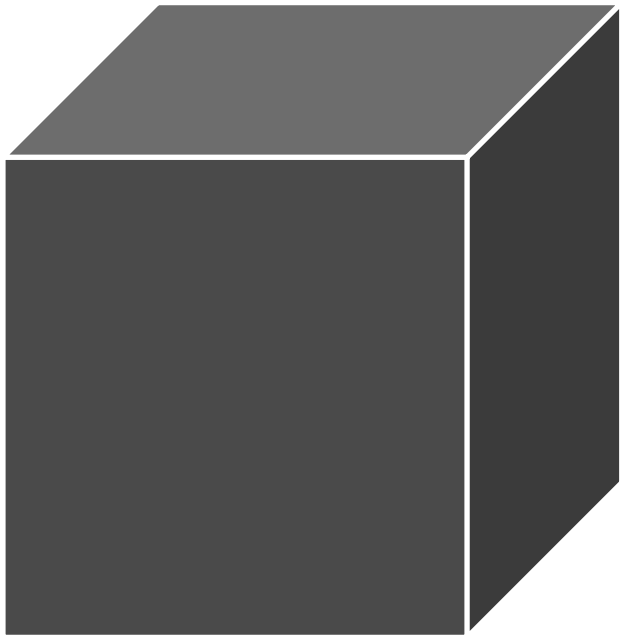
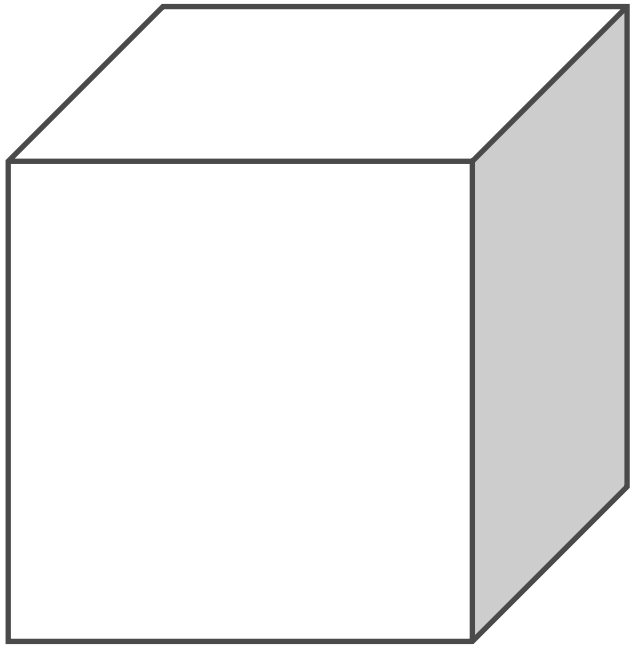
Trusted Learning Analytics Research Program

DIPF
Educational Research and Educational Information





EduTec
Educational Technologies @ DIPF

Prof. Dr. Hendrik Drachsler
SoLAR Webinar
29.06.2021

Structure

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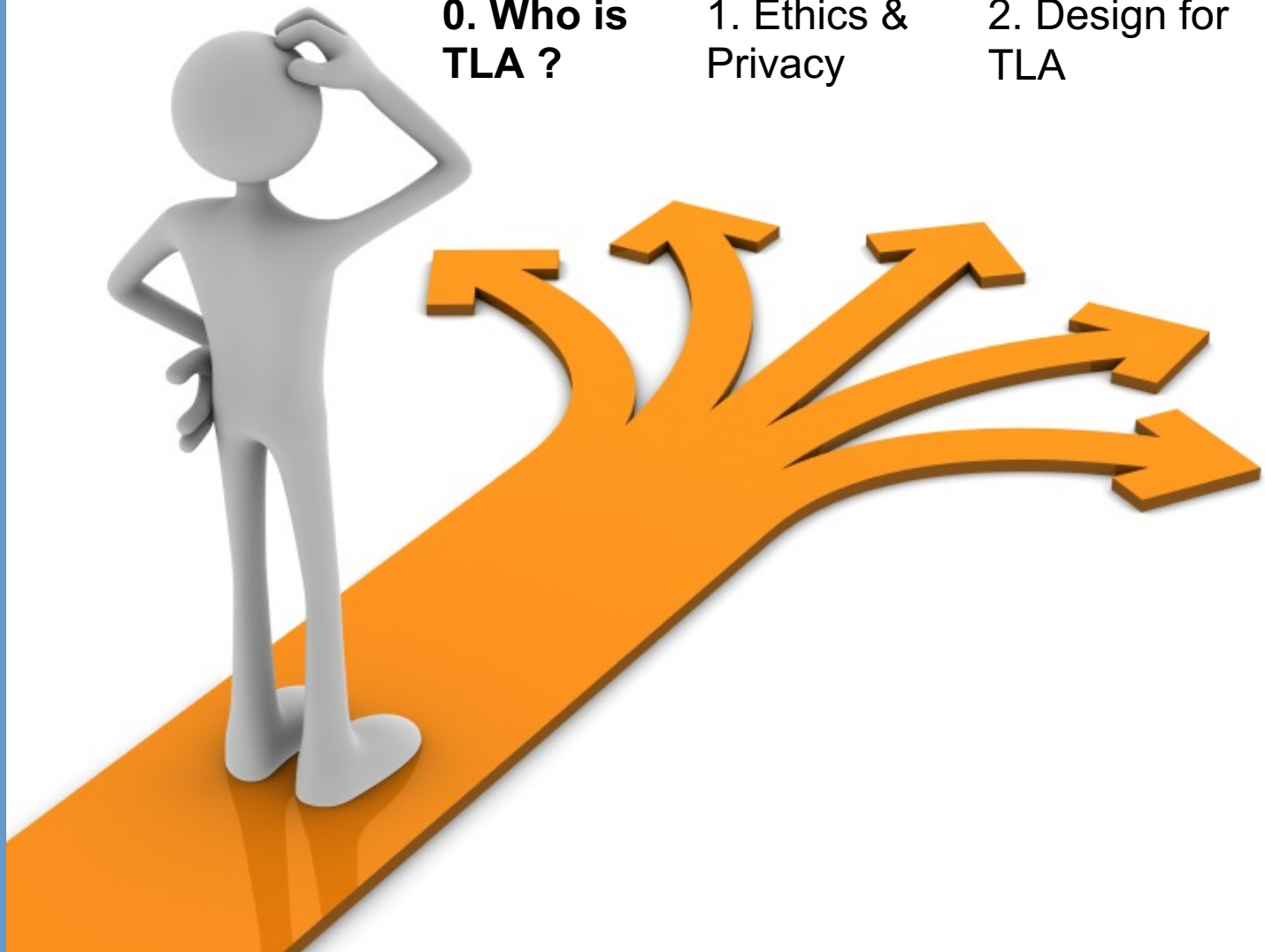
Educational Research
and Educational Information

0. Who is TLA ?

1. Ethics & Privacy

2. Design for TLA



3.Psychomotor competence support

4. Cognitive competence support

5. Computational Psychometrics

WhoAmI

Hendrik Drachsler
Professor of Educational Technologies
Head of edutec.science

Research topics
Learning Analytics
Recommender Systems
Multimodal Data for Learning
Computational Psychometrics

Application domains
Schools
HEI

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EduTec
Educational Technologies @ DIPF

JOHANN WOLFGANG GOETHE
UNIVERSITÄT
FRANKFURT AM MAIN

studiumdigitale
Zentrale eLearning-Einrichtung
Goethe-Universität Frankfurt am Main

Open Universiteit
welten-institute.org

EduTec School & Research

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EduTec

EDUTEC NEWS TEAM RESEARCH TEACHING PUBLICATIONS CONTACT

All you need to become an EduTec scientist: At the University of Frankfurt, you can follow an Educational Technology specialization within the department of computer science. We regularly provide the following lectures and classes on Educational Technologies:

- Lecture: M-EduTec: Learning Science & Analytics by Prof. Dr. Drachsler (summer)
- Lecture: M-PSeL: Platforms and Systems for eLearning by Dr. Schiffner & Prof. Dr. Drachsler (winter)
- Lecture: M-EduTeSt: Educational Testing and Statistics by Prof. Dr. Tillmann (summer)
- Practicum: M-EduT-PR: EduTec Practicum by Prof. Dr. Drachsler (winter)
- Seminar: M-EduT-S: EduTec Basics by Prof. Dr. Drachsler (winter)
- Seminar: M-Edu-RM: EduTec Research Methods by Dr. Jan Schneider & & Prof. Dr. Drachsler (summer & winter)
- Seminar: RAI4HS: Responsible AI for Human Support by Dr. Di Mitri & Prof. Dr. Drachsler (winter & summer)

TEACHING

All you need to become an EduTec scientist: At the University of Frankfurt, you can follow an Educat

https://edutec.science

TLA Research Fellows

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Dr. Jan Schneider
Postdoctoral researcher

Sebastian Wollny
Doctoral researcher

George Ciordas-Hertel
Doctoral researcher

Dr. Jane Yau
Postdoctoral researcher

Atezaz Ahmad
Doctoral researcher

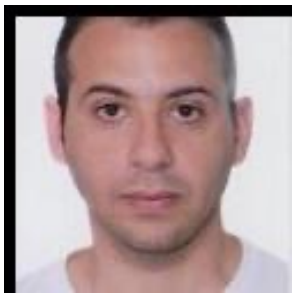
Dr. Daniele Di Mitri
Postdoctoral researcher

Onur Karademir
Doctoral researcher

Dr. Joshua Weidlich
Postdoctoral researcher

Sebastian Gombert
Doctoral researcher

Dr. Ioana Jivet



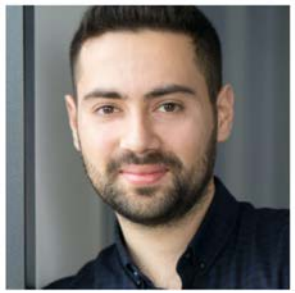
Fernando Cardenas-Hernandez
Doctoral researcher

Dr. Konstantinos Georgiadis

Dana Kube
Research management

Gianluca Romano
Doctoral researcher

Nina Seidenberg
Doctoral researcher



Daniel Biedermann
Doctoral researcher

Marcel Schmitz
Doctoral researcher

Sambit Praharaj
Doctoral researcher

TLA Research Fellows

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Prof. Dr. Halszka Jarodzka

Dr. Leen Catryssen

Prof. Dr. Holger Horz

Prof. Dr. Andreas Frey

Prof. Dr. Frank Goldhammer

Prof. Dr. Alexander Tillmann

Dr. Sarah Voß-Nakkour

Dr. David Weiß

Dr. Daniel Schiffner

Tornike Giorgashvili

Prof. Dr. Maren Scheffel

Scouting-Maturing-Service (SMS-Process)

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Identify, evaluate and test new with regard to possible application scenarios, conditions, opportunities and risks

User-centred maturing process on the basis of practice-oriented iteration cycles

Creation of a low-threshold, streamlined and integrated service offer

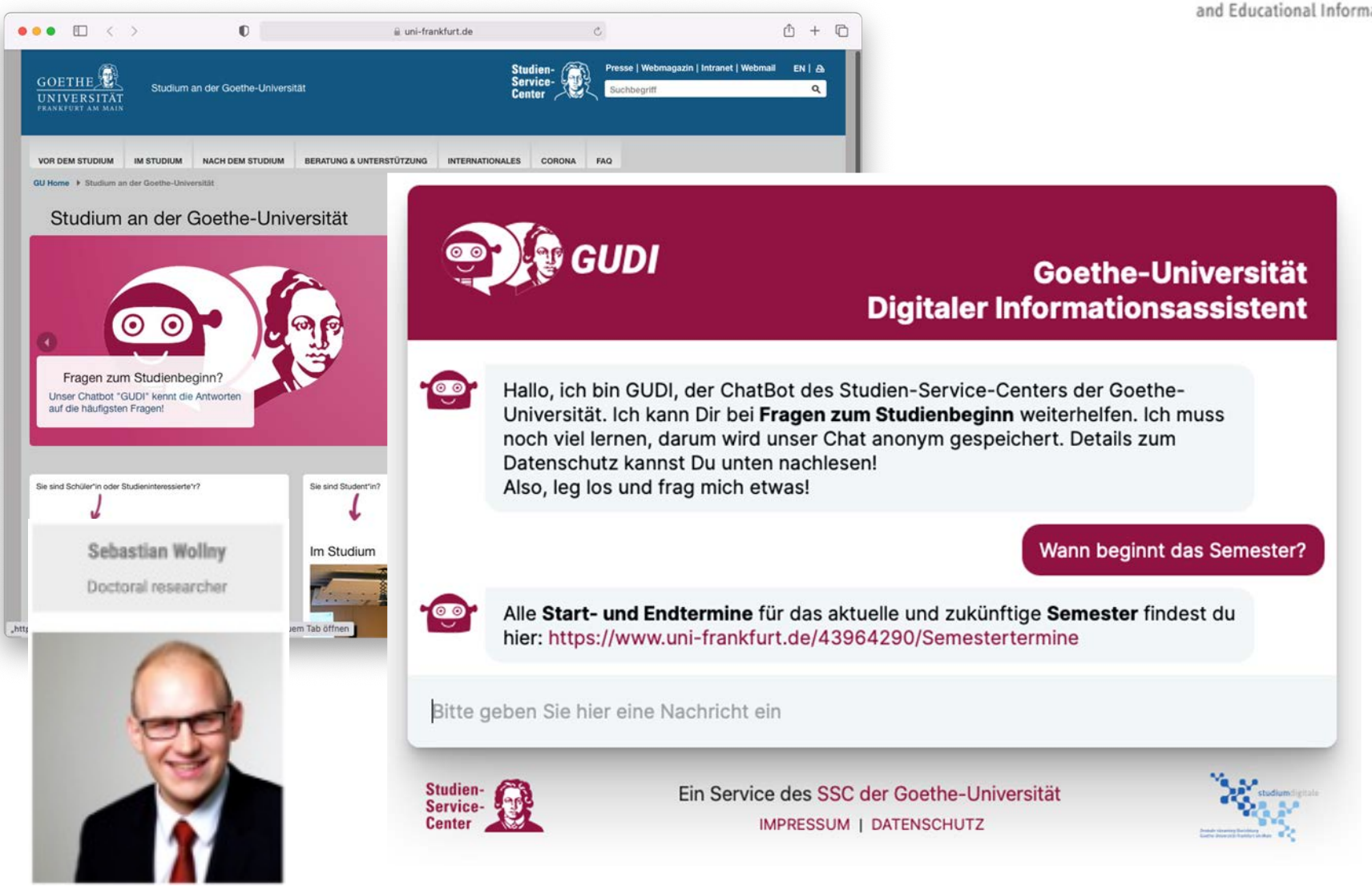
Dr. Sarah Voß-Nakkour

Dr. David Weiß

Prof. Dr. Alexander Tillmann

studiumdigitale
Zentrale eLearning-Einrichtung
Goethe-Universität Frankfurt am Main

