, research staff, research students (of whom some 20 from Birkbeck) working on 25+ projects, funded by the research councils, EU, JISC, industry
- Extended in 2010 to postgraduate teaching on the MSc in Learning Technologies, jointly taught by DCS and IoE staff

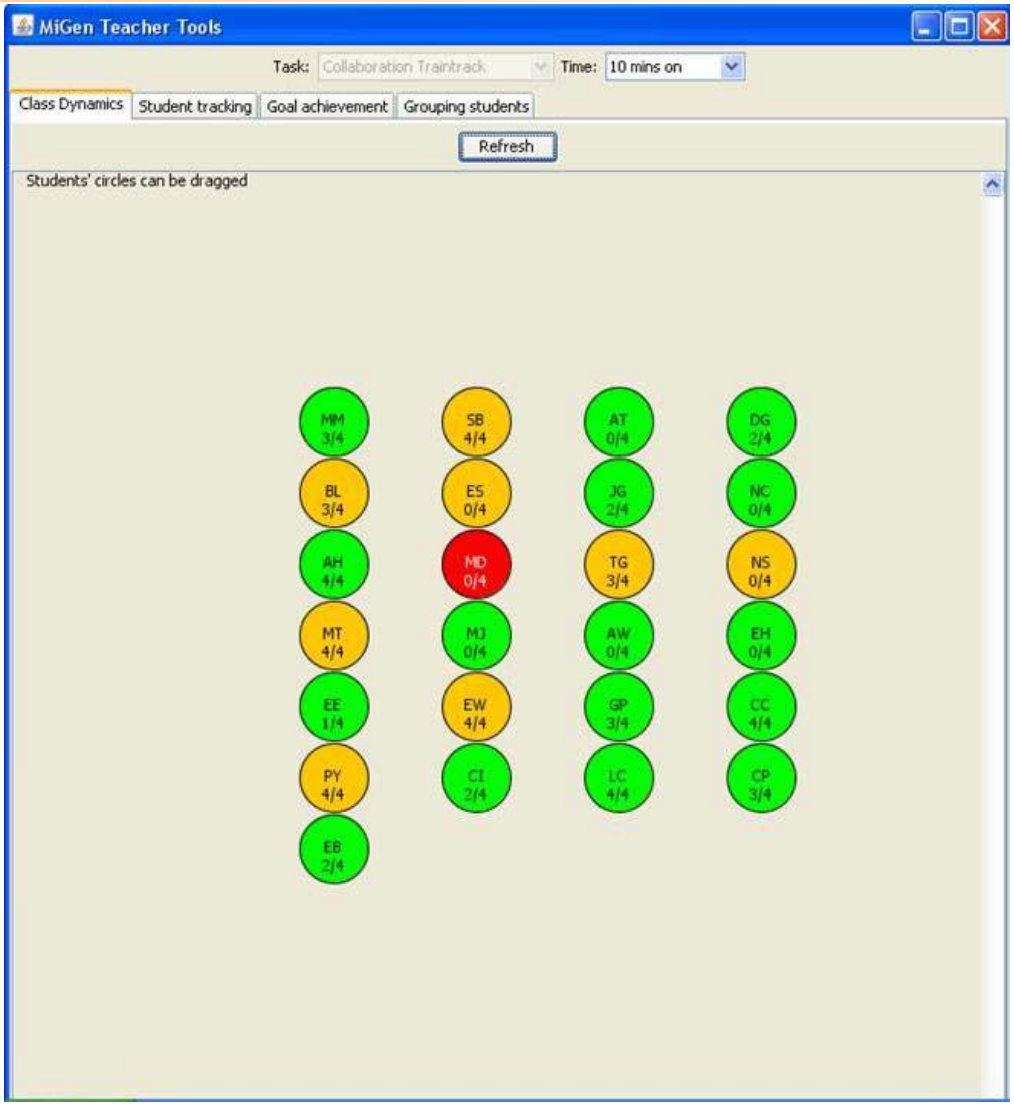
Challenges of interdisciplinary research projects

