

# Learning Analytics

@CEL, @CEE  
@NPULS

Marcus Specht  
(TUD)  
Manuel Valle Torre  
(TUD, Npuls)

Esther Ventura-  
Medina (TUE)

Anouschka  
van Leeuwen,  
(UU, Npuls)



Universiteit  
Leiden  
The Netherlands



Delft  
University of  
Technology

Erasmus  
University  
Rotterdam



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TU/e EINDHOVEN  
UNIVERSITY OF  
TECHNOLOGY



# Structure, Agenda

10 min introduction to **stakeholders** for LA (Marcus)

10 min best **practices** NPULS (Manuel)

10 min TUE Cases and challenges in **adoption** (Esther)

10 min **Strategies** forward (Anouschka)

10 min forming groups and activity instruction

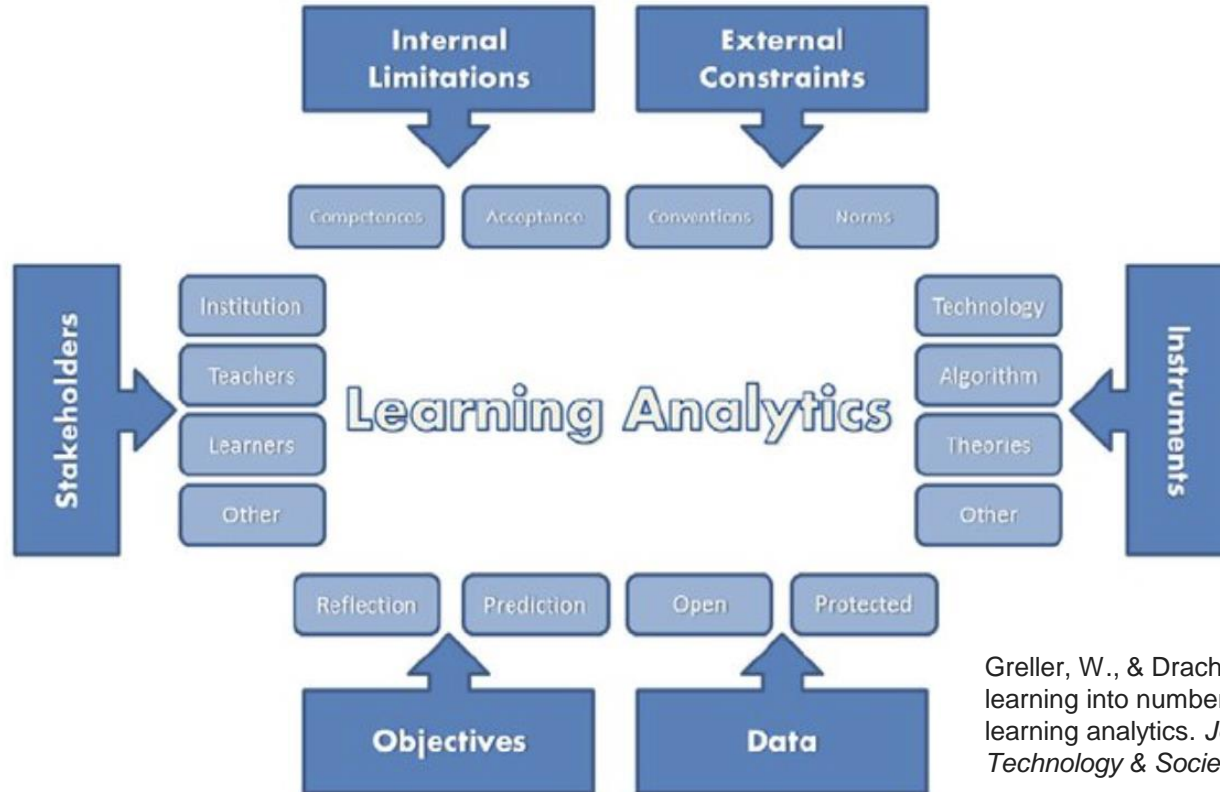
20 min describe your challenge according to models

20 min pitches plenary and discussion

# #1 Introducing different **Stakeholders** in Learning Analytics

Marcus Specht (TUD, CEL)

# Stakeholders in LA



Greller, W., & Drachsler, H. (2012). Translating learning into numbers: A generic framework for learning analytics. *Journal of Educational Technology & Society*, 15(3), 42-57.

# “One specific change that Learning Analytics will trigger in Dutch education is...”

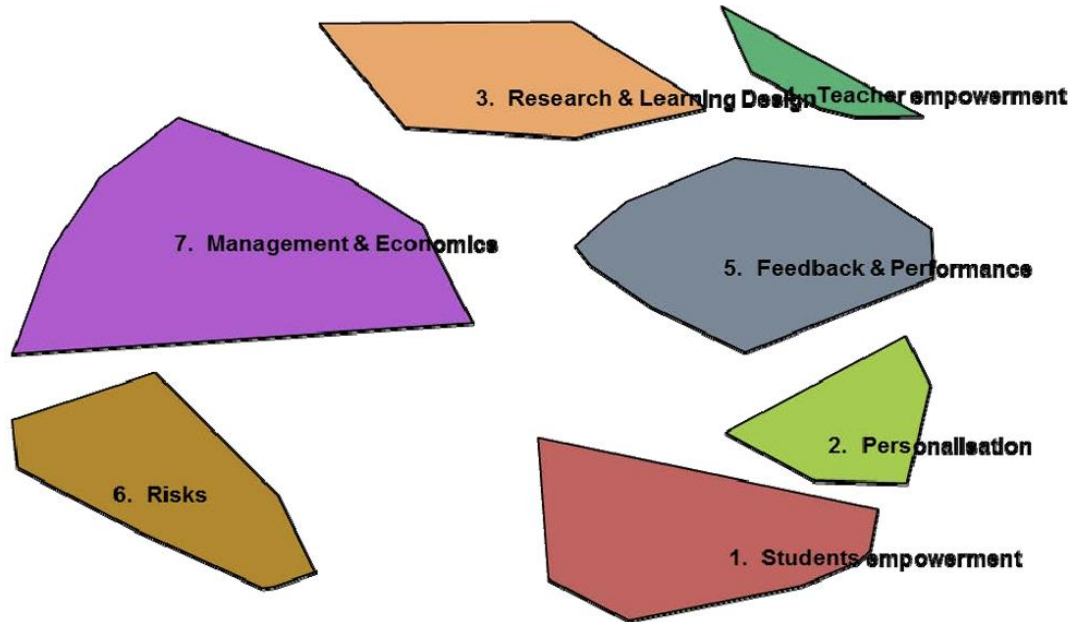
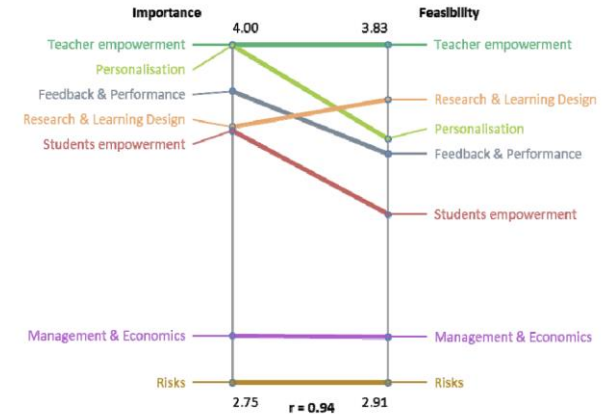


Figure 3: Seven clusters solution with labels



Drachsler, H., Stoyanov, S., & Specht, M. (2014, March). The impact of learning analytics on the Dutch education system. In *Proceedings of the Fourth International Conference on learning analytics and knowledge* (pp. 158-162).