SMS Outcome: Chatbot



Wollny, S., Schneider, J., Di Mitri, D., Weidlich, J., Rittberger, M., & Drachsler, H. (2021). ***Are we there yet? - A Systematic Literature Review on Chatbots in Education***. Frontiers in Artificial Intelligence, 4. https://doi.org/10.3389/frai.2021.654924

Technology-Based Assessment (TBA)

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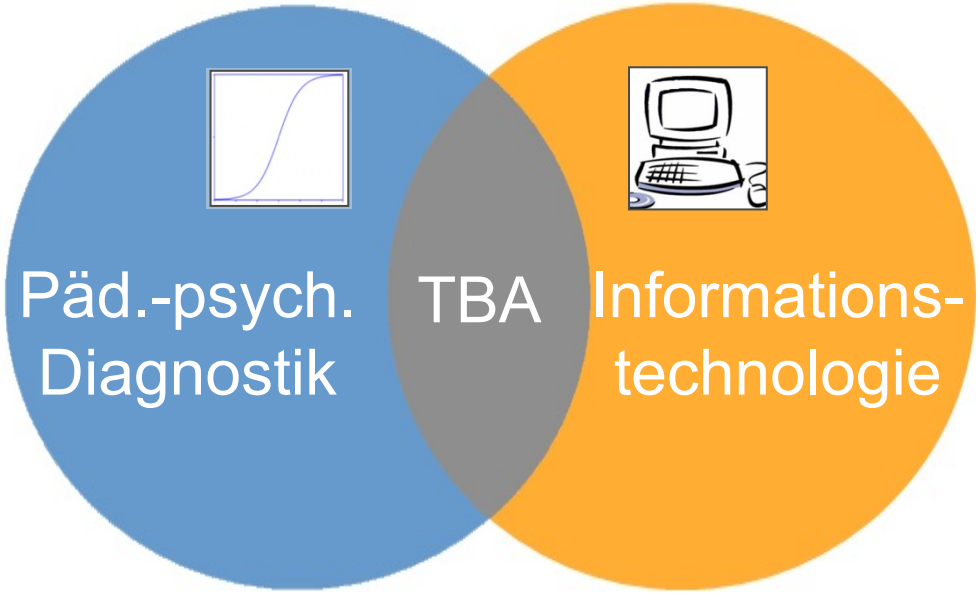
Prof. Dr. Frank Goldhammer

Dr. Daniel Schiffner



Frankfurter Allgemeine

Beruf & Chance

VERSTECKTE QUALIFIKATIONEN

Wie Flüchtlinge ihre Fähigkeiten beweisen sollen

VON NADINE BÖS - AKTUALISIERT AM 14.03.2018 - 19:59

Kein Zeugnis, kein Zertifikat und trotzdem viel Erfahrung im Auto-Schrauben? Solche versteckten Qualifikationen legt ein neuer Test offen.

Technology-Based Assessment (TBA)

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MYSKILLS
BERUFLICHE KOMPETENZEN ERKENNEN

Bundesagentur für Arbeit
Agentur für Arbeit
bringt weiter.

Beruf KFZ-Mechatroniker/-in
Ergebnisübersicht MYSKILLS

Name: @#Kundenname
Geburtsdatum: @#Kundengebda **Test-ID:** 12345678901234567890123 4
Kd.-Nr.: @#Kundennummer **Testort:** ääüüßööÄÜÖ
DSt.-Nr.: 5555 **Testdatum:** 12.02.2018 **Testsprache:** Deutsch

Der Test erfasst berufliches Handlungswissen in fünf zentralen Handlungsfeldern des Berufs KFZ-Mechatroniker/-in. Die Testung erfolgt durch Fragen zu berufstypischen Handlungssituationen am Computer. Die Handlungsfelder und -situationen sind aus den maßgeblichen Ausbildungsordnungen und Rahmenlehrplänen abgeleitet. Nachfolgend die Ergebnisse:

Berufliches Handlungswissen
●●●● Hohes
●●●○ Mittleres bis hohes
●●○○ Mittleres
●○○○ Nicht nachweisbares bis mittleres
○○○○ Nicht nachweisbares

MUSTER

Standardisierte Service- und Wartungsarbeiten durchführen
●●●● Standardisierte Service- und Wartungsaufgaben an Kraftfahrzeugen durchführen. Motoröl und Räder wechseln. Mechanische und elektrische Bauteile auf Verschleiß, Beschädigung und Funktion überprüfen.

Verschleißbehaftete mechanische und elektrische Systeme instand setzen
●●●○ Bremse, Abgasanlagen und Kupplung instand setzen. Die Beleuchtungsanlage, die Scheibenwischanlage und das Startsystem prüfen, messen und reparieren.

Mechanische und elektrische Systeme montieren und demontieren
●●○○ Räder montieren und wuchten. Den Spurstangenkopf, die Zentralverriegelung, den Luftmassenmesser und den Injektor ersetzen. Die Anhängerkupplung nachrüsten.

Mechatronische Systeme reparieren
●○○○ Airbags, Klimaanlagen, Luftfahrwerk und Automatikgetriebe prüfen und reparieren. Gefahren durch explosive Stoffe und elektrische Spannungen erkennen. Messungen, beispielsweise mit einem Oszilloskop, durchführen und die Ergebnisse beurteilen.

Fahrzeugsysteme mit Expertensystemen diagnostizieren
○○○○ Mit einer Prüfsoftware eine geführte Fehlersuche durchführen. Fehler mit Messgeräten sowie Schalt- und Funktionsplänen bearbeiten und diagnostizieren, welche Bauteile oder Systeme nicht mehr funktionieren. Die Datenkommunikation zwischen Steuergeräten erfassen und bewerten. Gesetzlich vorgeschriebene Prüfungen (HU/AU) durchführen.

Hier finden Sie Beispiele für Testergebnisse der folgenden Berufe:

Kfz-Mechatroniker - PKW-Technik	**Download**	**Fachkraft für Metalltechnik - Fachrichtung Konstruktionstechnik**	**Download**
Verkäufer	**Download**	**Hochbaufacharbeiter - Schwerpunkt Maurerarbeiten**	**Download**
Landwirt	**Download**	**Tischler**	**Download**
Koch	**Download**	**Bauten- und Objektbeschichter (Maler)**	**Download**

BertelsmannStiftung

Structure

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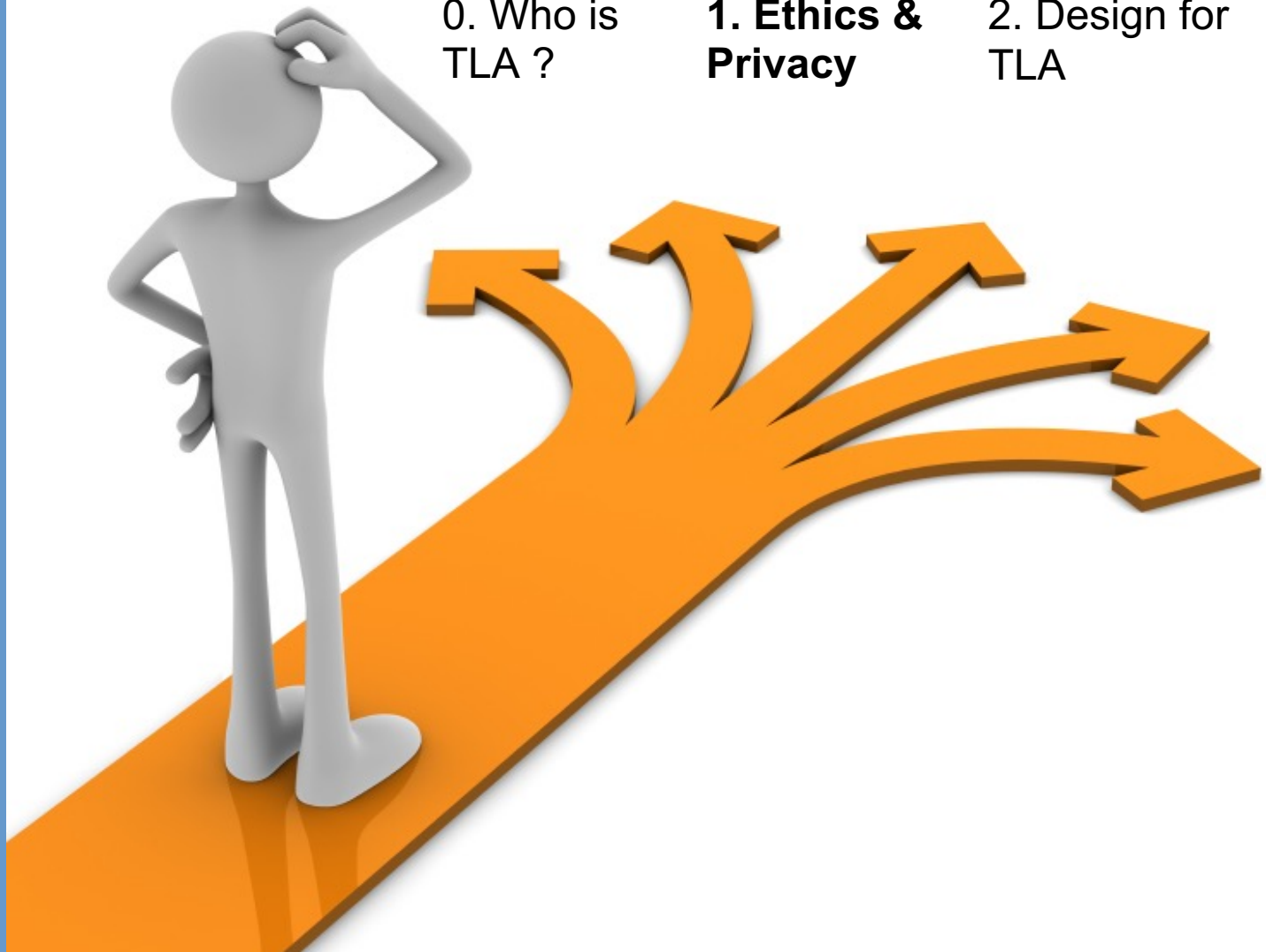

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Trusted Learning Analytics

D

DETERMINATION – Why you want to apply Learning Analytics?
- What is the added value (Organisational and data subjects)?
- What are the rights of the data subjects (e.g., EU Directive 95/46/EC)

E

EXPLAIN – Be open about your intentions and objectives
- What data will be collected for which purpose?
- How long will this data be stored?
- Who has access to the data?

L

LEGITIMATE – Why you are allowed to have the data?
- Which data sources you have already (aren't they enough)?
- Why are you allowed to collect additional data?

I

INVOLVE – Involve all stakeholders and the data subjects
- Be open about privacy concerns (of data subjects)
- Provide access to the personal data collected (about the data subjects)
- Training and qualification of staff

C

CONSENT – Make a contract with the data subjects
- Ask for a consent from the data subjects before the data collection
- Define clear and understandable consent questions (Yes / No options)
- Offer the possibility to opt-out of the data collection without consequences

A

ANONYMISE – Make the individual not retrievable
- Anonymise the data as far as possible
- Aggregate data to generate abstract metadata models (Those do not fall under EU Directive 95/46/EC)

T

TECHNICAL – Procedures to guarantee privacy
- Monitor regularly who has access to the data
- If the analytics change, update the privacy regulations (new consent needed)
- Make sure the data storage fulfills international security standards

E

EXTERNAL – If you work with external providers
- Make sure they also fulfil the national and organisational rules
- Sign a contract that clearly states responsibilities for data security
- Data should only be used for the intended services and no other purposes

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ALEJANDRA MARTÍNEZ-MONÉS


BARBARA WASSON


DAI GRIFFITHS


IOANA JIVET


MAREN SCHAFFEL


REBECCA FERGUSSON


TOBIAS LEY

SOLAR
SOCIETY for LEARNING ANALYTICS RESEARCH

LACE

Best Paper Award LAK16

Drachsler, H. & Greller, W. (2016). ***Privacy and Analytics – it's a DELICATE issue. A Checklist to establish trusted Learning Analytics.*** *6th Learning Analytics and Knowledge Conference 2016, April 25-29, 2016, Edinburgh, UK.*

Trusted Learning Analytics

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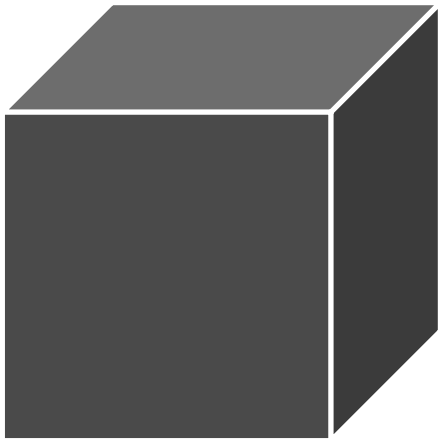
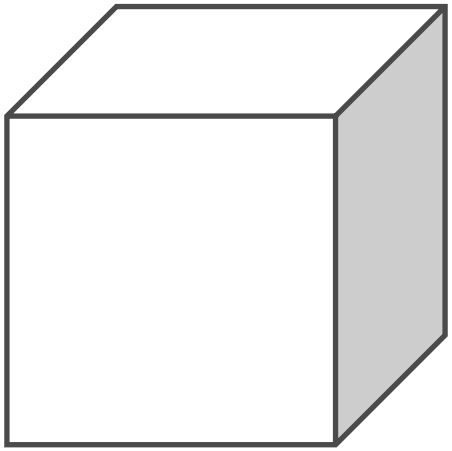
Black box vs. White box



Unknown algorithms
Unknown data collection
Automated decisions
No access to raw data
No control who uses it



Open algorithms
Transparent indicators
No automated decisions
Full access to data
Knowing who accesses your data