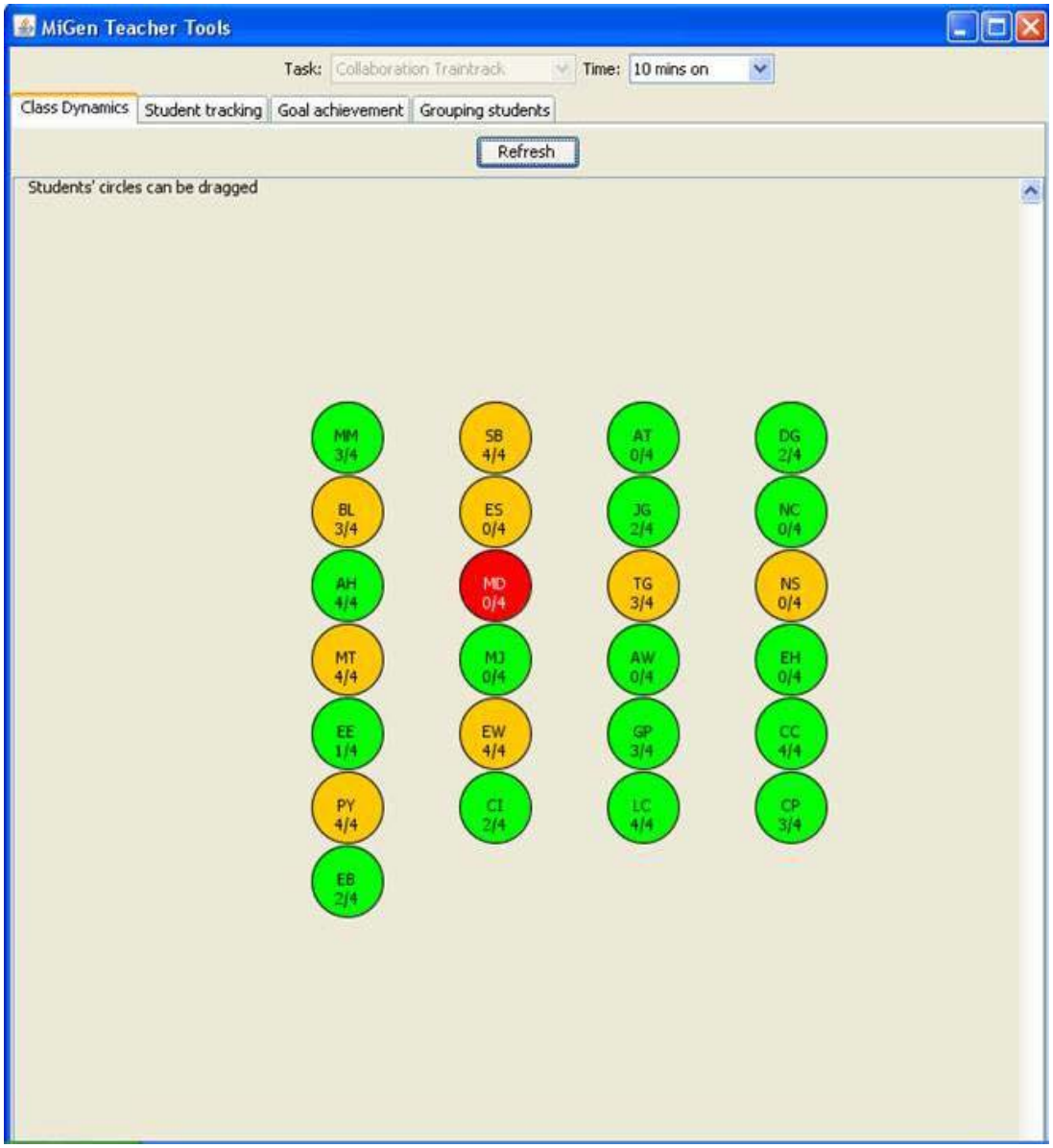
- requires development of a common language of discourse between researchers from the different disciplines – often, a specialist term has different meanings in different disciplines e.g. *ontology*, *design*, *implementation*
- typically a lack of well-defined “requirements” at the outset of the research project: identification of an initial set of requirements on the basis of which to begin to research and design initial prototype software is a necessary first step
- production of the first prototype and trialling with domain experts leads to elicitation of more precise requirements (sometimes contradicting the initial requirements); followed by further research and design of a second prototype
- the project typically progresses in this *iterative collaborative* fashion, comprising successive cycles of requirements elicitation, research, design, and trialling

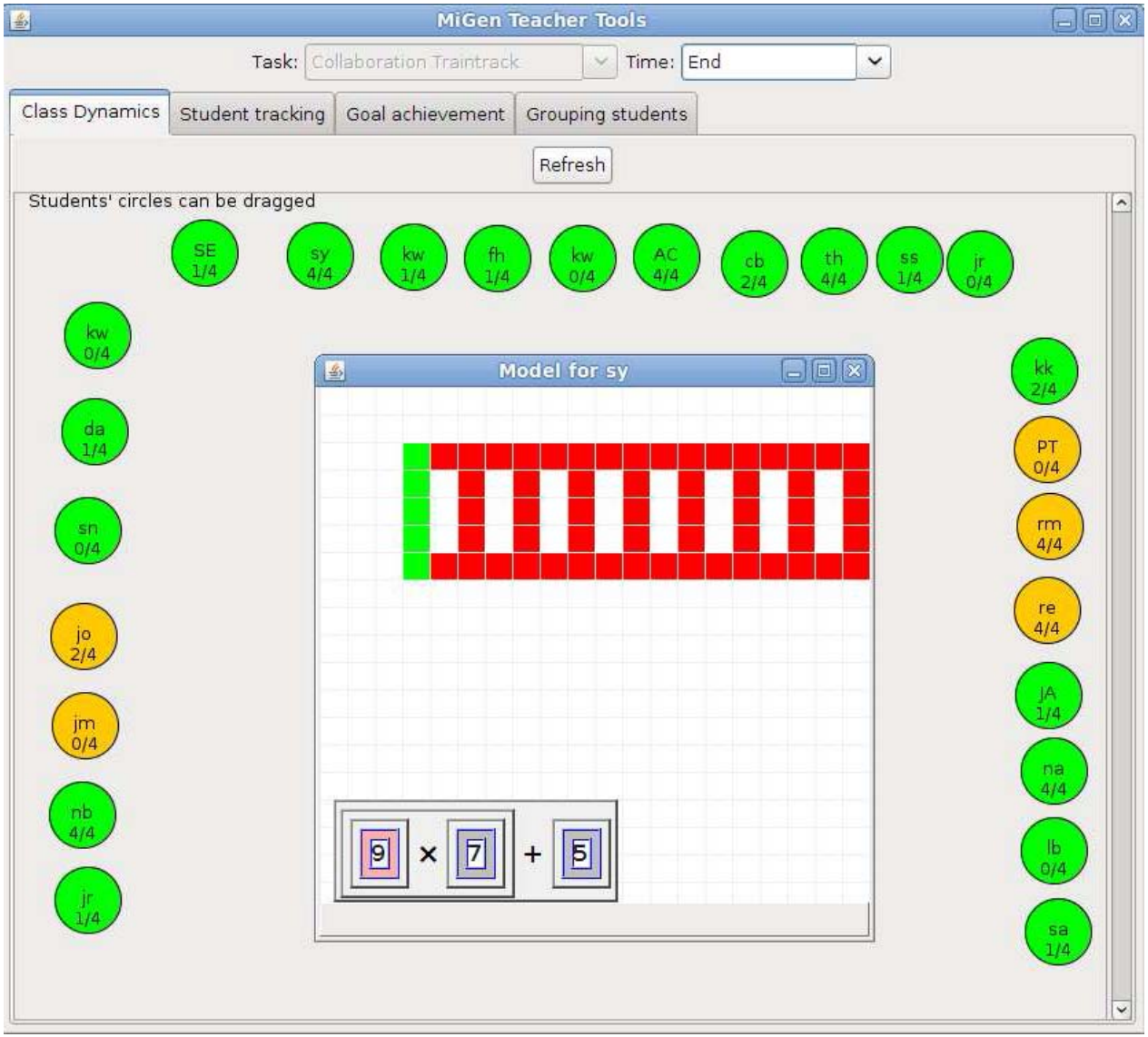
Our research at the London Knowledge Lab