# Researchers on Learning Analytics

Share resources, knowledge, conditions and expertise



- More fundamental research questions about higher education
- Always based on a well-defined research question



- Interpretation of data (self-fulfilling prophecy)



- Culture of collaboration and sharing
- Both small-scale, short term and large-scale, long term research

# Students on Learning Analytics

Watch out for "verschooling"



- Assisted goal-setting
- Guidance & mentorship ("nudge")
- Best study methods/successful study techniques



- More customizing own curriculum  
-> not one fixed curriculum for everyone



- Performance progress



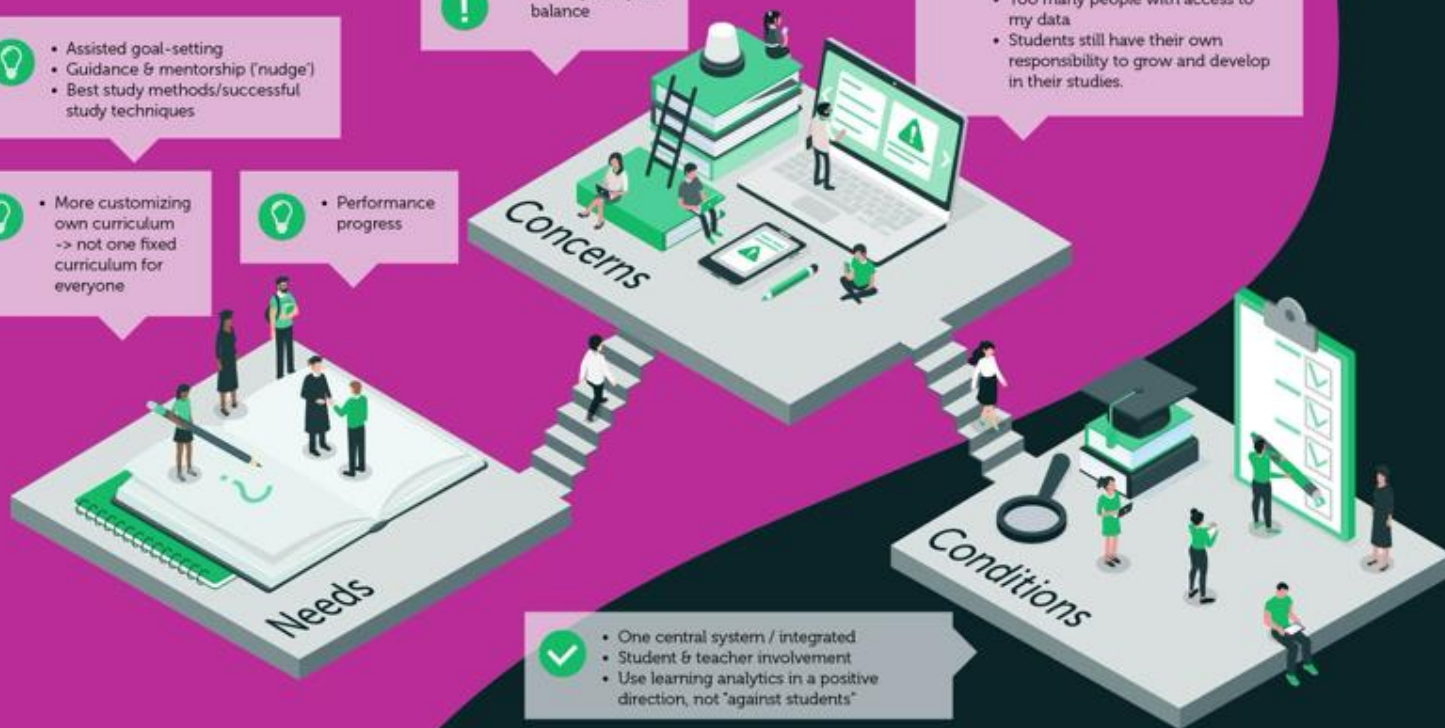
- Healthy study/life balance



- "Verschooling"
- Room for personal development
- We also need the input of the "low-performing" students on learning analytics. Include them as well!
- Too many people with access to my data
- Students still have their own responsibility to grow and develop in their studies.



- One central system / integrated
- Student & teacher involvement
- Use learning analytics in a positive direction, not "against students"



# Teachers on Learning Analytics

Our focus should be on the learner



- Facilitate students & help students to get the most out of themselves
- Personalized learning paths
- Facilitate teachers in using learning analytics: provide training
- Provide dashboards and standard reporting
- Insight in individual learning needs
- Oversight of frequent errors in formative tests



- Need to understand the data: so involve e.g. students for interpretation
- Insight in progress of students in a course



- Drawing the wrong conclusions
- Learning is more than assessments!

Concerns

Needs

Conditions



- Involve the hard working but failing student



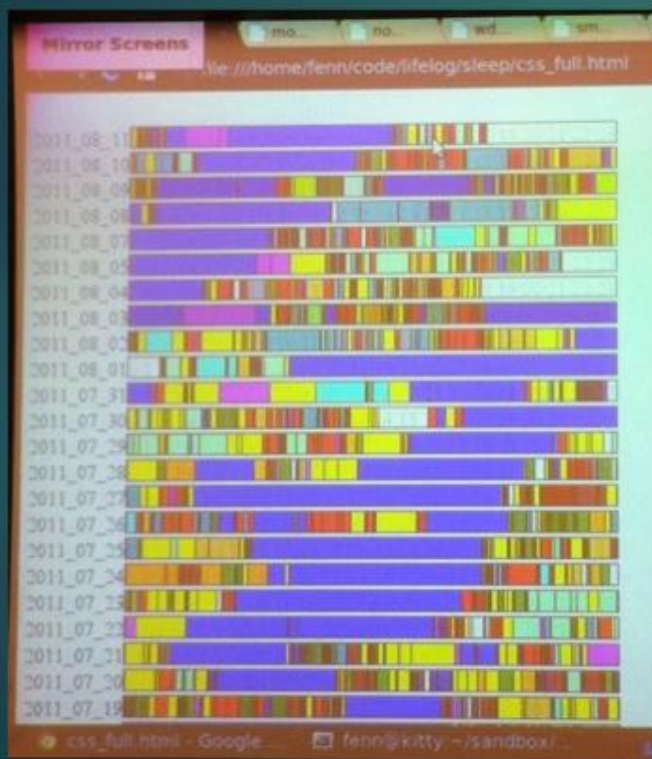
- Student & teacher involvement
- Use the scientific process in creating learning analytics and dashboards



- Open up Canvas Learning analytics!