Drachsler, H. & Greller, W. (2016). ***Privacy and Analytics – it's a DELICATE issue. A Checklist to establish trusted Learning Analytics.*** *6th Learning Analytics and Knowledge Conference 2016, April 25-29, 2016, Edinburgh, UK.*

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Data protection in EU (GDPR 2018)

1. Right to be informed
2. Right of access
3. Right to rectification
4. Right to erasure
5. Right to restrict processing
6. Right to data portability
7. Right to object automated decision making

Trusted Learning Analytics

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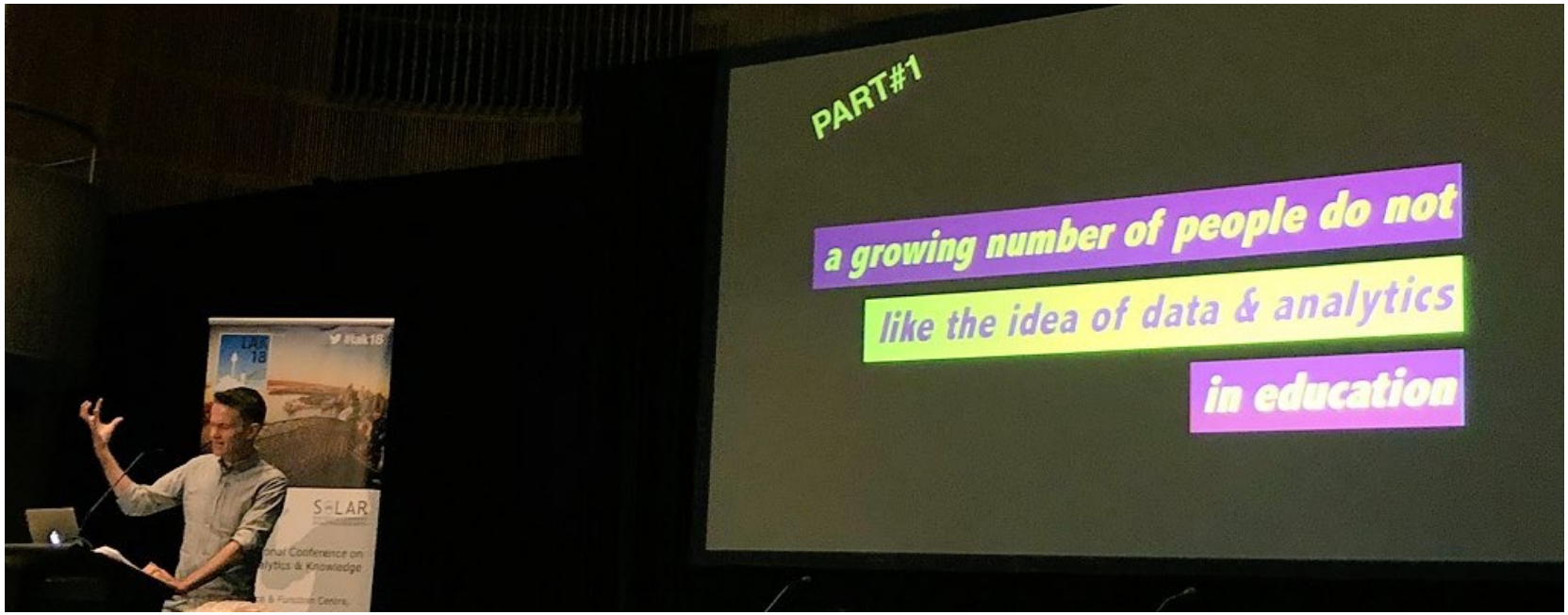
Keynote Neil Selwyn @ LAK 2018, Sydney, Australia



Learning Analytics has a trust problem …

Trusted Learning Analytics

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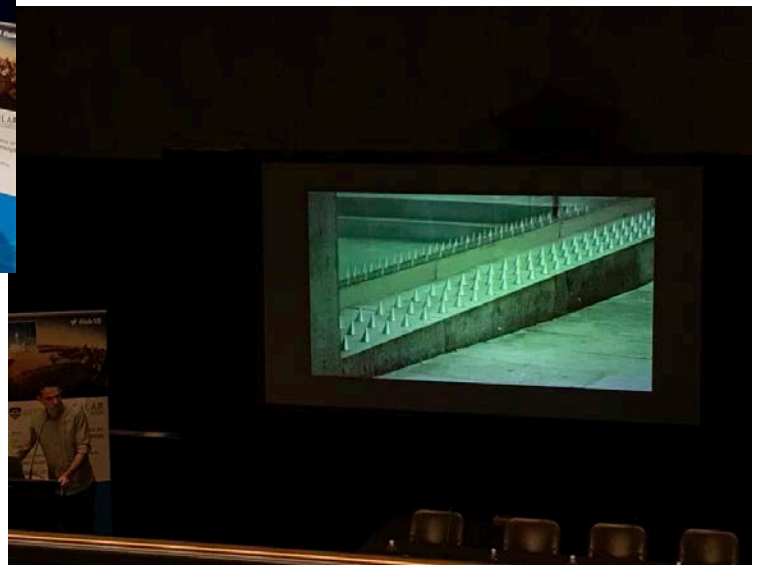
Keynote Neil Selwyn @ LAK 2018, Sydney, Australia



… because Learning Analytics has the potential of becoming a high stakes assessment.

TLA Infrastructure

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and Educational Information

George Ciordas-Hertel
Doctoral researcher

Keywords: Privacy, GDPR, Trust, Interoperability, Infrastructure, Big Data, Multimodality

TLA Infrastructure

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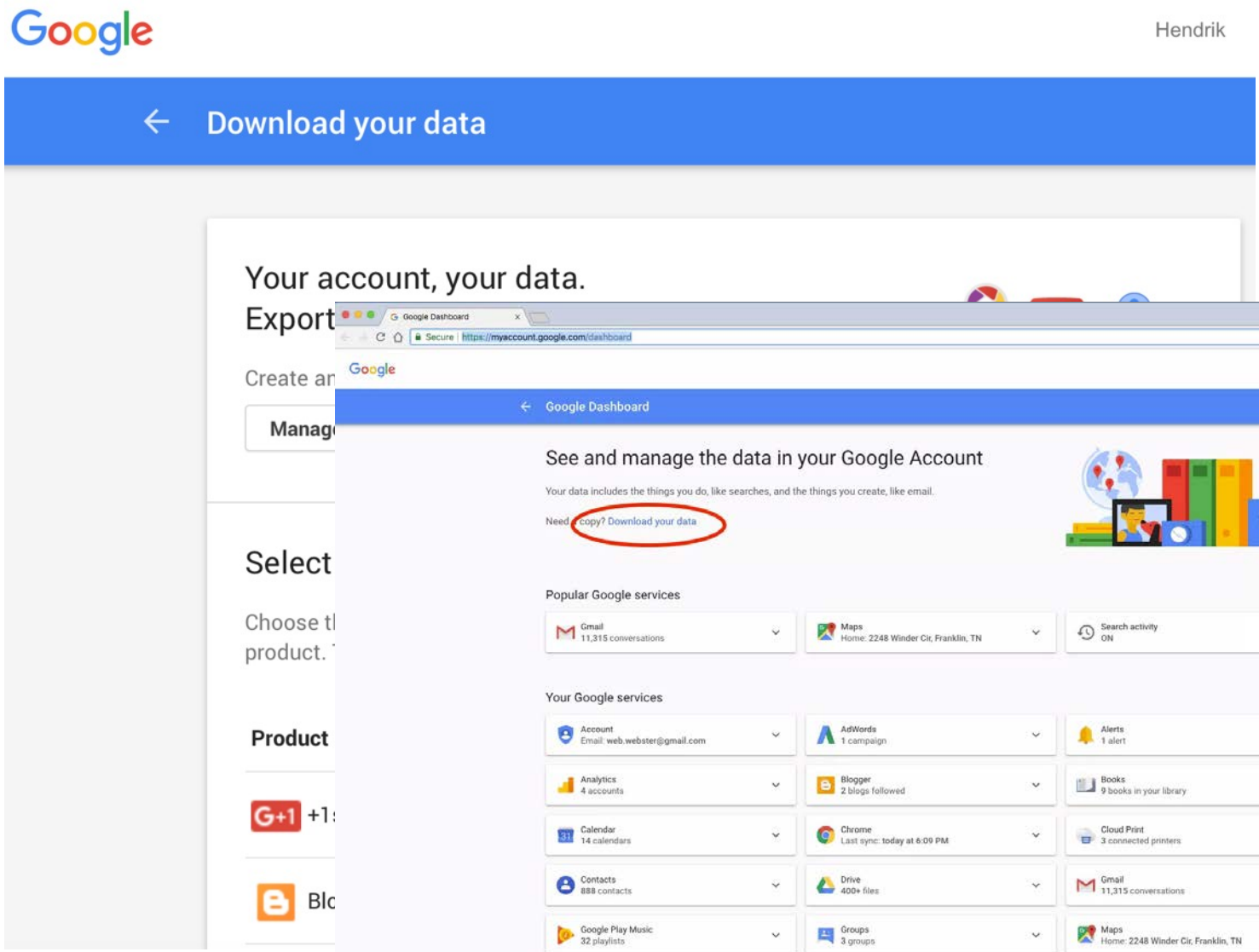

TLA Infrastructure

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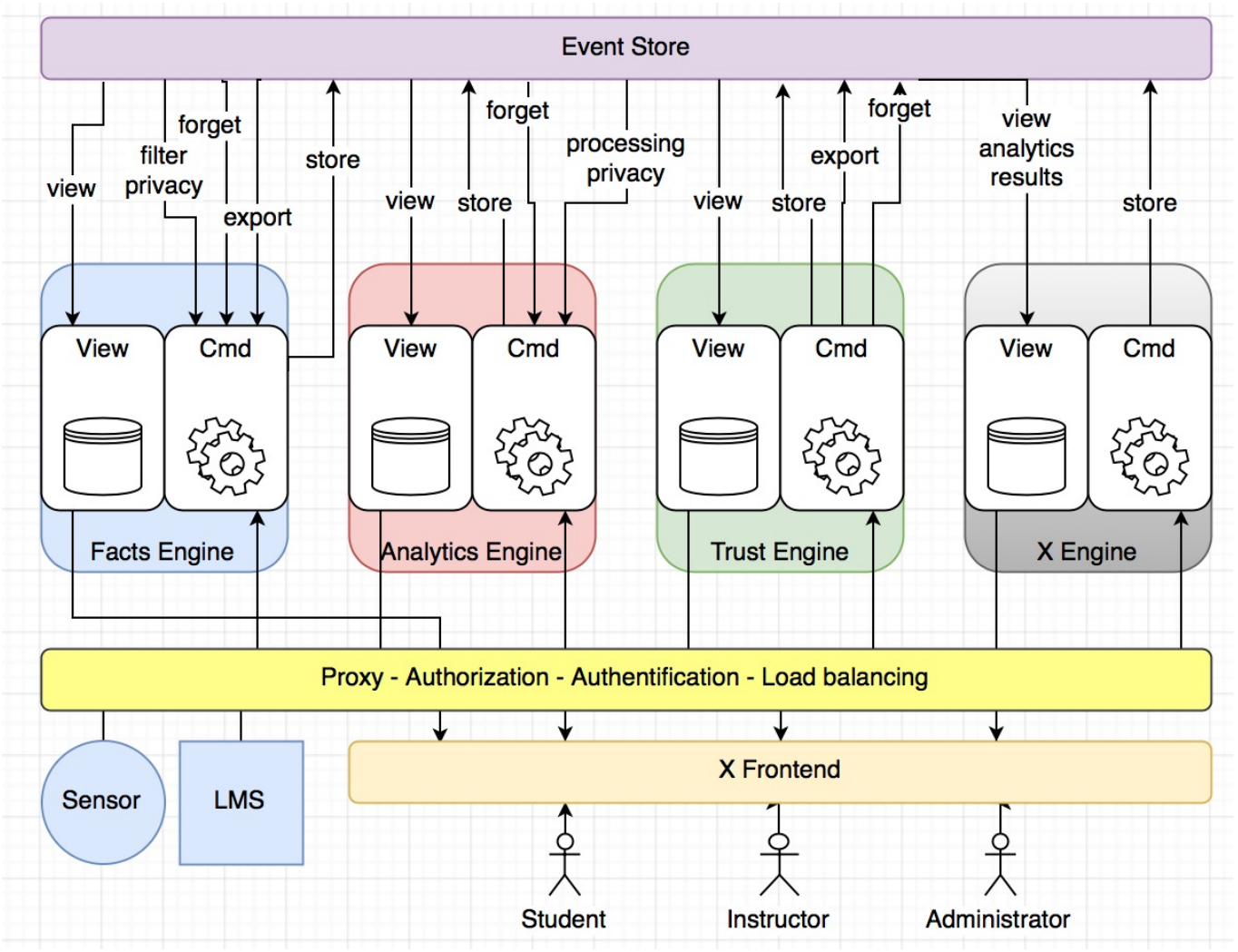

Best Paper Award

Ciordas-Hertel, G. P., Schneider, J., and Drachsler, H. (2020). ***Which Strategies are Used in the Design of Technical LA Infrastructure?: A Qualitative Interview Study***, IEEE Global Engineering Education Conference (EDUCON), Virtual Event, Portugal, 2020, pp. 96-105, doi: 10.1109/EDUCON45650.2020.9125363. * **Best Paper award**