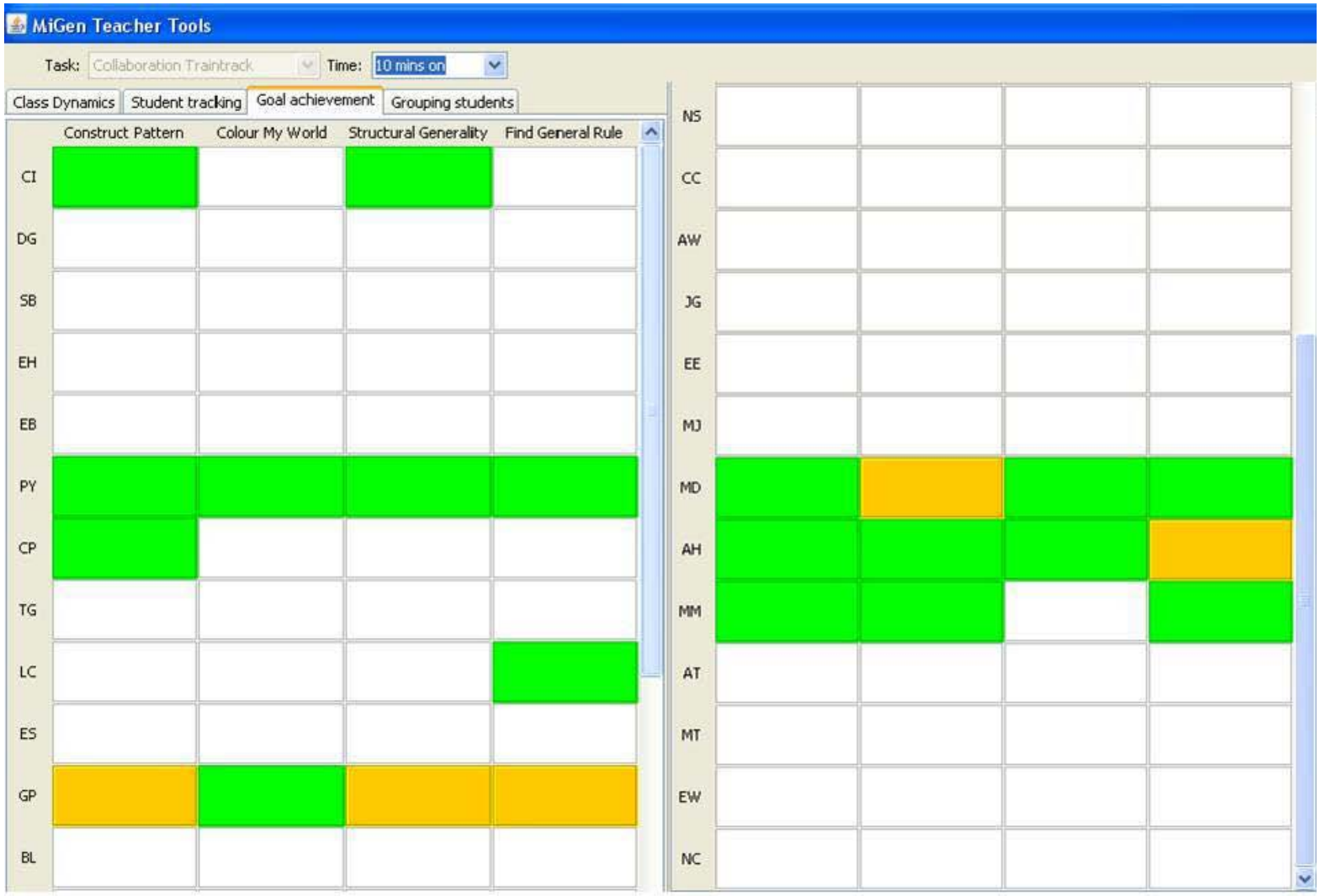
- **Intelligent Tools for Learning and Teaching**:
  - designing tools that provide personalisation, support and guidance to learners and teachers
- **Participatory design approaches** to developing **Mobile and Pervasive applications:**
  - generation of knowledge from data collected through mobile devices
  - resulting in innovative applications in areas such as monitoring biodiversity, healthcare, urban development, transportation, art
- Creation, integration, analysis, visualisation of **specialist data and knowledge bases**, collaborating with researchers and practitioners from the sciences, social science, arts and humanities

MiGen: intelligent support for learning algebra




MiGen Teacher Tools
Task:
Collaboration Traintrack
Time:
10 mins on
Class Dynamics
Student tracking
Goal achievement
Grouping students
Refresh
Students' circles can be dragged
MM 3/4
BL 3/4
AH 4/4
MT 4/4
EE 1/4
PY 4/4
EB 2/4
SB 4/4
ES 0/4
MD 0/4
MJ 0/4
EW 4/4
CI 2/4
AT 0/4
JG 2/4
TG 3/4
AW 0/4
GP 3/4
LC 4/4
DG 2/4
NC 0/4
NS 0/4
EH 0/4
CC 4/4
CP 3/4