# The Quantified Self



QUESTIONING



AWARENESS



EXPERIMENTATION



MEASURING



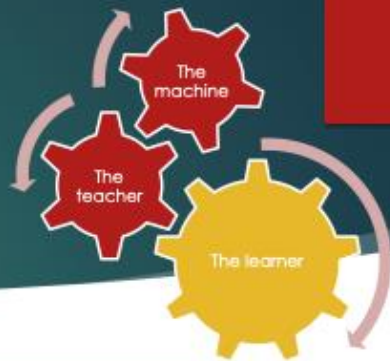
DATA COLLECTION



CHANGE

<https://quantifiedstudent.nl/>

# Supporting the Learner



**Reflection** support with data from your traces

**R**

Peer assessment and review for **judgement**

Developing **expertise** and mental models

# Supporting the Teacher

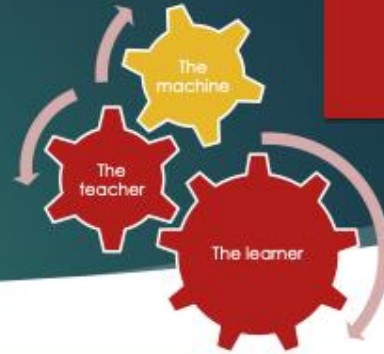


Scalable analytics and assessment

Augmenting the learning environment

Enhancing feedback for mental models

# Supporting the Machine



Multimodal datasets for model dev.

Expert Training for real-time feedback

Sequence analysis of collaboration sets

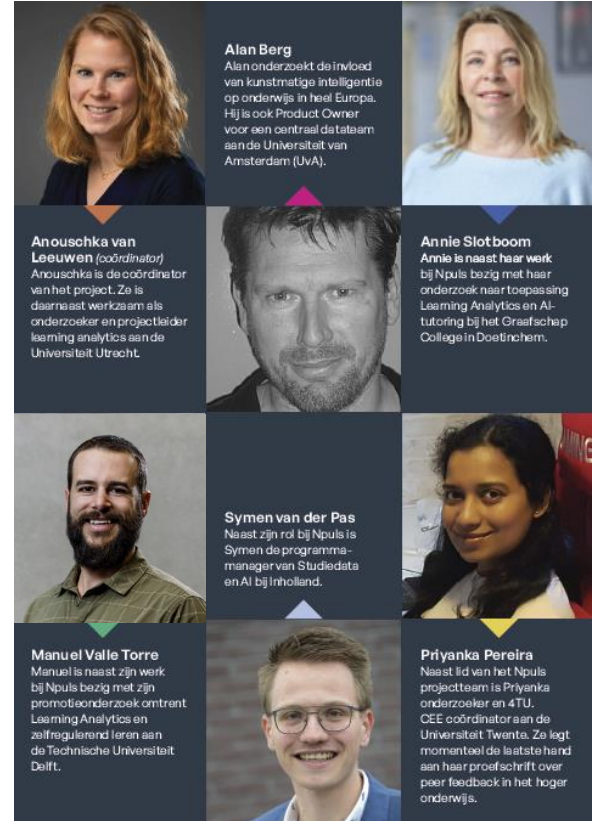
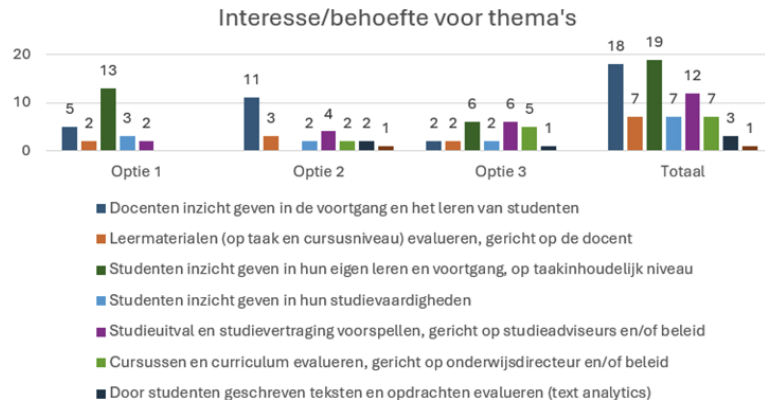
# #2 Best Practices of Learning Analytics - Npuls

(Anouschka, Manuel)

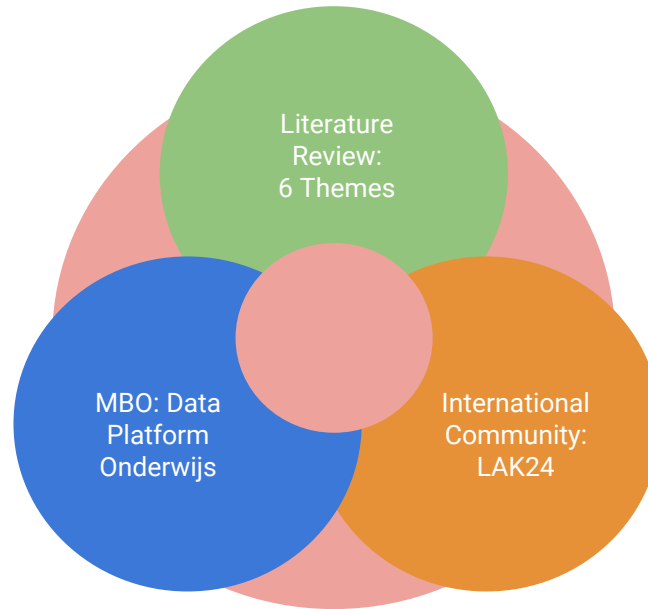


# About us

- Npuls pilothub Studiedata and AI
- Mission: provide inspiration for LA
- First theme: Barriers and Facilitators of LA Adoption
- Second theme: LA Insights for Students and their learning process



# Barriers and Facilitators of LA Adoption



# Literature Review

- Culture
- Frameworks
- Literacy and Training
- Learning Theory
- Ethical and Legal
- Technical





# DPO - Educational Data Platform partnership

- 16 MBO Institutions
- Data Analytics: Operation & Management vs Learning
- Flexible student trajectories and multiple educational platforms/applications result on data integration challenge
- DPO can help to share solutions to technical barriers, but institutional culture remains a challenge



# Expert Opinions: LAK24



LAK24, Kyoto

## Suggestions on:

- Management buy-in
- Privacy regulations
- Bottom up versus top down



**Professor Simon Buckingham Shum**

*University of Technology Sydney*

Zijn toegepaste onderzoek bevindt zich op het snijvlak van de multidisciplinaire gebieden mens-computer interactie, kunstmatige intelligentie, computeronderwijs, leersteun, samenwerking, learning analytics en AI in het onderwijs.