TLA Infrastructure

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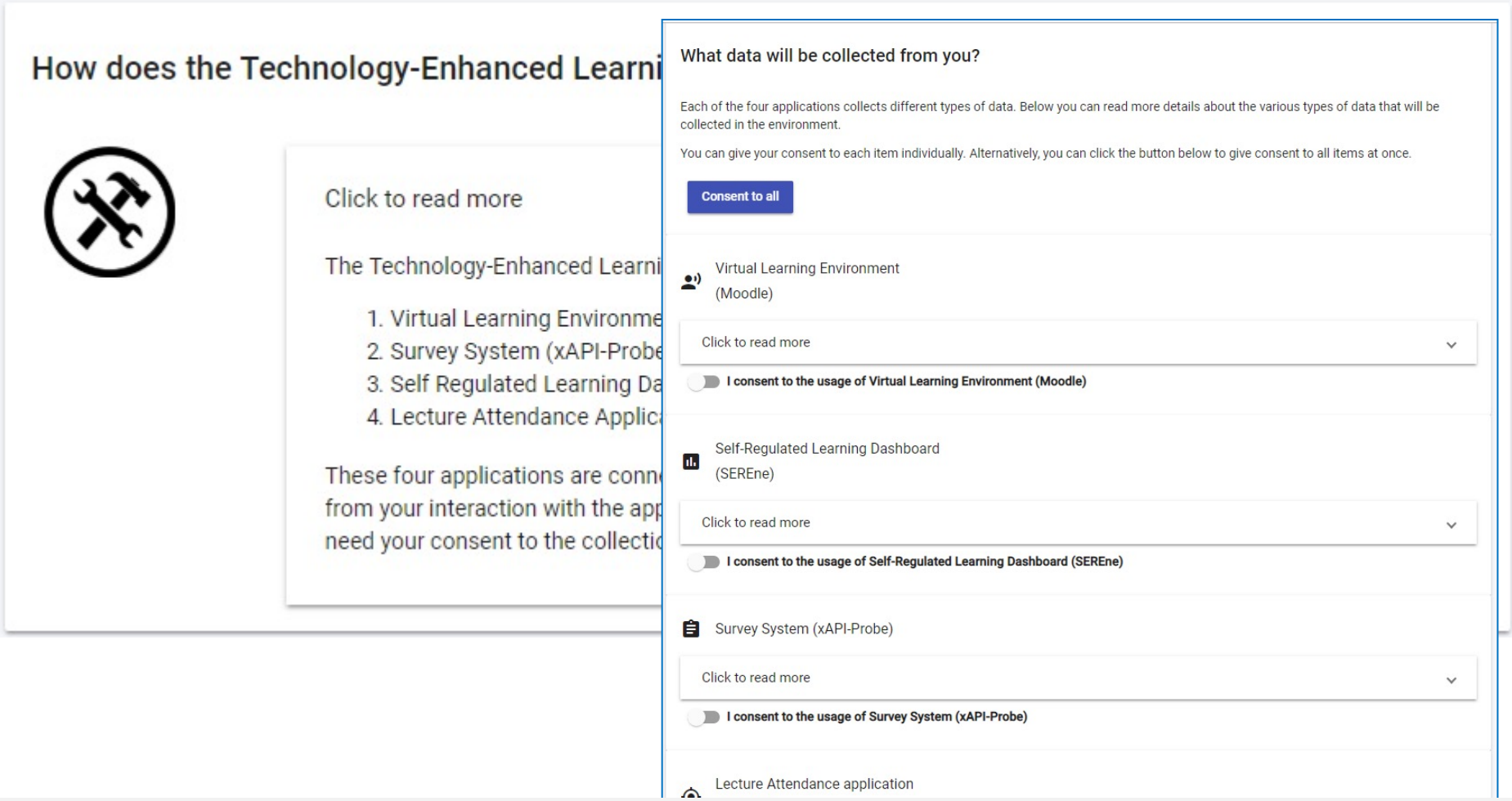
and Educational Information



Ciordas-Hertel, G. P., Schneider, J., and Drachsler, H. (2020). ***Which Strategies are Used in the Design of Technical LA Infrastructure?: A Qualitative Interview Study***, IEEE Global Engineering Education Conference (EDUCON), Virtual Event, Portugal, 2020, pp. 96-105, doi: 10.1109/EDUCON45650.2020.9125363. *** Best Paper award**

TLA Infrastructure

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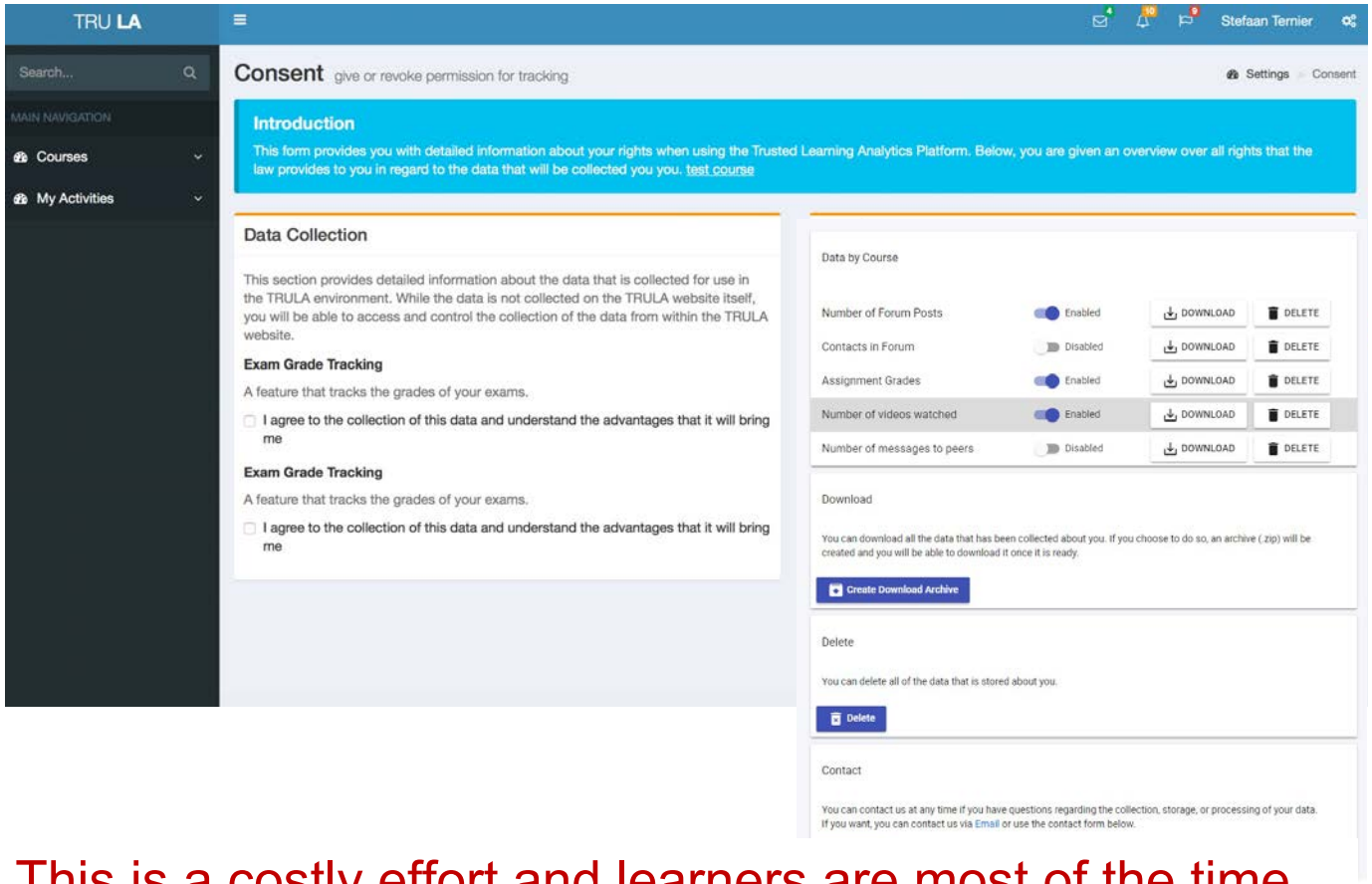

1. Right to be informed
2. Right of access
3. Right to rectification
4. Right to erasure
5. Right to restrict processing
6. Right to data portability
7. Right to object automated decision making

This is a costly effort and learners are most of the time are overwhelmed by the potential choices and consequences and do not use the tools at the end.

Ciordas-Hertel, G., P., Schneider, J., Ternier, S., Drachsler, H., (2019). **Adopting Trust in Learning Analytics Infrastructure: A Structured Literature Review.** Journal of Universal Computer Science, Vol. 25, No. 13, pp. 1668-1686.

Policy making for learning analytics

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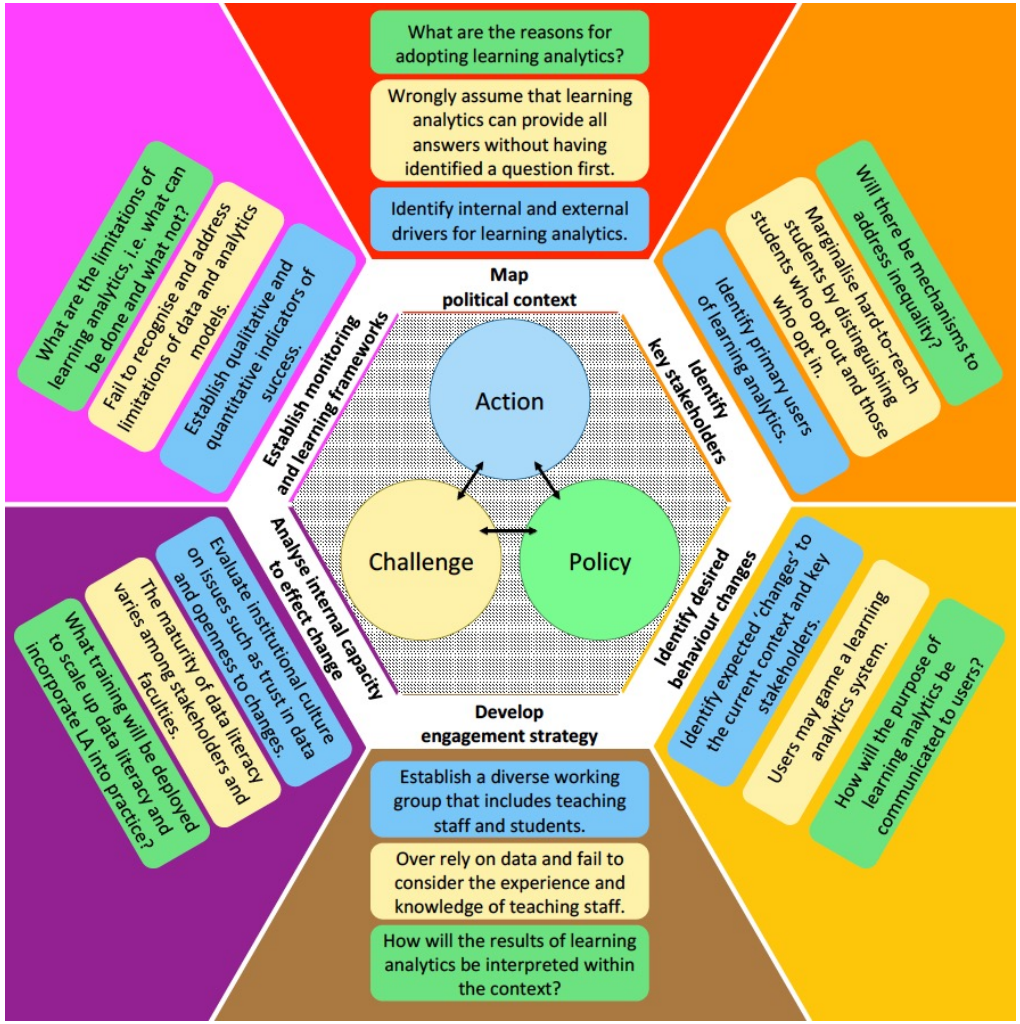

http://www.sheilaproject.eu

Yi-Shan Tsai, Pedro Manuel Moreno-Marcos, Kairit Tammets, Kaire Kollom, and Dragan Gašević. 2018. **SHEILA policy framework: informing institutional strategies and policy processes of learning analytics.** In Proceedings of the 8th International Conference on Learning Analytics and Knowledge (LAK '18). ACM, New York, NY, USA, 320-329. DOI: https://doi.org/10.1145/3170358.3170367

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Contents lists available at ScienceDirect

Computers & Education

journal homepage: www.elsevier.com/locate/compedu

Learning analytics in European higher education—Trends and barriers☆

Yi-Shan Tsai[a,*], Diego Rates[b], Pedro Manuel Moreno-Marcos[c], Pedro J. Muñoz-Merino[c], Ioana Jivet[d], Maren Scheffel[d], Hendrik Drachsler[e,d,1], Carlos Delgado Kloos[c], Dragan Gašević[a,2]

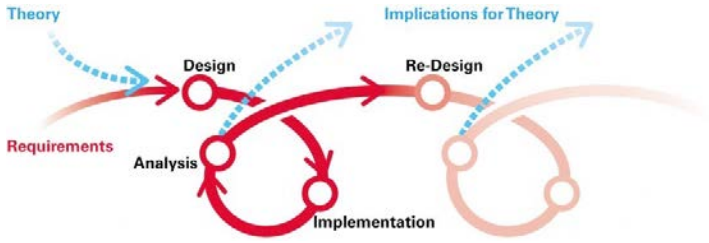
Challenge 1: Stakeholder engagement and buy-in.

Challenge 2: Weak pedagogical grounding.

Challenge 3: Resource demand.

Challenge 4: Ethics and privacy.

Design-Based Research Methodology



Tsai, Y-S, Rates, D., Moreno-Marcos, M. P., Muñoz-Merino, P. J., Jivet, I., Scheffel, M., Drachsler H., Delgado Kloos, C, Gašević, D (2020). ***Learning analytics in European higher education–trends and barriers***, Computers & Education, 103933, https://doi.org/10.1016/j.compedu.2020.103933.

German Code of Conduct for LA

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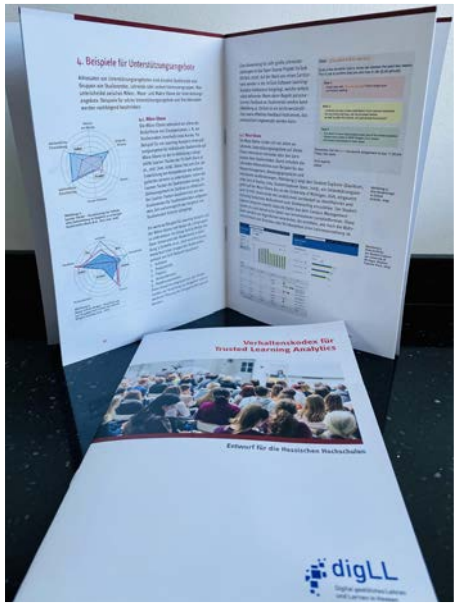

7 Principles

1. Improving conditions for learning and teaching
2. Support services for all students
3. Transparent handling of data
4. Critical handling of data
5. Human control
6. Managerial responsibility
7. Commitment to continuing training

Hansen, J., Rensing, C., Hermann, O., & Drachsler, H. (2020). **Verhaltenskodex für Trusted Learning Analytics: Entwurf für die Hessischen Hochschulen**. Frankfurt am Main, Germany.
https://bit.ly/German_CoC_LA

TLA - Startups

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and Educational Information

Onur Karademir

Doctoral researcher

StudyCore Start-up: https://studycore.de

- Adaptive quiz with gamification-elements
- Learning Analytics Dashboards for teachers and students
- Instructors can deliver personalized feedback at scale

Karademir, O., Ahmad, A., Schneider, J., Di Mitri, D., Jivet, I. & Drachsler, H. (2021). **Designing the Learning Analytics Cockpit - a Dashboard that Enables Interventions**. MIS4TEL'21: 11th International Conference in Methodologies and Intelligent Systems for Technology Enhanced Learn.