MiGen Teacher Tools
Task: Collaboration Traintrack
Time: End
Class Dynamics
Student tracking
Goal achievement
Grouping students
Refresh
Students' circles can be dragged
SE 1/4
sy 4/4
kw 1/4
fh 1/4
kw 0/4
AC 4/4
cb 2/4
th 4/4
ss 1/4
jr 0/4
kw 0/4
da 1/4
sn 0/4
jo 2/4
jm 0/4
nb 4/4
jr 1/4
Model for sy
9 × 7 + 5
kk 2/4
PT 0/4
rm 4/4
re 4/4
JA 1/4
na 4/4
lb 0/4
sa 1/4


MiGen Teacher Tools
Task: Collaboration Traintrack
Time: 10 mins on
Class Dynamics
Student tracking
Goal achievement
Grouping students
Construct Pattern
Colour My World
Structural Generality
Find General Rule
CI
DG
SB
EH
EB
PY
CP
TG
LC
ES
GP
BL
NS
CC
AW
JG
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MJ
MD
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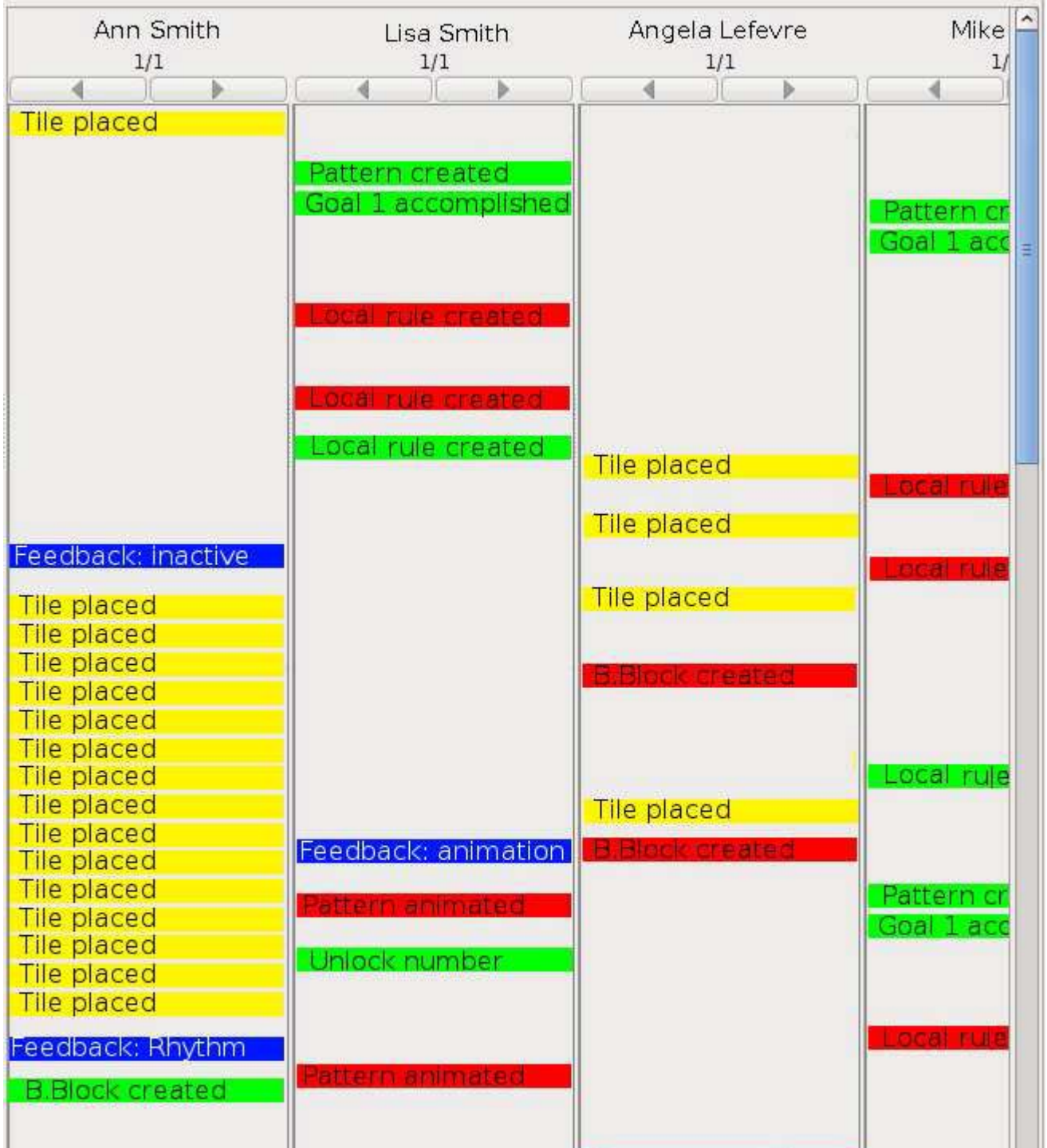
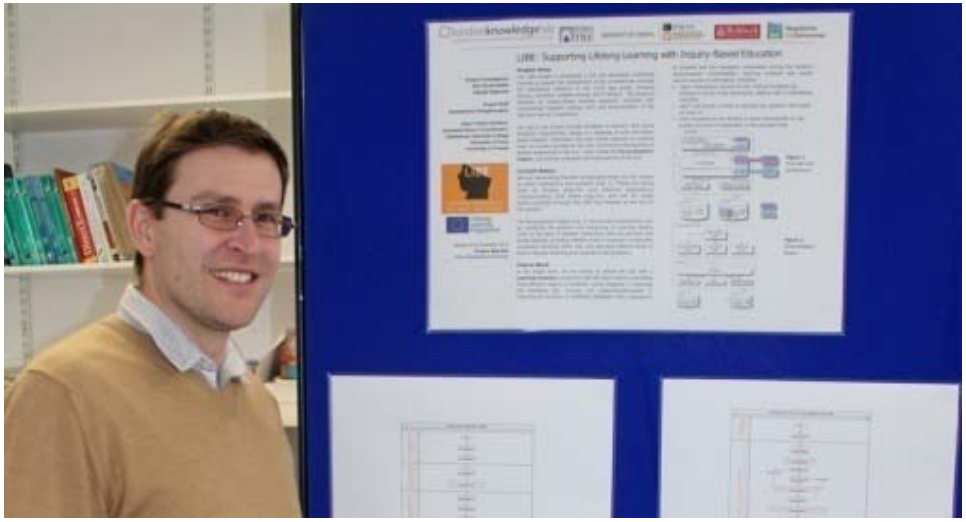