**Professor Abelardo Pardo**

*University of South Australia*

Auteur van meer dan 200 onderzoekspapers in wetenschappelijke tijdschriften en internationale conferenties op het gebied van onderwijstechnologie en technisch onderwijs.



**Professor Stephanie Teasley**

*University of Michigan*

Projectleider voor My Learning Analytics (MLA) aan de Universiteit van Michigan. Een studentgericht prestatiedashboard. Voormalig voorzitter van SoLAR (2017-2019).



**Professor Alyssa Wise  
en Professor Xavier Ochoa**

*Vanderbilt University & New York University*

Hebben samengewerkt aan NYU's Learning Analytics Research Network (LEARN).



**Professor Bart Rienties**

*Open University (UK)*

Professor in Learning Analytics. Huidige president van SoLAR.

# Next steps



Magazine coming out soon

LA Event on June 18



Next theme: student-facing LA

# #3 Adoption of Learning Analytics

Esther Ventura-Medina (TUE)

# Learning Analytics (LA) adoption in Higher Education –European perspective

Research study

Esther Ventura-Medina<sup>a</sup>, Caroline Vonk<sup>b</sup>, Ludo van Meeuwen<sup>c</sup>

<sup>a</sup>Applied Physics and Science Education | Eindhoven School of Education, <sup>b</sup> 4TU.CEE, <sup>c</sup> General Affairs

# LA workshops Research study

Research study objectives:

1. sharing the current state of the art on LA adoption at different levels within institutions in different countries,
2. comparing different institutional approaches paying attention to the contextual differences and,
3. **exploring through different scenarios challenges and opportunities for adoption and scale-up,**
4. drawing conclusions for future directions on research and development.

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# Research setting

- Ethical approval ERB2024ESOE1.
- 2 Workshop @
  - TU/e (26 participants)
  - LAK2024 (19 participants)
- Participants: Teacher/Education support/Policy perspective –voluntary participation distributed ~equally in groups

## Scenarios:

1. Student Digital well-being
2. Empowering educators
3. Student performance

Data: Discussions captured via flipcharts & notes



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## Ongoing...

- Meta-analysis including field notes and speakers' presentations
- Cross-institutional comparison
- Conclusions and further research questions

For more information contact

[e.ventura.medina@tue.nl](mailto:e.ventura.medina@tue.nl)

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# #4 **Strategies** forward - Utrecht University

Anouschka van Leeuwen (UU)

# Learning Analytics @ Utrecht University



Anouschka van Leeuwen

[a.vanleeuwen@uu.nl](mailto:a.vanleeuwen@uu.nl)

[www.uu.nl/en/education/learning-analytics](http://www.uu.nl/en/education/learning-analytics)



Learning Analytics

## How do LA projects initiate?

Top-down-bottom-up approach

### Top-down

Learning analytics policy  
Proper technical infrastructure  
Collaborations and dependencies



### Bottom-up

Projects are initiated by students  
and staff within the faculties.



# How do LA projects initiate?

Top-down-bottom-up approach

## Top-down

Learning analytics policy  
Proper technical infrastructure  
Collaborations and dependencies

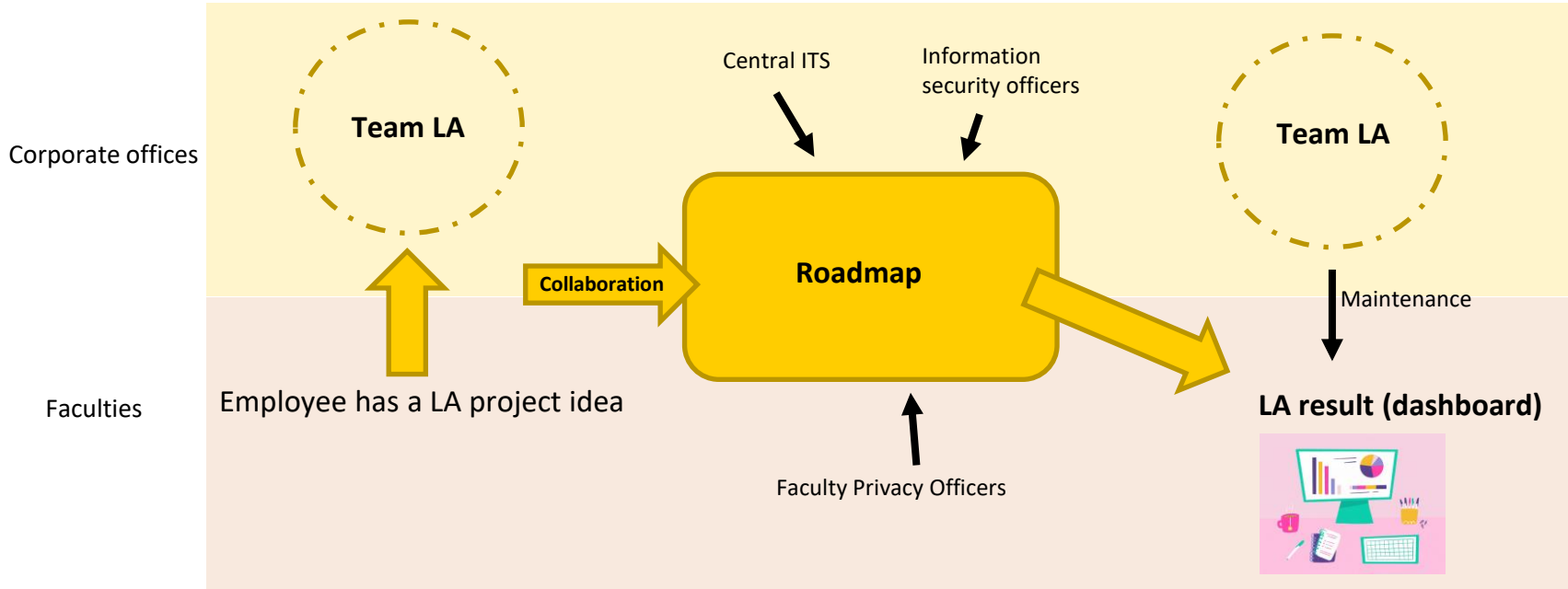
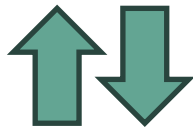