TLA - Startups

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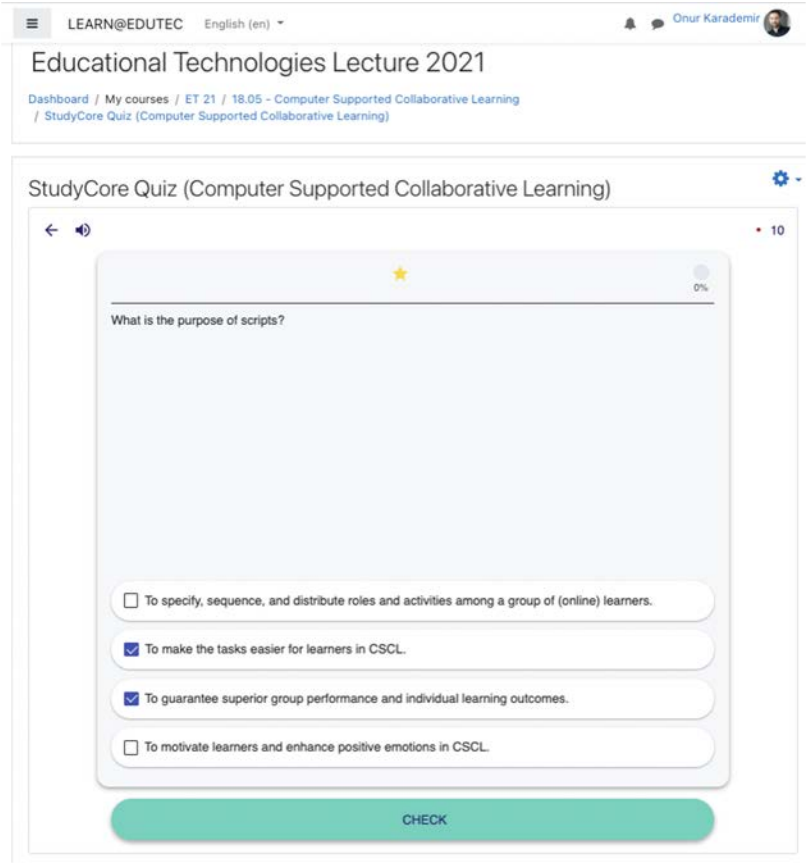

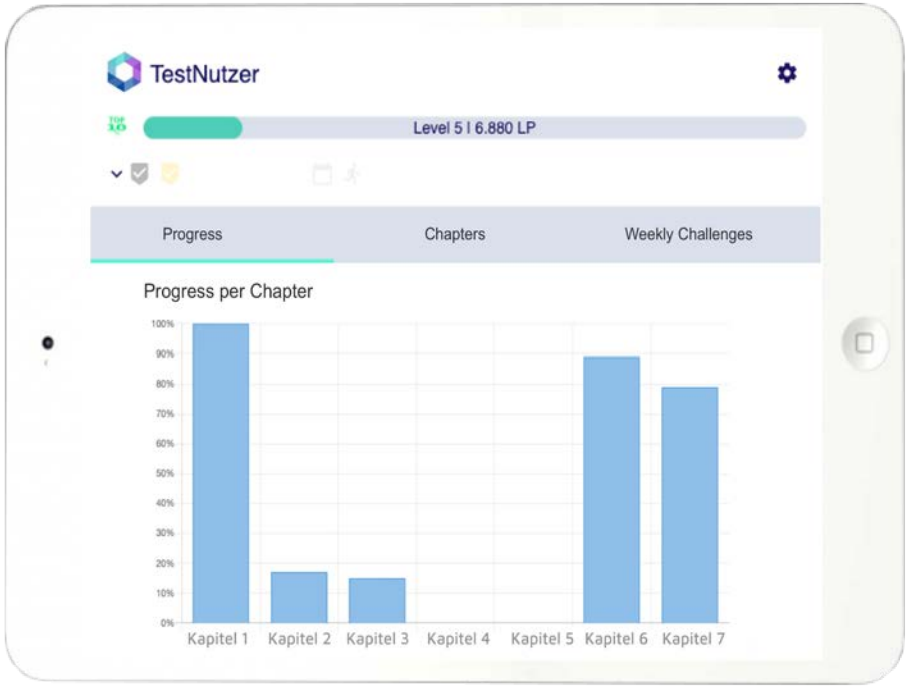

- on premise installation on university servers
- no personal data collected, only pseudonyms used
- students login with their university account via LDAP or OAuth authentication.
- GDPR compliant

https://studycore.de

Structure

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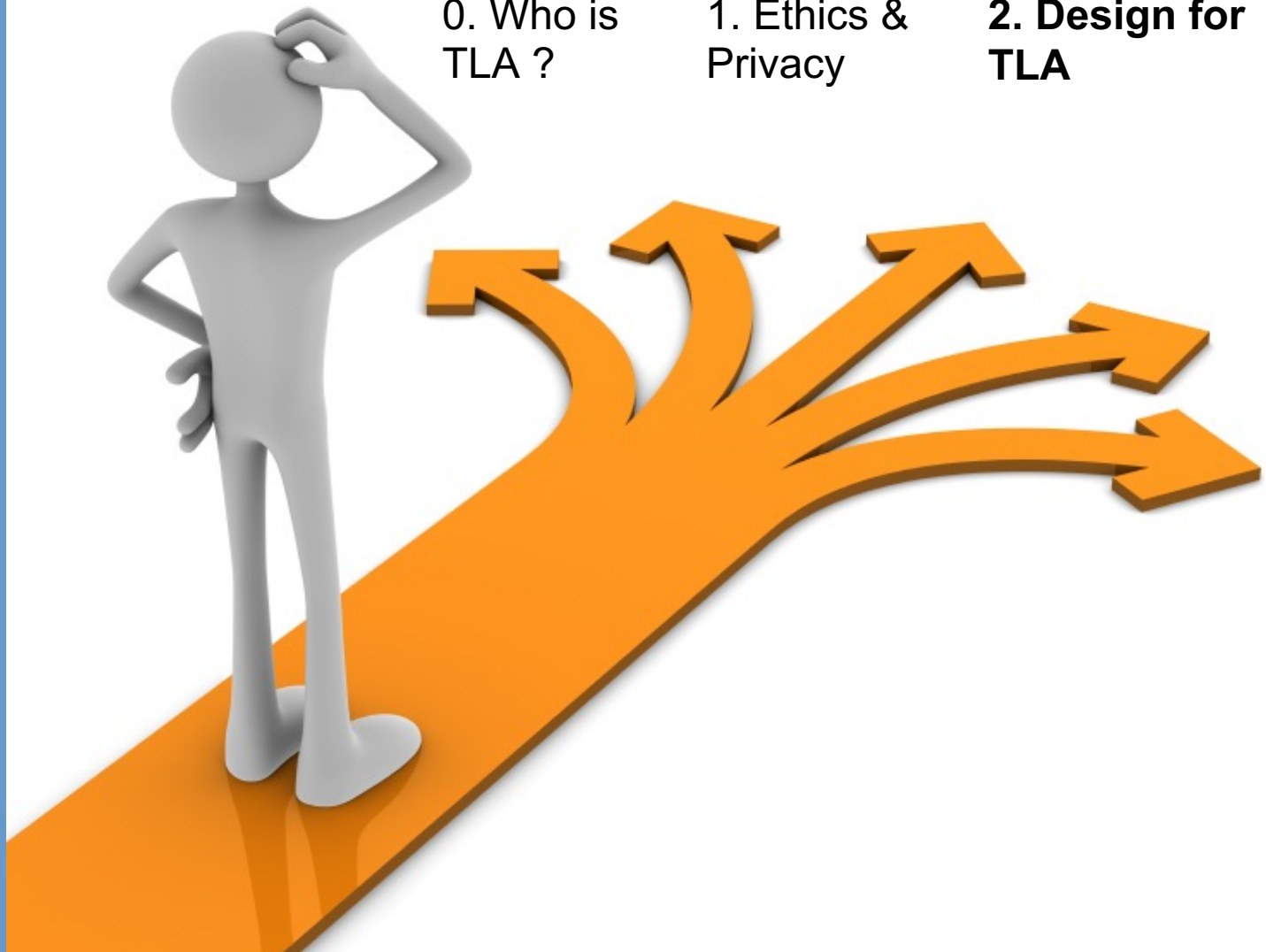

3.Psychomotor competence support

4. Cognitive competence support

5. Computational Psychometrics

Learning Analytics supported Learning Design

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Educational Research and Educational Information

Prof Dr.
Maren Scheffel

Prof. Dr.
Halszka Jarodzka

Dr. Joshua Weidlich
Postdoctoral researcher

Prof. Dr. Alexander Tillmann

Marcel Schmitz
Doctoral researcher

Atezaz Ahmad
Doctoral researcher

Dr. Sarah Voß-Nakkour

Dr. David Weiß

Learning Analytics supported Learning Design

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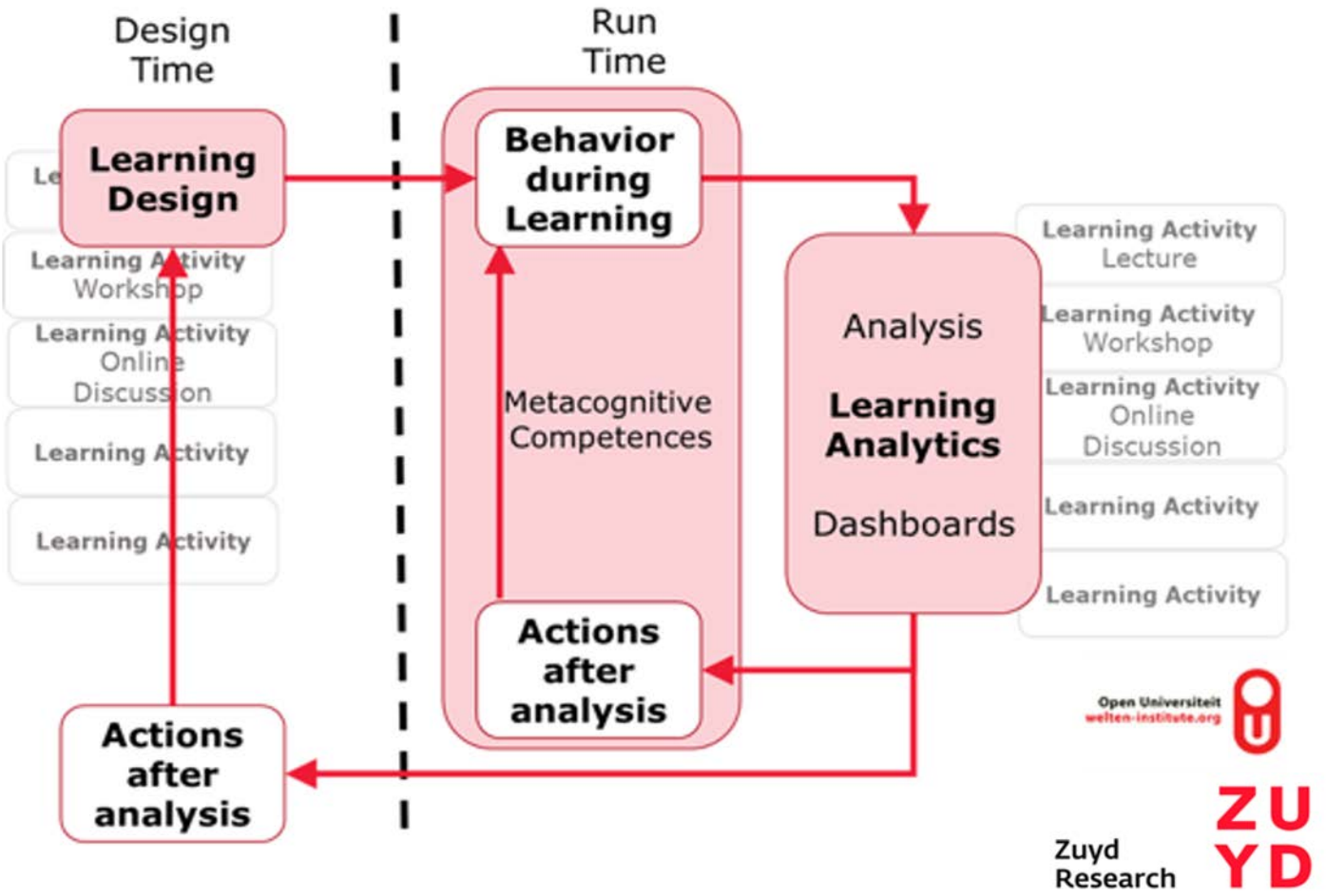
Marcel Schmitz
Doctoral researcher



Schmitz M., Scheffel M., van Limbeek E., Bemelmans R., Drachsler H. (2018) "***Make It Personal!" - Gathering Input from Stakeholders for a Learning Analytics-Supported Learning Design Tool.*** EC-TEL 2018. LNCS, vol 11082. Springer, Cham

Digital Cycle for Education (DC4E)