Ann Smith
1/1
Lisa Smith
1/1
Angela Lefevre
1/1
Mike
1/
Tile placed
Pattern created
Goal 1 accomplished
Pattern cr
Goal 1 acc
Local rule created
Local rule created
Local rule created
Tile placed
Local rule
Tile placed
Feedback: inactive
Local rule
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
Tile placed
B.Block created
Local rule
Tile placed
Feedback: animation
B.Block created
Pattern cr
Goal 1 acc
Pattern animated
Unlock number
Feedback: Rhythm
Local rule
Pattern animated
B.Block created

Learning Designer & LIBE projects

The Learning Designer project has produced software that supports teachers and lecturers in capturing their pedagogic ideas, allowing them to build on what others have learnt and to share their experiences with their community. It promotes novel approaches to teaching, encouraging teachers to move away from traditional instruction towards more personalised learning experiences

The LIBE project is implementing a learning environment to support young adult learners in developing key literacy, numeracy and problem-solving skills. The project is adopting an inquiry-based approach to learning, extended with computerised adaptive testing (CAT) and personalisation of the individual learner's experience



Wearable technologies; Museum trails

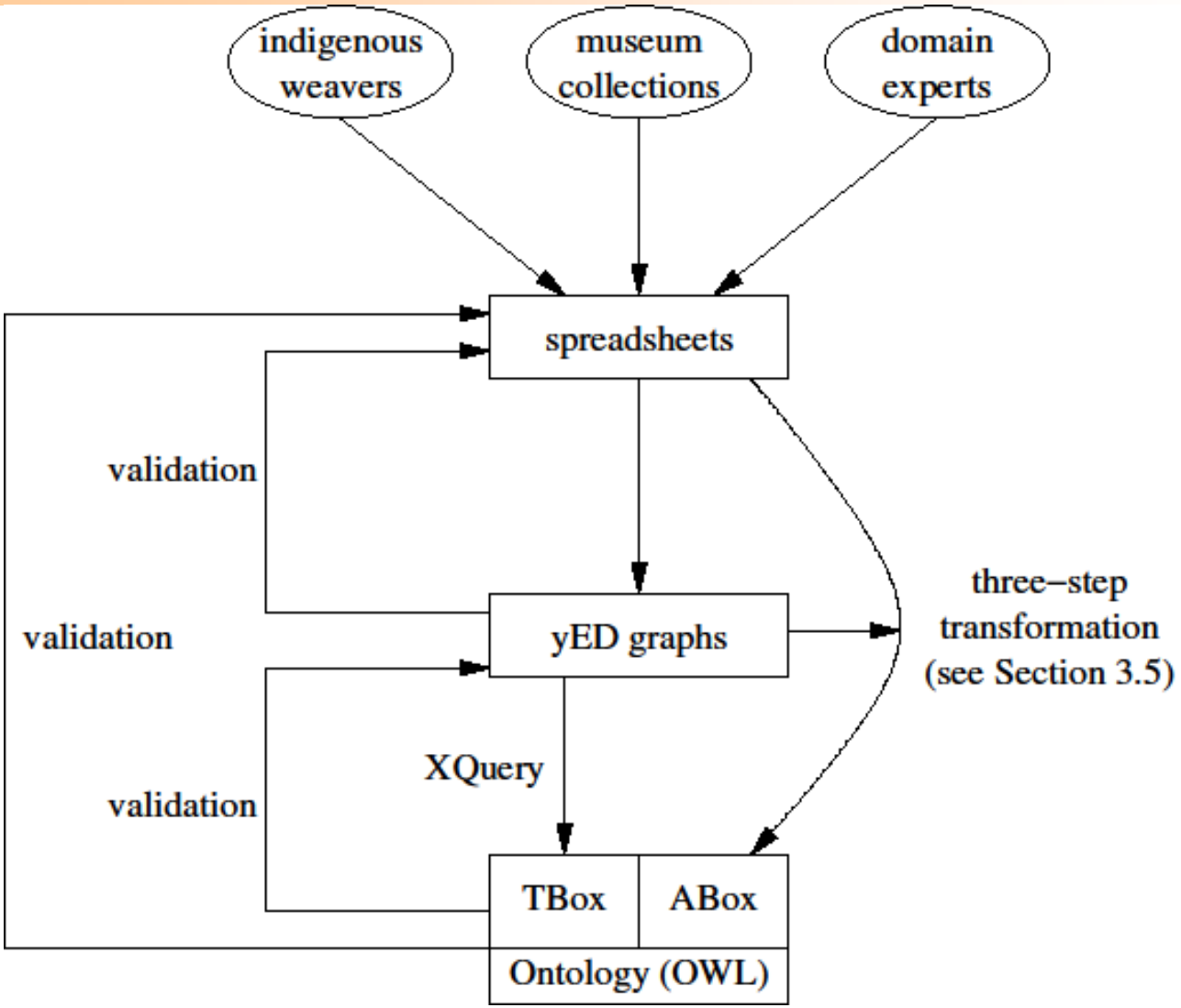
Wearable technologies developed at the London Knowledge Lab: Carnival performance costumes with embedded environmental sensing capabilities that display the current levels of various pollutants via LEDs sewn into the garments.