## Bottom-up

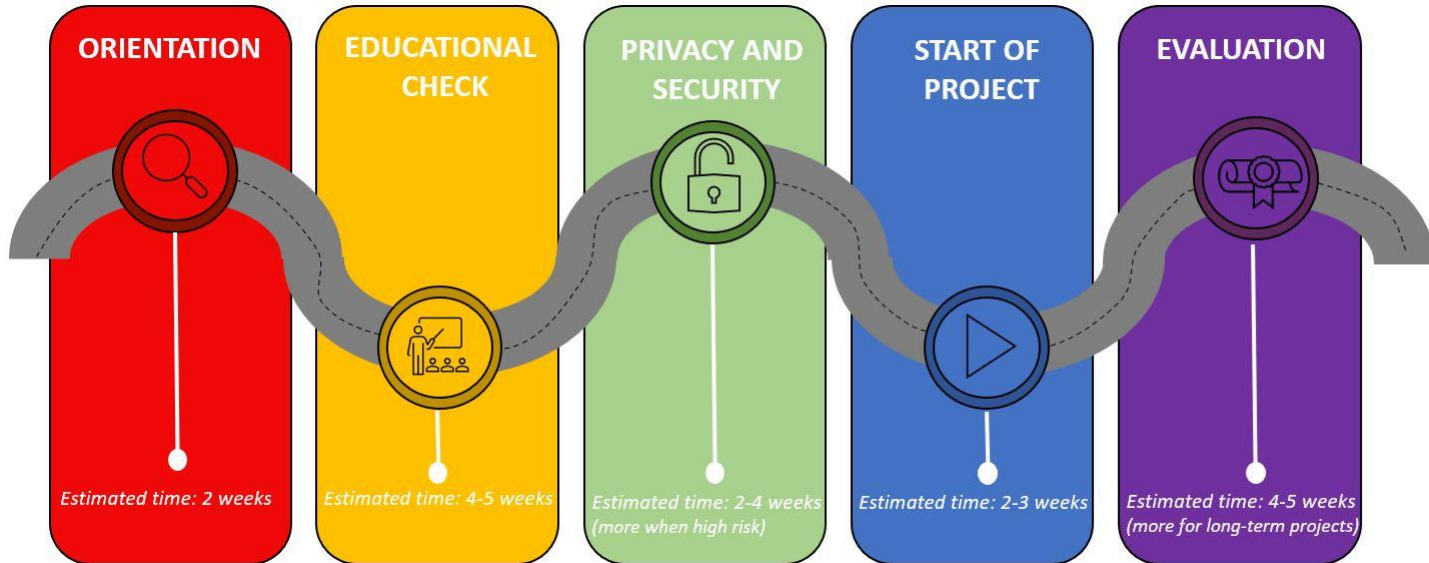
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# Top-down-bottom-up approach

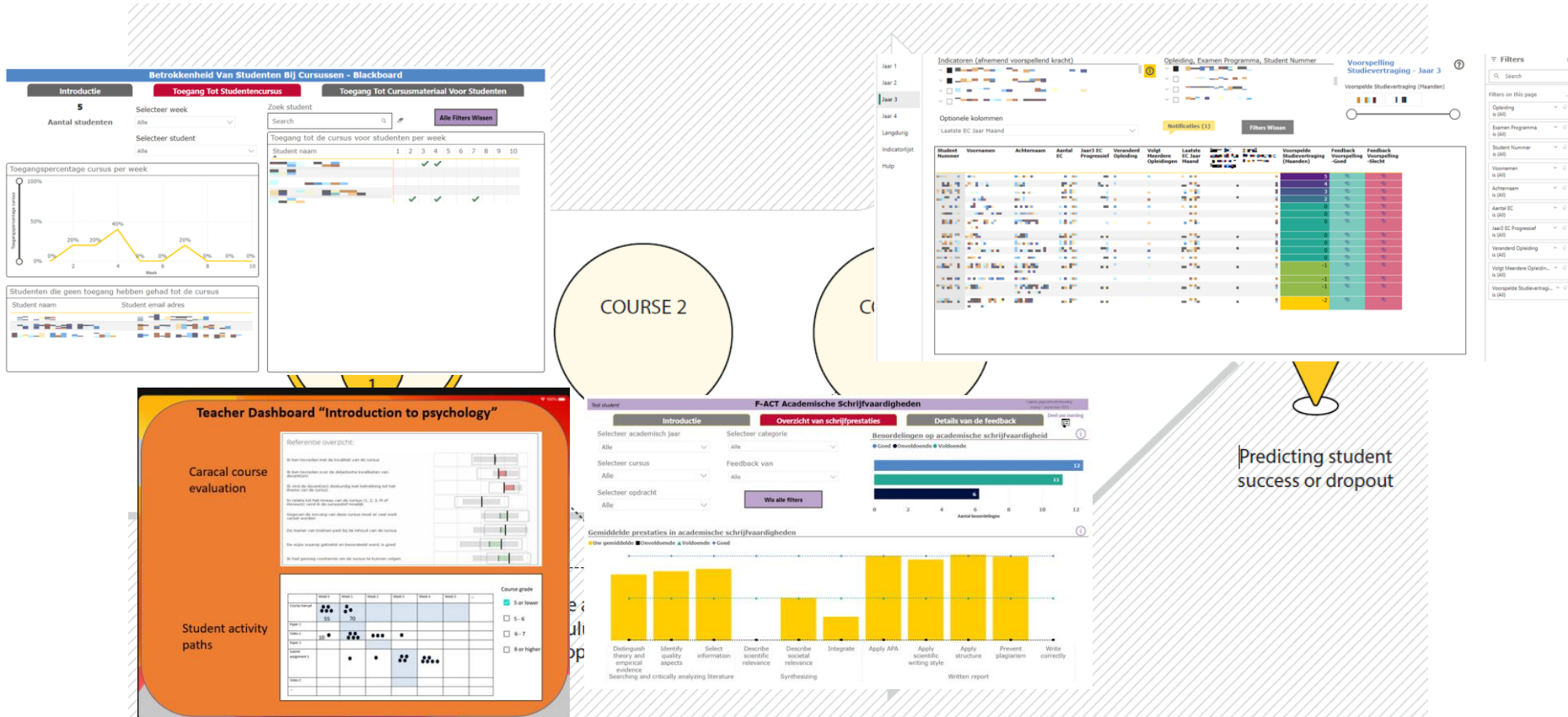


# The roadmap



# Learning analytics policy

## Goals of learning analytics



# # Workshop Challenge

Describe a case from your organisation for Learning Analytics with the given dimensions of stakeholders, practices, adoption and strategy !