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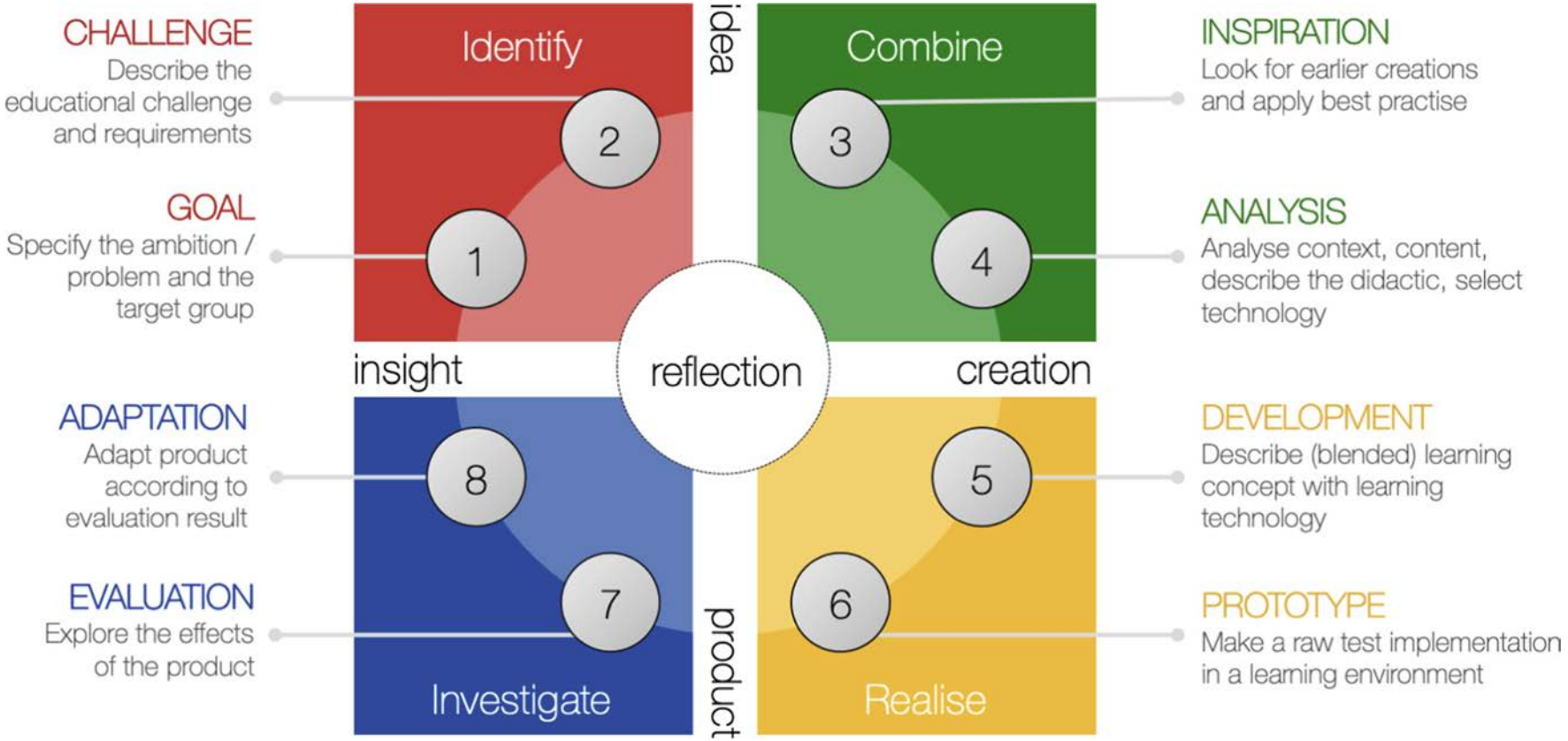

Scheffel, M., van Limbeek, E., Joppe, D., van Hooijdonk, J., Kockelkoren, C., Schmitz, M., Ebus, P., Sloep, P., and Drachsler, H. (2019). **The means to a blend: A practical model for the redesign of face-to-face education to blended learning**. 14th European Conference on Technology Enhanced Learning, EC-TEL 2019, Delft, 16-19 September 2019, Proceedings (Lecture Notes in Computer Science).Cham: Springer

DC4E: Knowledge Acquisition Metapher

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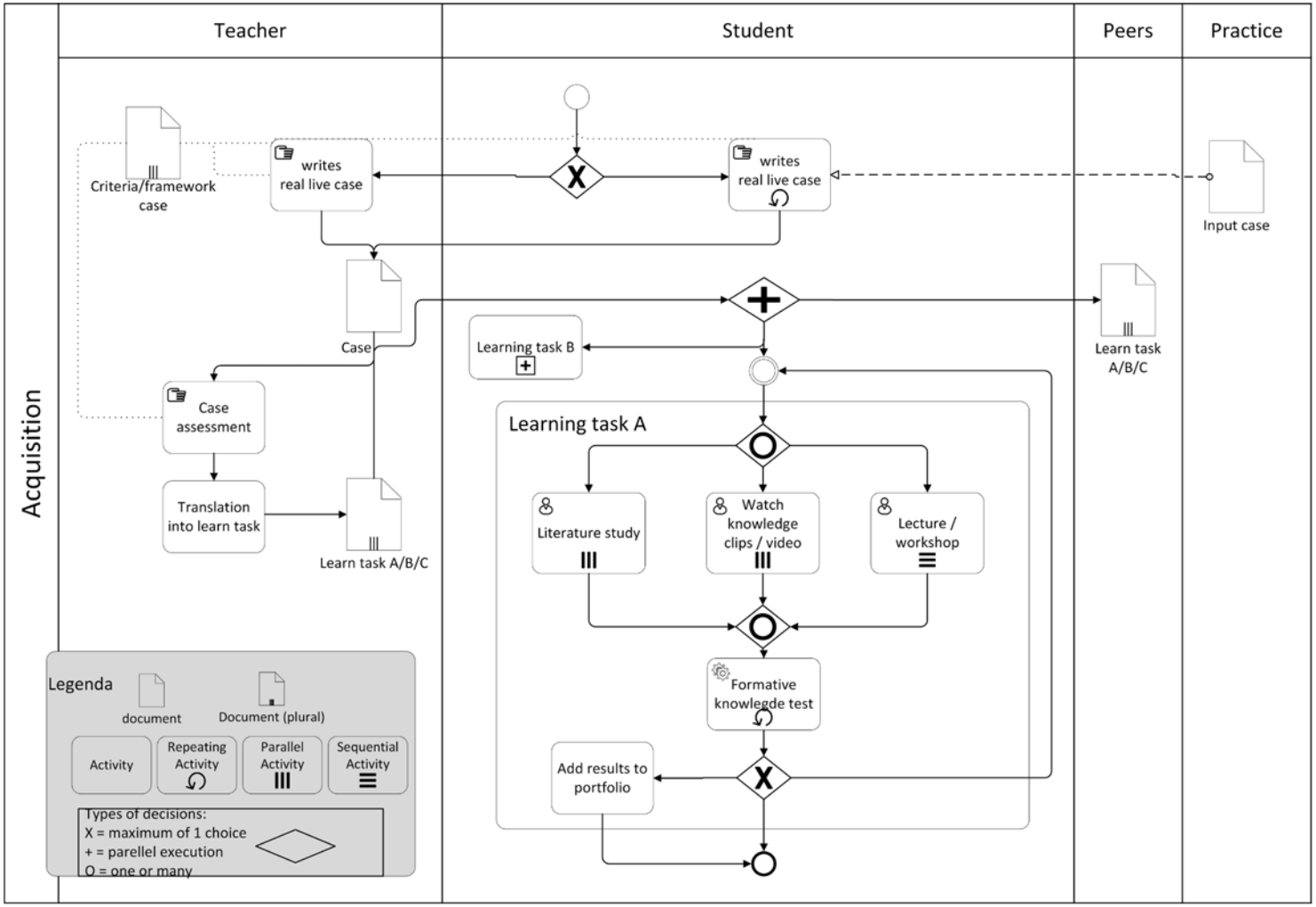
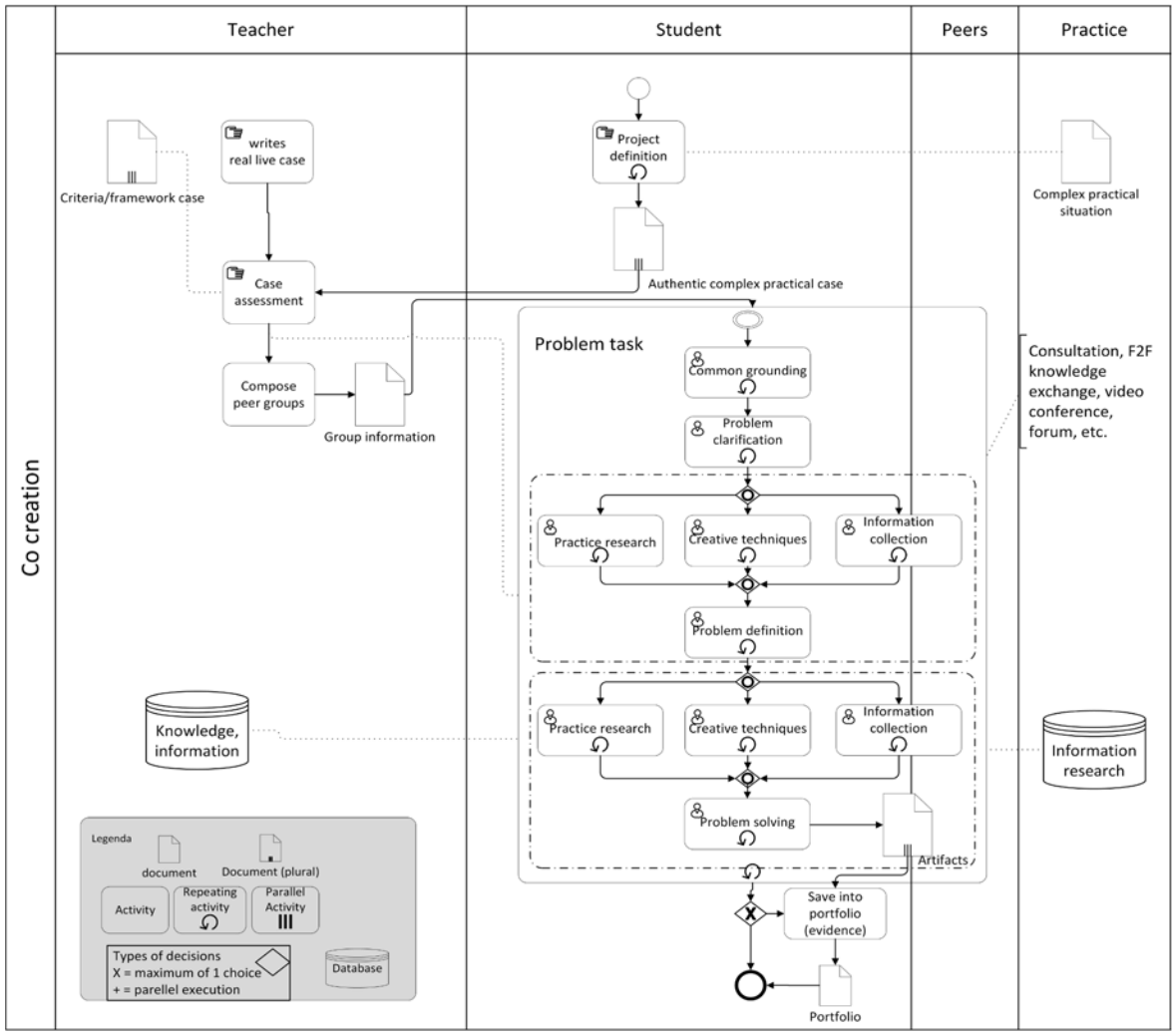


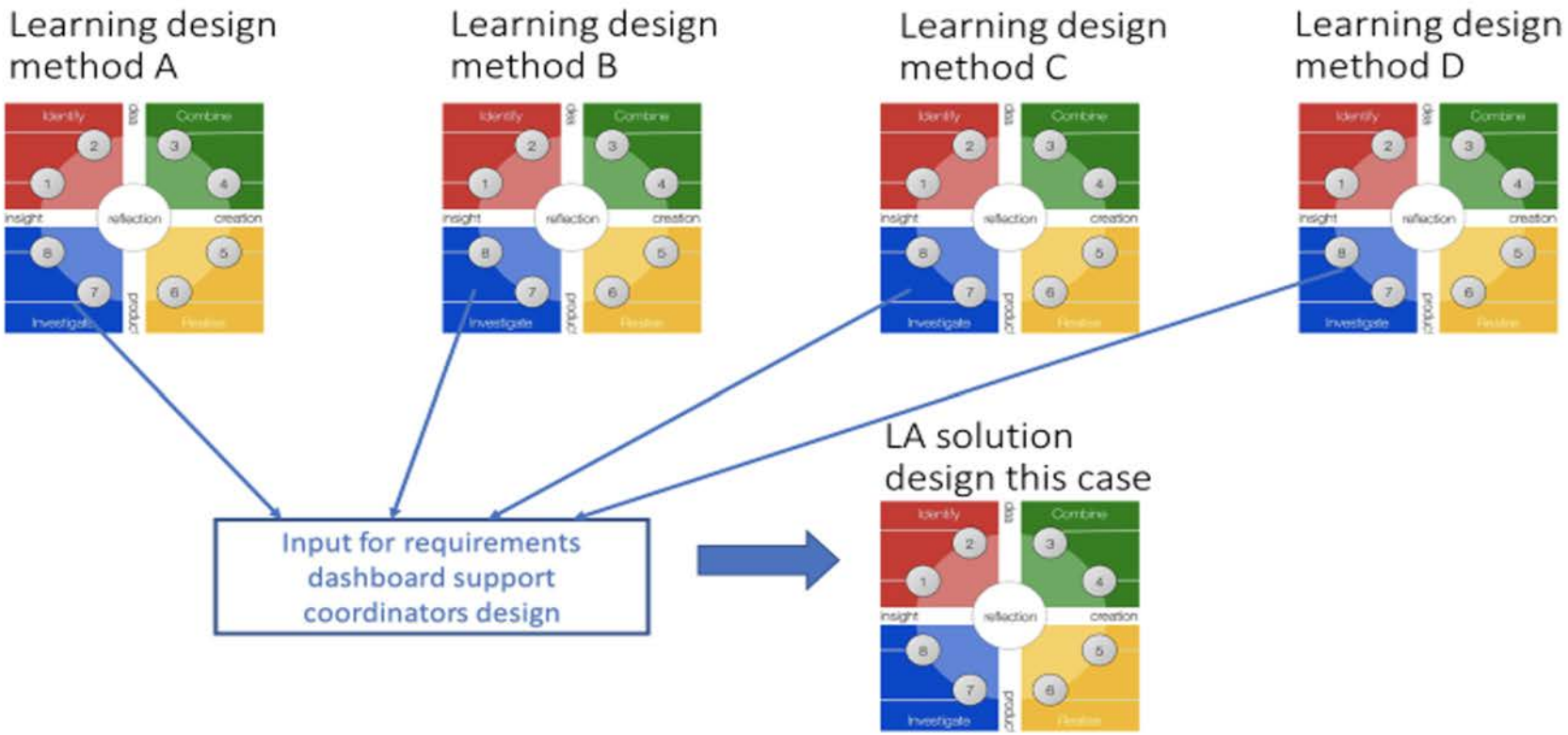
Scheffel, M., Schmitz, M., van Hooijdonk, J., van Limbeek, E., Kockelkoren, C., Joppe, D., & Drachsler, H. (2021). **The Design Cycle for Education (DC4E) – A practical model for the design of blended and online education**. Andrea Kienle et. al. (Hrsg.): Die 19. Fachtagung Bildungstechnologien (DELFI),Lecture Notes in Informatics (LNI), Gesellschaft für Informatik, Bonn 2021