Inferring museum visitors' motivations from their patterns of spatial navigation: London Zoo visitor trails

Weaving Communities of Practice project www.weavingcommunities.org

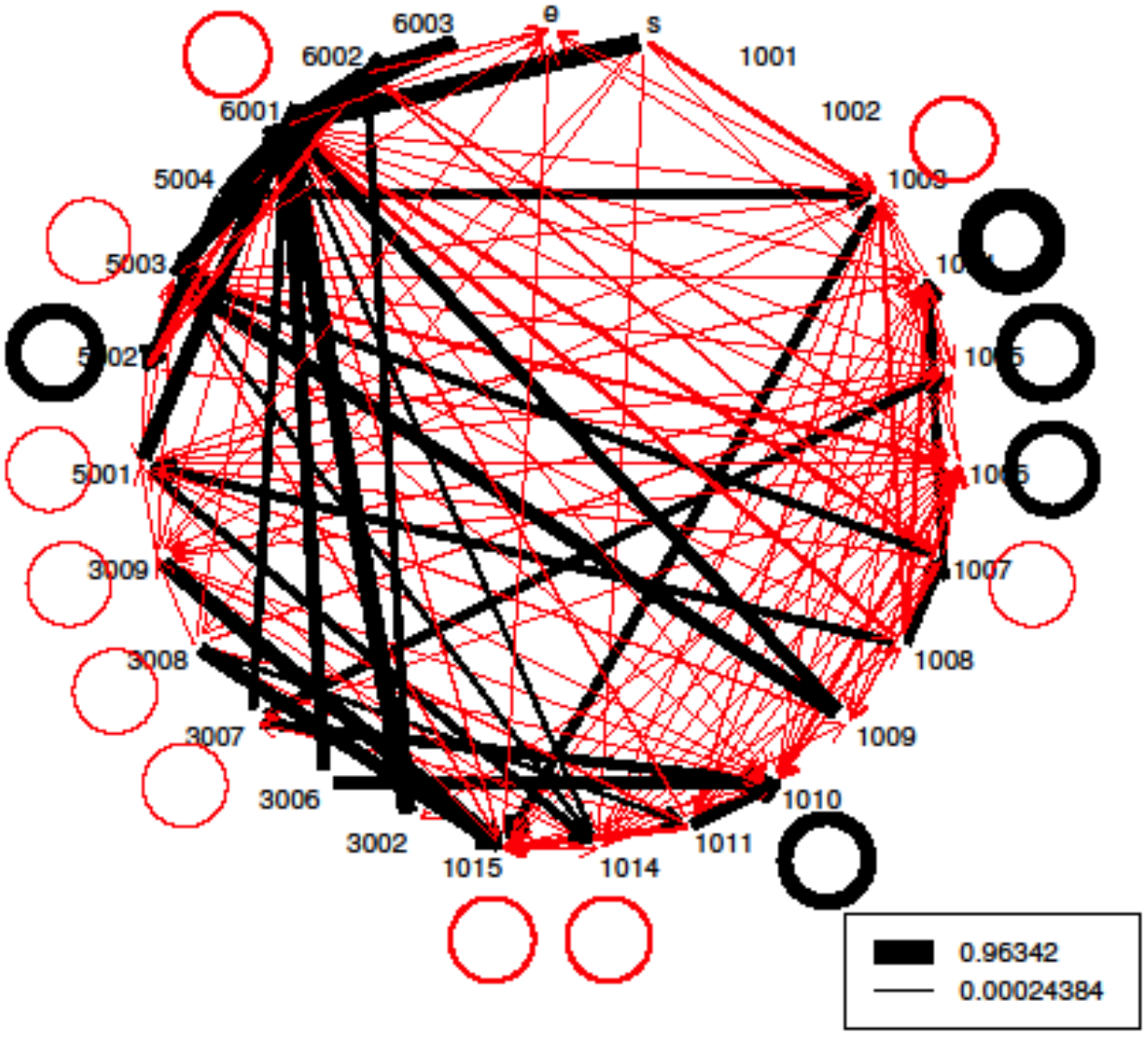
- Pilot project to create a Knowledge Base of Andean weaving designed to contribute to curatorial practice and heritage policy
- The research team gathered data on the chain of activities, instruments, resources, peoples, places and knowledge involved in the production of textiles, relating to over 700 textile samples
- A major part of the project was the modelling and representation of the knowledge of domain experts, and information about the textile objects themselves, in the form of an **OWL ontology**
- Followed by the development of a suite of search facilities to be supported by the ontology
- We opted to develop an ontology rather than a relational database, or other structured database, due to:
  - more flexibility in integrating domain knowledge and data as this becomes available and evolves
  - formal reasoning to validate the evolving knowledge model