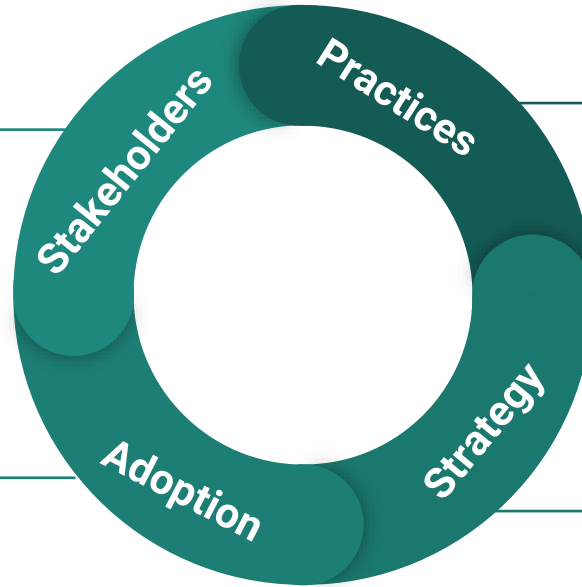


Who are your SH?  
What are important values for them?  
What do they gain?  
What are their problems at the moment?

Frameworks & LA buy in.

What are barriers of adoption?  
What are drivers of adoption?

Effects & Scalability



Do you have an overview of current practices?

Do you know the literature?

5 Themes:

- Culture
- Literacy
- Theory
- Ethical & Legal
- Technical

What is your policy?

Is there space for experimentation?

How is the support system in your institution?

## Stakeholders

Who are your SH?  
What are important values for them?  
What do they gain?  
What are their problems at the moment?

Frameworks,  
LA buy in

## Practices

Do you have an overview of current practices?  
Do you know the literature?  
5 Themes

Culture  
Literacy  
Theory  
Ethical & Legal  
Technical

## Adoption

What are barriers of adoption?  
What are drivers of adoption?

Effects  
Scalability

## Strategy

What is your policy?  
Is there space for experimentation?  
How is the support system in your institution?

# Stakeholder references and further readings

Greller, W., & Drachsler, H. (2012). Translating learning into numbers: A generic framework for learning analytics. *Journal of Educational Technology & Society*, 15(3), 42-57.

Drachsler, H., Stoyanov, S., & Specht, M. (2014, March). The impact of learning analytics on the Dutch education system. In *Proceedings of the Fourth International Conference on learning analytics and knowledge* (pp. 158-162).

# Adoption: references and further readings

Clark, J. A., Liu, Y., & Isaias, P. (2020). Critical success factors for implementing learning analytics in higher education: A mixed-method inquiry. *Australasian Journal of Educational Technology*, 36(6), 89-106.

Arnold, K. E., Lonn, S., & Pistilli, M. D. (2014, March). An exercise in institutional reflection: The learning analytics readiness instrument (LARI). In *Proceedings of the fourth international conference on learning analytics and knowledge* (pp. 163-167).

Klein, C., Lester, J., Rangwala, H. et al. (2019). Technological barriers and incentives to learning analytics adoption in higher education: insights from users. *J Comput High Educ* 31, 604–625 .

Márquez, L., Henríquez, V., Chevreux, H., Scheihing, E., & Guerra, J. (2024). Adoption of learning analytics in higher education institutions: A systematic literature review. *British Journal of Educational Technology*, 55(2), 439-459.

# Practices: references and further readings

Hernández-de-Menéndez, M., Morales-Menendez, R., Escobar, C. A., & Ramírez Mendoza, R. A. (2022). Learning analytics: state of the art. *International Journal on Interactive Design and Manufacturing (IJIDeM)*, 16(3), 1209-1230.

Lang, C., Siemens, G., Wise, A., Gašević, D., Merceron, A. (Eds.). 2022. *Handbook of Learning Analytics* (2nd. ed.). SoLAR

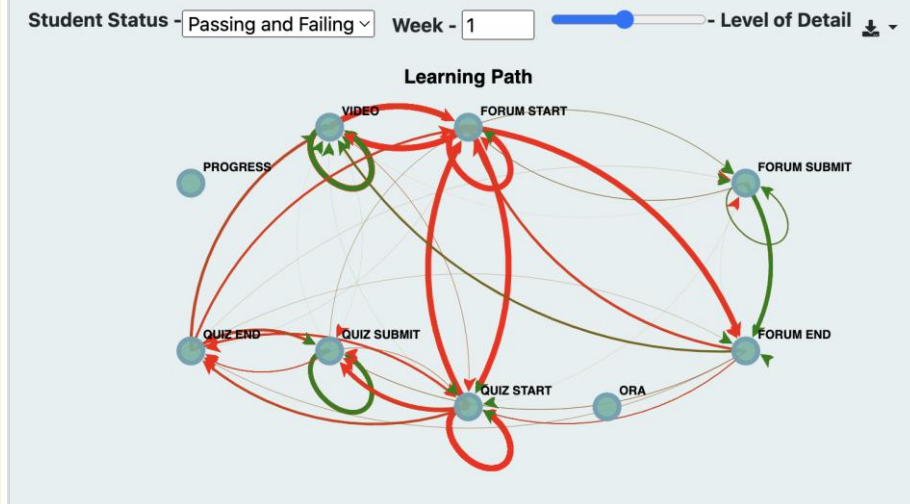
# Strategies Forward: references and further readings

Freitas, E., Fonseca, F., Garcia, V., Falcão, T. P., Marques, E., Gašević, D., & Mello, R. F. (2024). MMALA: Developing and Evaluating a Maturity Model for Adopting Learning Analytics. *Journal of Learning Analytics*, 1-20.

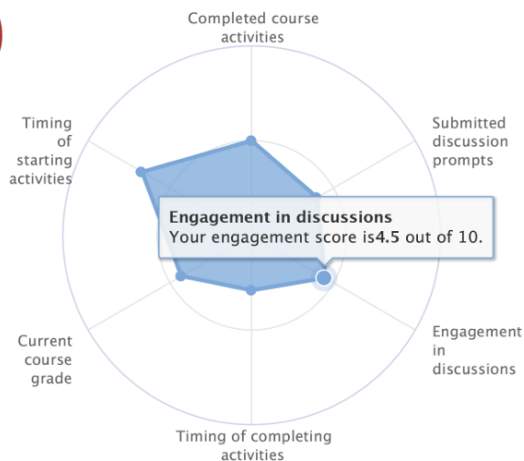
# # Example Cases for Workshop

# TU Delft Cases: LLL

- Lecturer Support: **ELAT** in Edx courses for path analysis in Extension School LifeLong Learning
- Personal Reflection with performance indicators



D



Change goal

Change indicators

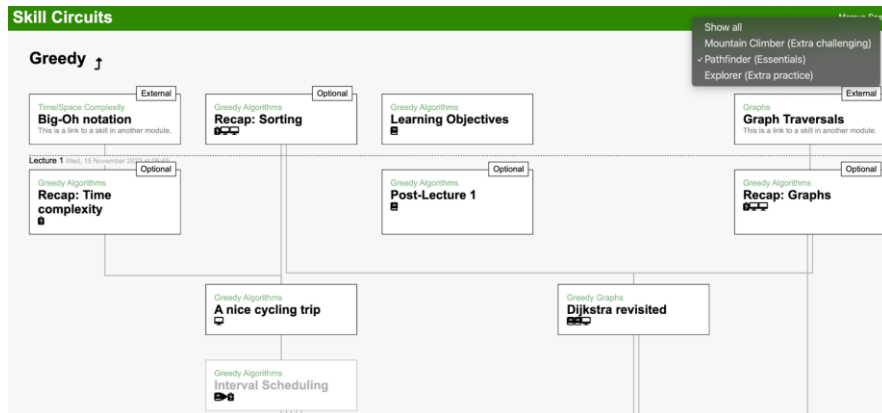
Show explanations

Open FAQ



# TU Delft Case: Course Tools

- **SkillCircuits**, choosing your path and monitoring, used in BSc (500+) student courses



## Badges support on Answers [Article](#)

### Badges v1.0

Today we have added support for badges to the Answers platform 🏆. Badges serve as a reward when you are helping out the community.