DC4E: Co-Creation Metapher



Scheffel, M., Schmitz, M., van Hooijdonk, J., van Limbeek, E., Kockelkoren, C., Joppe, D., & Drachsler, H. (2021). **The Design Cycle for Education (DC4E) – A practical model for the design of blended and online education**. Andrea Kienle et. al. (Hrsg.): Die 19. Fachtagung Bildungstechnologien (DELFI),Lecture Notes in Informatics (LNI), Gesellschaft für Informatik, Bonn 2021

DC4E: Learning Analytics supported Curricula



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Schmitz, Marcel; Scheffel, Maren; Bemelmans, Roger; Drachsler, Hendrik (2020): ***Fellowship Of The Learning Activity – Learning Analytics 4 Learning Design*** https://doi.org/10.25385/zuyd.9884279

Learning Analytics supported Learning Design

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Schmitz, Marcel; Scheffel, Maren; Bemelmans, Roger; Drachsler, Hendrik (2020): ***Fellowship Of The Learning Activity – Learning Analytics 4 Learning Design*** https://doi.org/10.25385/zuyd.9884279

LA Indicator Repository

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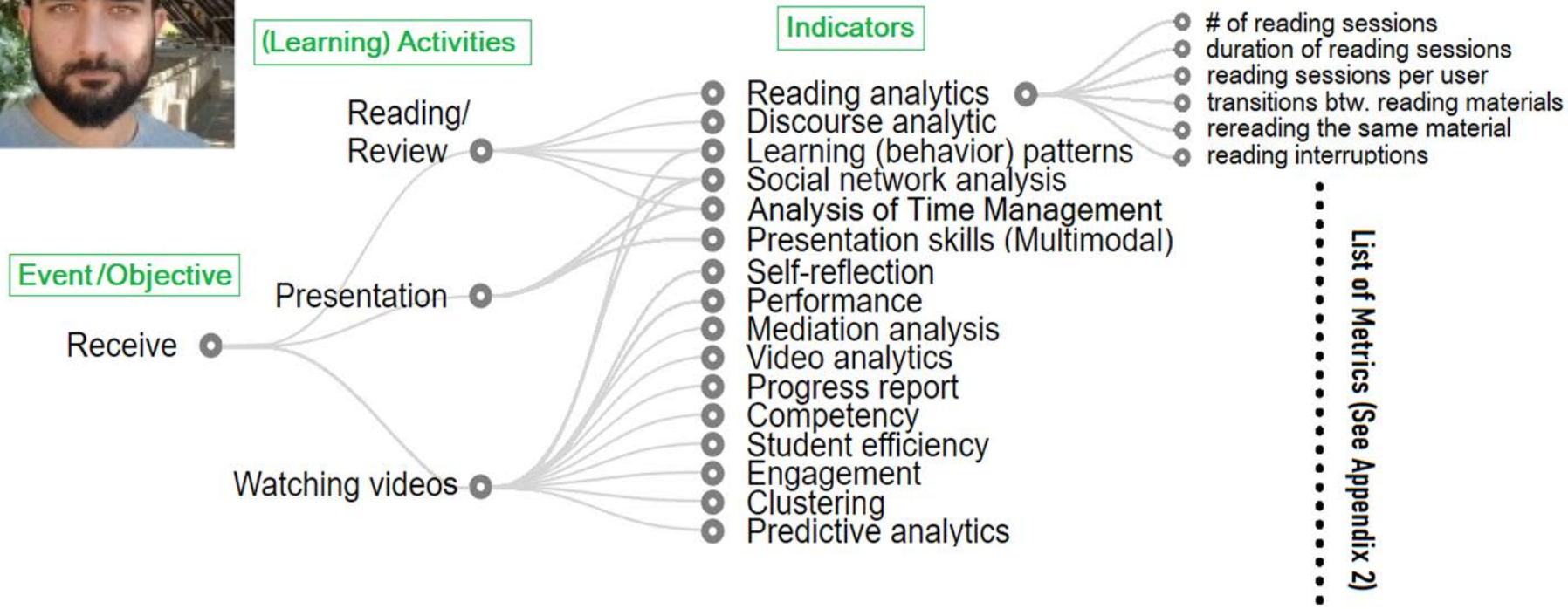
Atezaz Ahmad
Doctoral researcher



A tree view of **'Receive'** event followed by the learning activities, indicator, and metrics

Ahmad, A., Schneider, J., & Drachsler, H. (2020, September). **OpenLAIR an Open Learning Analytics Indicator Repository Dashboard**. In *European Conference on Technology Enhanced Learning* (pp. 467-471). Springer, Cham.

LA Indicator Repository

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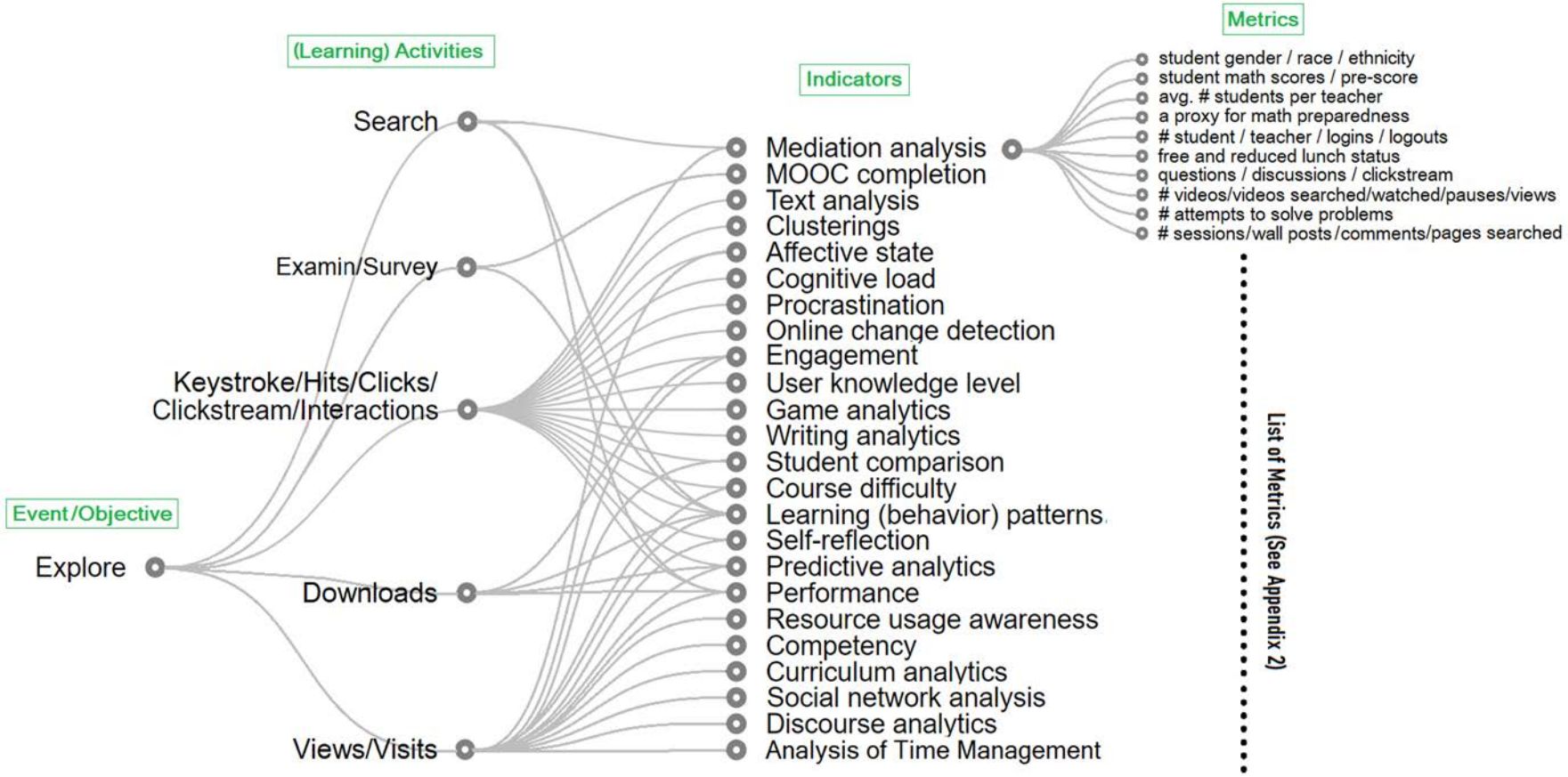

A tree view of '**Explore**' event followed by the learning activities, indicator, and metrics

Ahmad, A., Schneider, J., & Drachsler, H. (2020, September). **OpenLAIR an Open Learning Analytics Indicator Repository Dashboard**. In *European Conference on Technology Enhanced Learning* (pp. 467-471). Springer, Cham.

LA Indicator Repository

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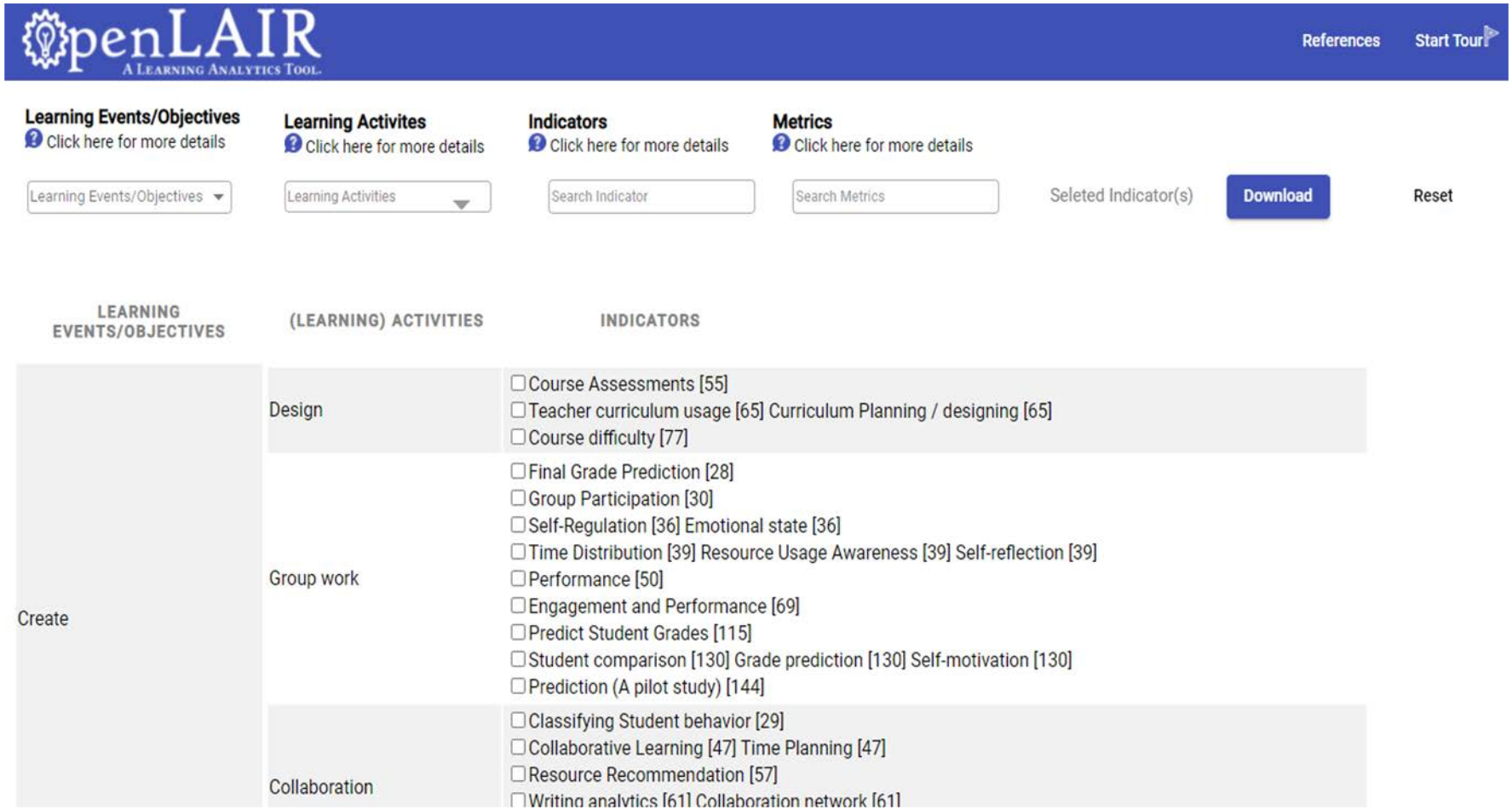