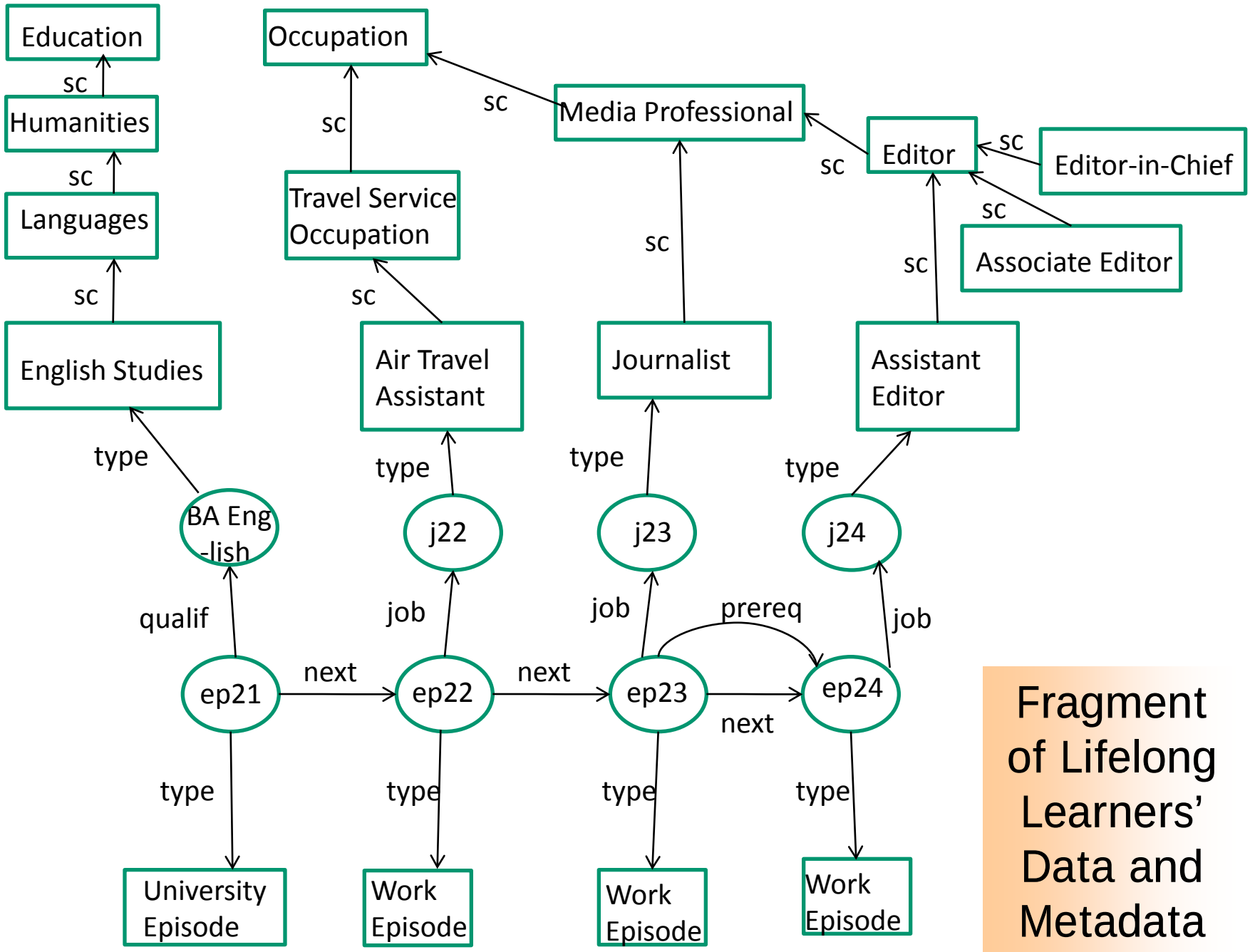
Development Methodology



Graph-based modelling, querying, analysis, visualisation

Student/system interaction data from the MiGen system




Education
Occupation
Media Professional
Editor
Editor-in-Chief
Associate Editor
Humanities
Languages
Travel Service Occupation
English Studies
Air Travel Assistant
Journalist
Assistant Editor
sc
type
BA Eng -lish
j22
j23
j24
qualif
job
prereq
next
ep21
ep22
ep23
ep24
University Episode
Work Episode
Fragment of Lifelong Learners' Data and Metadata

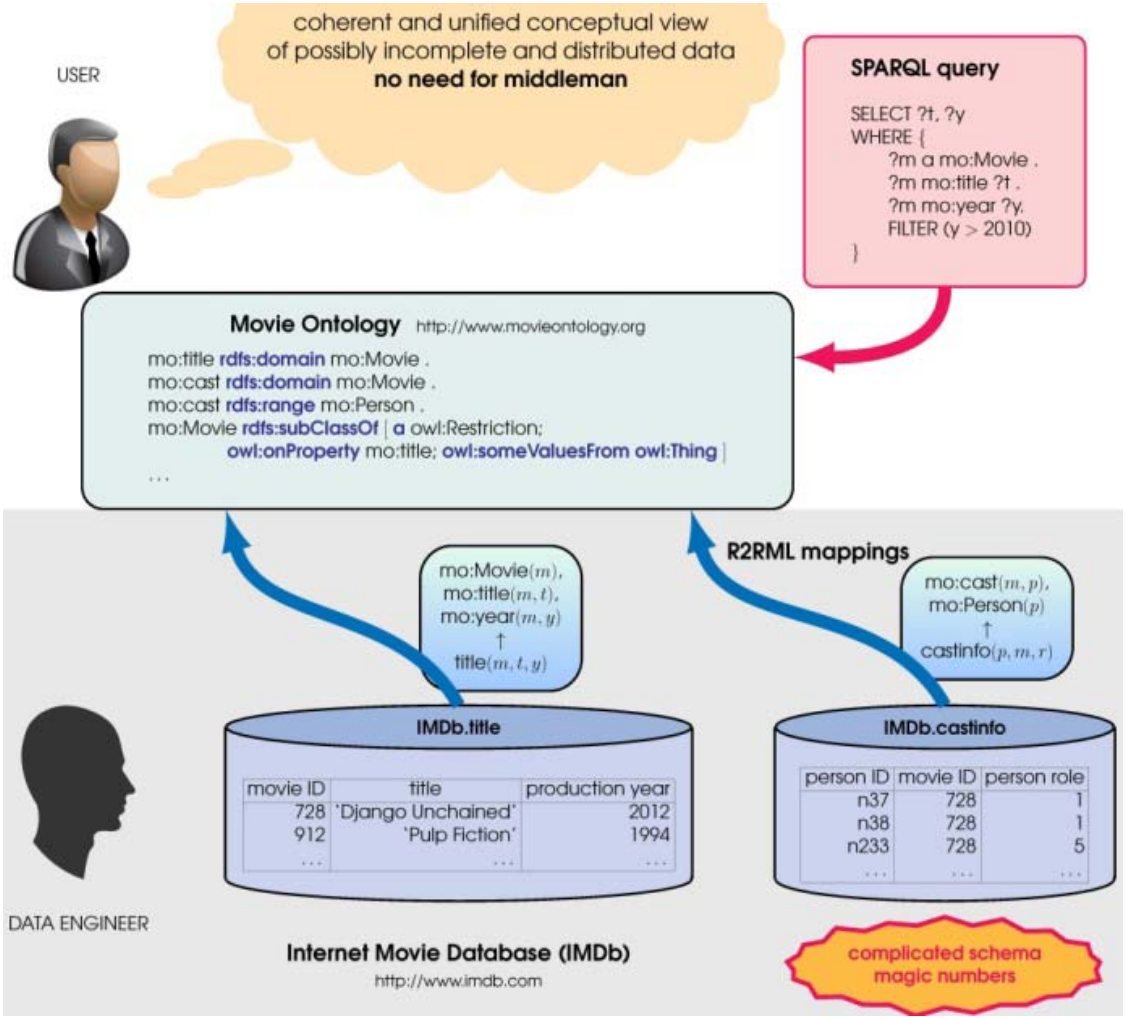
Our research at the London Knowledge Lab (cont'd)