At the time of writing, the following badges can be earned:

Badge	Description
Autobiographer	Complete your profile and upload a profile picture
First Question	Ask your first question
First Answer	Contribute your first answer
Self Learner	Answer your own question with an answer that others find useful
Teacher	Help another community member with a good answer to their question
Top Contributor	Every two weeks the top contributor for of each course will be awarded this badge (if the course has sufficient contributions)

Additionally, some badges have bronze, silver and gold variants:

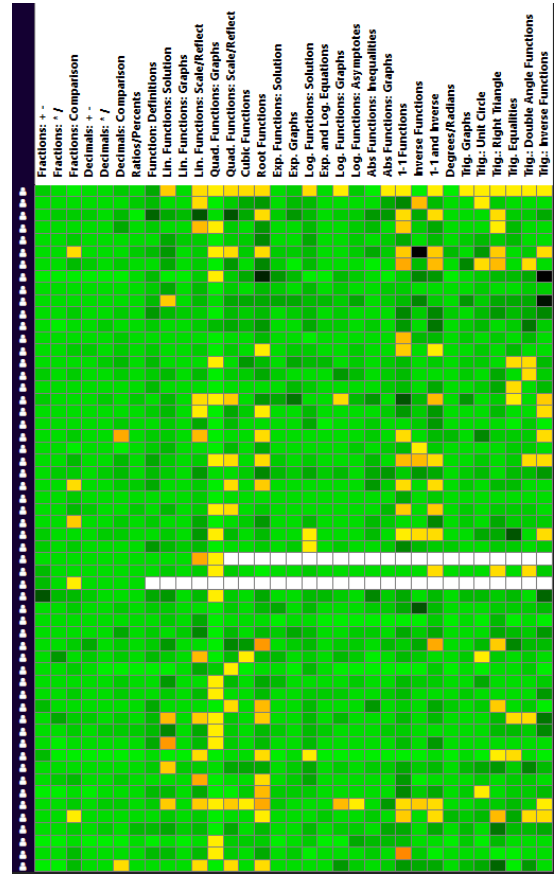
- **Answers:** Learning network for value creation

# UT Cases - Mathematics Bridging Course

- **Student** gets insight into their (expected) knowledge level
- **Teachers** get an overview of the whole class and can adapt lessons to class level
- Can be built for any course, limited by **data availability** (which is guided by university **vision/policy**) and **support resources**

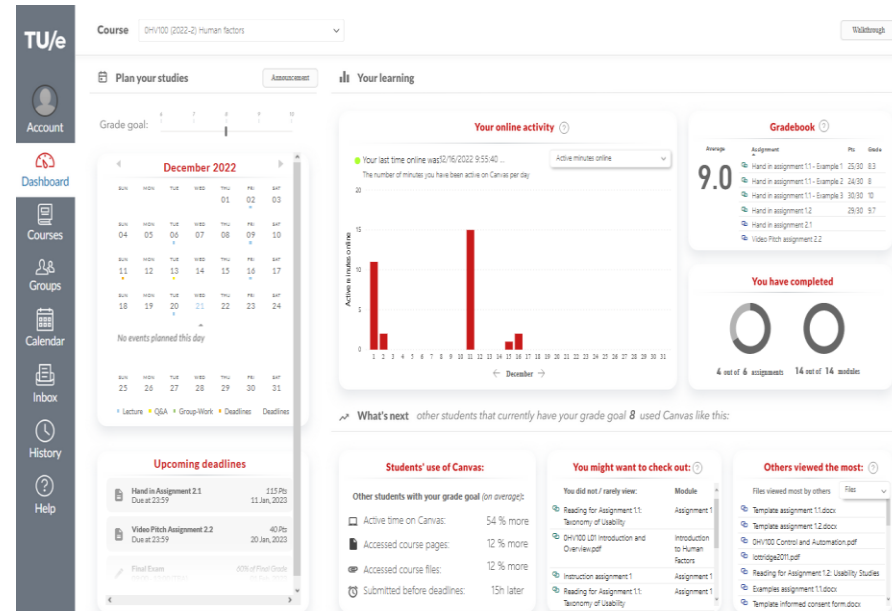
## Learning Objective

✓ Fractions: Addition / Subtraction	★★★★★
✓ Fractions: Multiplication / Division	★★★★★
✓ Fractions: Comparison	★★★★★
✓ Decimals: Addition / Subtraction	★★★★★
✓ Decimals: Multiplication / Division	★★★★★
✓ Decimals: Comparison	★★★★★
✓ Ratios/Rates/Percents/Proportion	★★★★★
✓ Function: Definitions	★★★★★
✓ Linear Functions: Solving	★★★
✓ Linear Functions: Graphs	★★★★★
✓ Linear Functions: Scaling / Reflecting	★★★★★
✓ Quadratic Functions: Drawing / Graphing	★★★
✓ Quadratic Functions: Scaling / Reflecting	★★★★★
✓ Cubic Functions	★★★★★
✓ Root Functions	★★★★★
✓ Exponential Functions: Solution	★★★★★
✓ Exponential Graphs	★★★★★
✓ Logarithmic Functions: Solution	★★★★★
✓ Exponential and Logarithmic Equations	★★★★★
✓ Logarithmic Graphs	★★★★★
✓ Logarithmic Functions: Asymptotes	★★★★★
✓ Absolute Value Functions: Inequalities	★★★★★
✓ Absolute Value Functions: Graphs	★★★★★
✓ One-to-One Functions	★★★★★
✓ Inverse Functions	★★★★★
✓ One-to-One and Inverse Functions	★★★★★
✓ Degrees and Radians	★★★★★
✓ Trigonometric Graphs	★★★★★
✓ Trigonometry: Unit Circle	★★★★★
✓ Trigonometry: Right Triangle	★★★★★
✓ Trigonometric Equalities	★★★★★
✓ Trigonometry: Double Angle Functions	★★★★★
✓ Trigonometry: Inverse Functions	★★★★★



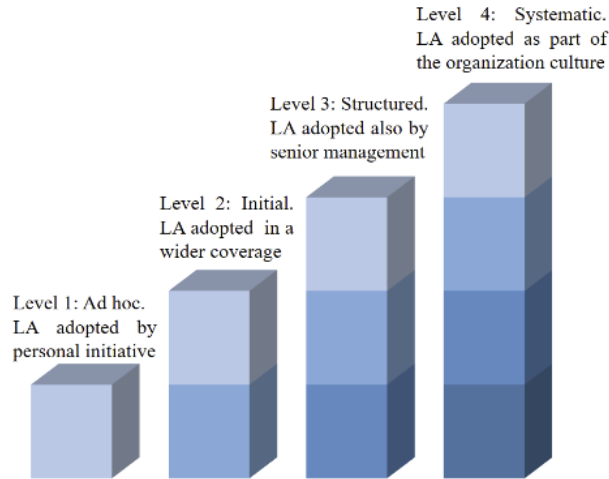
# TU Eindhoven Cases

- Unobtrusive measurement of **self-regulated learning**, portable across blended courses
- **Teach the teacher** to facilitate teachers' application of LA interventions for **personalized learning**
- First **student-facing dashboards**



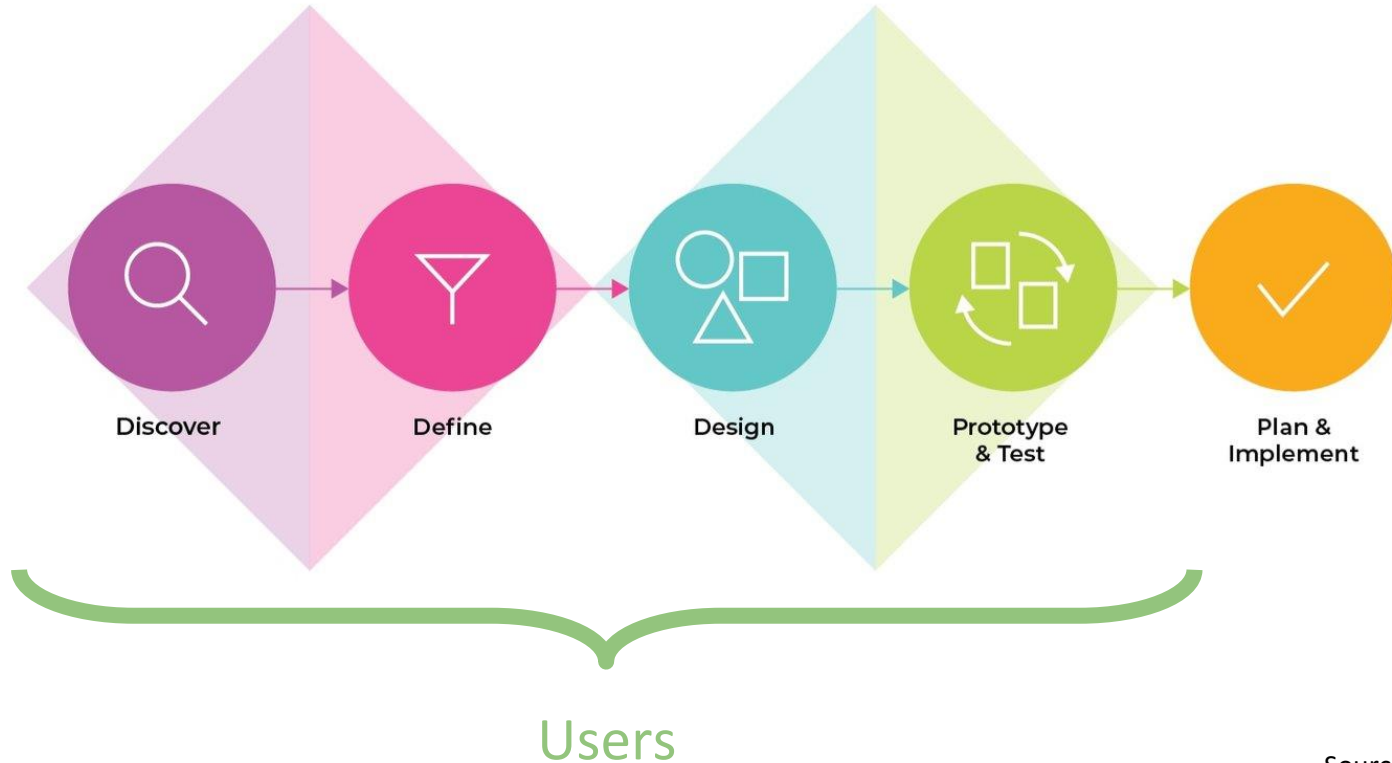
Support/Extra

# LA Maturity Model



Category	Process areas
Data management	Data acquisition (DA) Data quality (DQ) Data ownership (DO) Infrastructure (INF)
Administration and training (subsequently readjusted to Governance and training)	Funding (FUN) Leadership (LEA) Stakeholders' identification and involvement (SII) Communication (COM) Stakeholders' training (STR)
Pedagogical support	Pedagogical planning of solutions (PPS) Support in interpreting results (SIR) <b>Result-based intervention (RBI)</b>
Data analysis	Development of own solutions (DOS) Acquisition of ready-made solutions (ACQ) Evaluating the effectiveness of solutions (EVA)
Legislation, privacy, and ethics	<b>Legislation, privacy, and ethics (LPE)</b>

# Human-Centred Learning Analytics



Source:

<http://outwitly.com/>

# Group work activity

Problem

Data

Visuals

Implement





# Define and describe a problem

- Identify at-risk students
- Increase student retention
- Support students' in choosing effective learning strategies
- Improve student engagement and satisfaction
- Understand instructor effectiveness
- Determine course effectiveness and identify areas for curriculum improvement

# Define and describe a problem

Who will use the analytics?

What will they use the analytics for?

When will they use the analytics?

How will they use the analytics?

What meaning will the analytics have for users?

How will you know that you *successfully* solved the problem?

# Identify information & data

What information do you need to know in order to work on solving the problem?

What data can give you this information?  
Where can you find this data?

# Identify information & data

VLE/MOOC logs:

Assignments

Calendar

Content

Social

Video

Assessment

Sessions

External content

Surveys

Wearables, sensors

Mobile applications

Social Networks

# Visualize data

How can you visualise this information in an intuitive way fitting your users?

Do you need to customise the visualisation for different sets of users?

Think about the problem, what is the context? and the framing?

# Prototype in your system

What features are *currently* available in your learning environment?

How can you use those features to solve your problem?

What is missing between the current state and your visualization?

# Plan an evaluation

How do you plan to evaluate the design of your analytics?

How can you measure the success?  
Where will you get this data from?

# Combining results