- Integration and querying of Linked Open Data
- Knowledge extraction from the Internet of Things to assist in decision making
- Health informatics:
  - genomic data sets arising from next generation sequencing technologies are increasingly available, presenting significant challenges in data analysis to enable early detection of drug resistance and determine the most effective treatment
  - large-scale data-driven techniques for clinical categorisation of Parkinson's disease patients through disease progression quantification, aiming to tailor care management to individual needs

Collaborating with the London Knowledge Lab

- Our overarching research aim is to **support communities in capturing, organising, discovering and sharing knowledge**
- Examples of recent research projects are:
  - the **Ontop** system, allows users to integrate diverse datasets under a common Ontology and to query the ontology using SPARQL – see ontop.inf.unibz.it
  - the **SAMTLA** system (Search And Mining Tools with Linguistic Analysis) – see www.samtla.com
    - online integrated research environment to facilitate the study of digitised text archives written in any language
    - to date it has been used for research on Hebrew, Judaeo-Arabic, Aramaic and Arabic texts
  - the Knowledge Base developed for the **Weaving Communities of Practice** Project – www.weavingcommunities.org

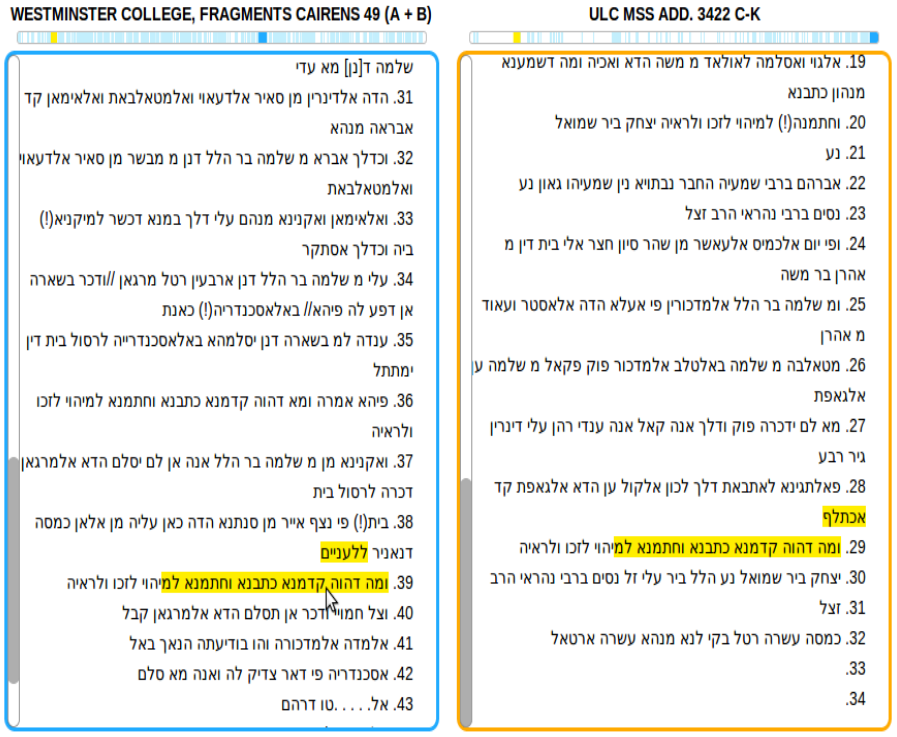
Collaborating with the London Knowledge Lab



Ontop system architecture:

- Allows diverse databases to be mapped to one ontology
- Supports SPARQL queries over the ontology
- Incorporates RDFS and OWL reasoning

Collaborating with the London Knowledge Lab



Samtla

The SAMTLA system has been designed to facilitate the study of digitised texts. Includes language-agnostic statistical modelling. Currently supports the research of three corpora:

- the Genizah collection held by the Taylor-Schechter Genizah Research Unit in Cambridge University;
- a collection of Aramaic incantation texts from late antiquity;
- 13 versions of the Bible in English

Avenues for Collaboration

- Collaborative research projects: to create, analyse, visualise new databases and knowledge bases; generate new knowledge from data; develop novel applications supporting knowledge communities, including mobile and pervasive applications
- Joint organisation of workshops
- Joint PhD supervision
- Staff and student internships
- Guest lecturing on Masters programmes
- Consultancy
- Knowledge Transfer partnerships