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LA Indicator Repository

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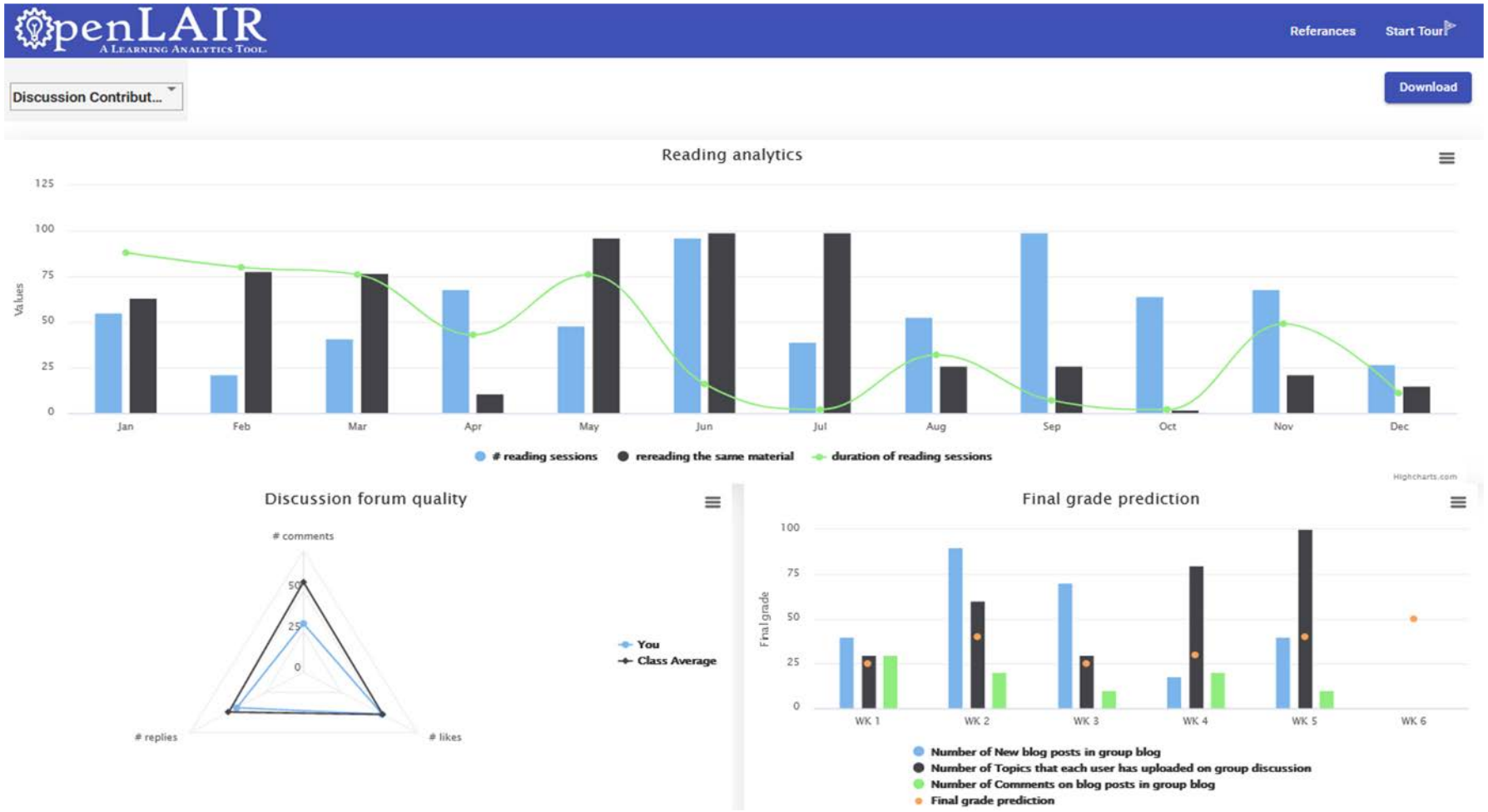

Ahmad, A., Schneider, J., & Drachsler, H. (2020, September). **OpenLAIR an Open Learning Analytics Indicator Repository Dashboard**. In *European Conference on Technology Enhanced Learning* (pp. 467-471). Springer, Cham.

Structure

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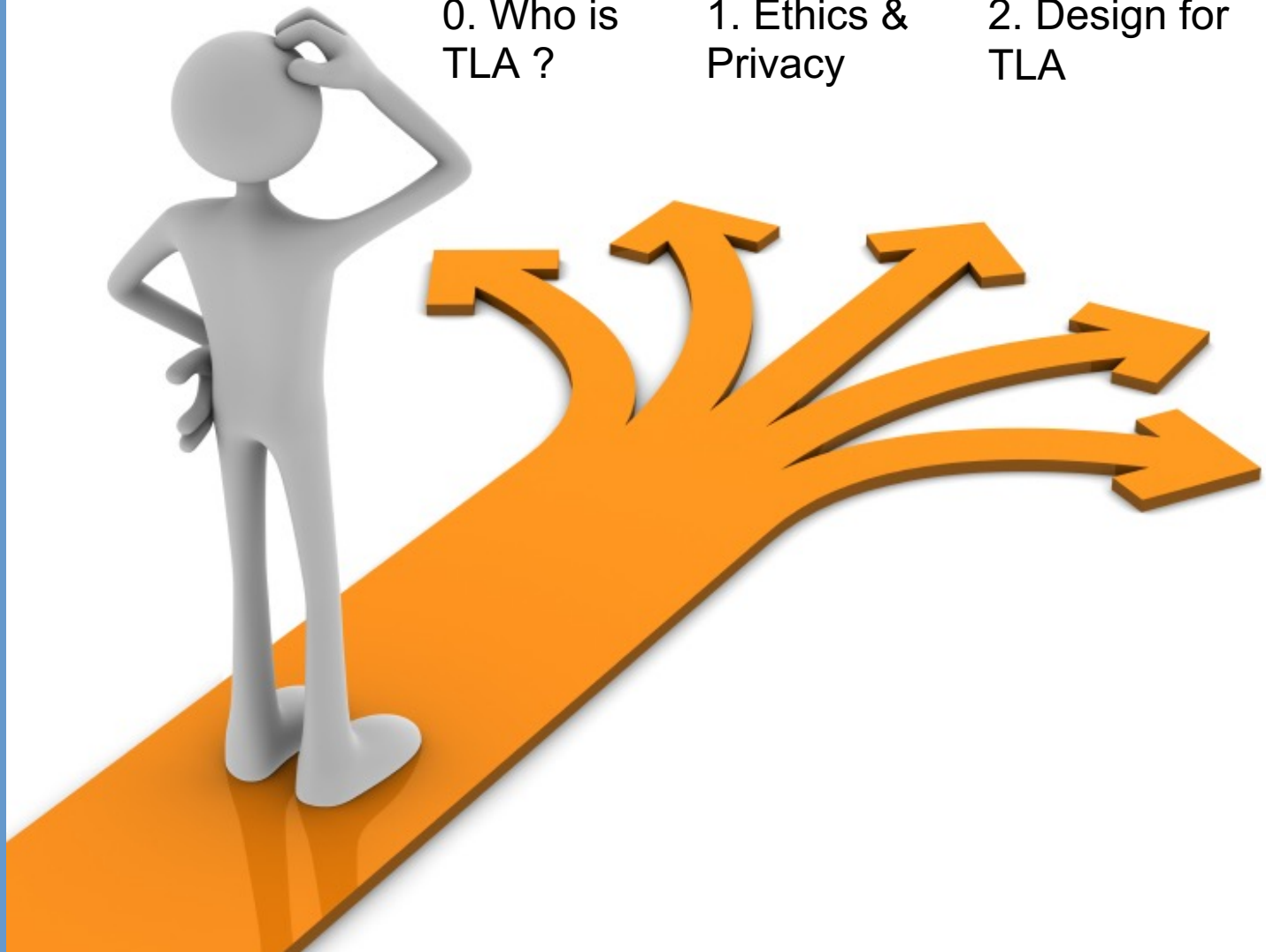

0. Who is TLA ?

1. Ethics & Privacy

2. Design for TLA

3.Psychomotor competence support

4. Cognitive competence support

5. Computational Psychometrics

Multimodal Learning Analytics

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Dr. Jan Schneider
Postdoctoral researcher

Dr. Daniele Di Mitri
Postdoctoral researcher

Dr. Joshua Weidlich
Postdoctoral researcher

Prof Dr.
Maren Scheffel

Sambit Praharaj
Doctoral researcher

George Ciordas-Hertel
Doctoral researcher

Fernando Cardenas-Hernandez
Doctoral researcher

Gianluca Ro
Doctoral resea

Streetlight effect

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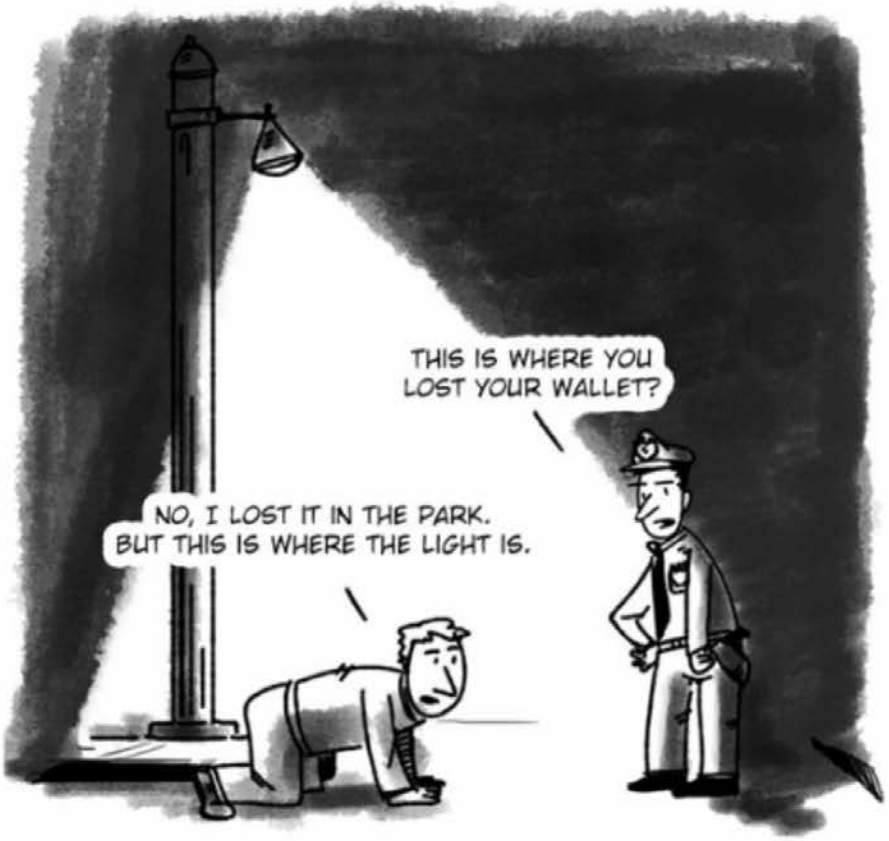
Multimodality allows to expand the visible area



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Research Centre for Learning, Teaching and Technology

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Multimodal Learning Analytics

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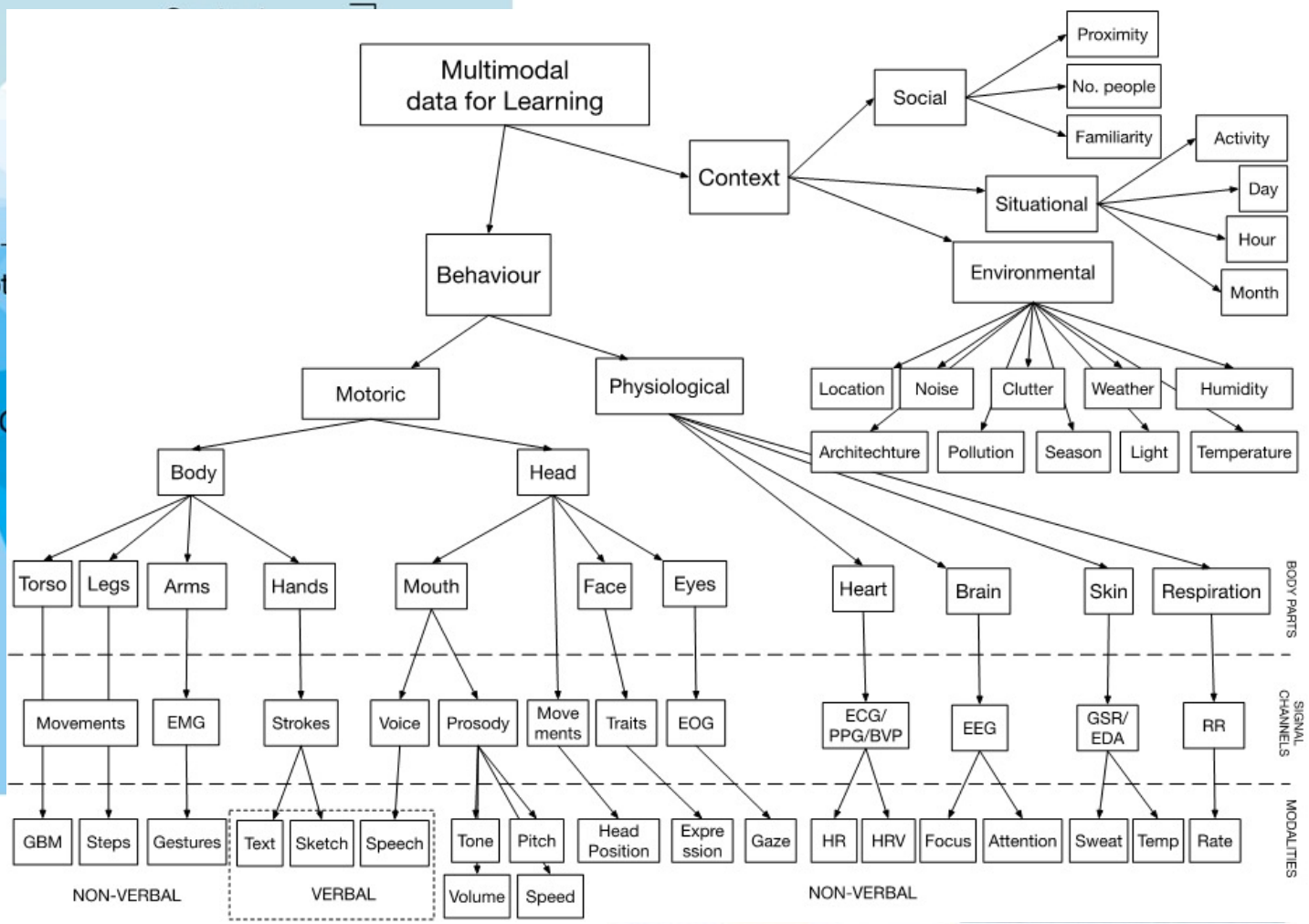
INPUT SPACE

Observable evidence, multimodal data that can be tracked automatically with sensors

Observability line

HYPOTHESIS SPACE

Inferred learning labels, collected firstly through human annotation. Later they can be predicted automatically



Di Mitri D, Schneider J, Specht M, Drachsler H. (2018). **From signals to knowledge: A conceptual model for multimodal learning analytics.** J Comput Assist Learn. 2018;34:338–349.

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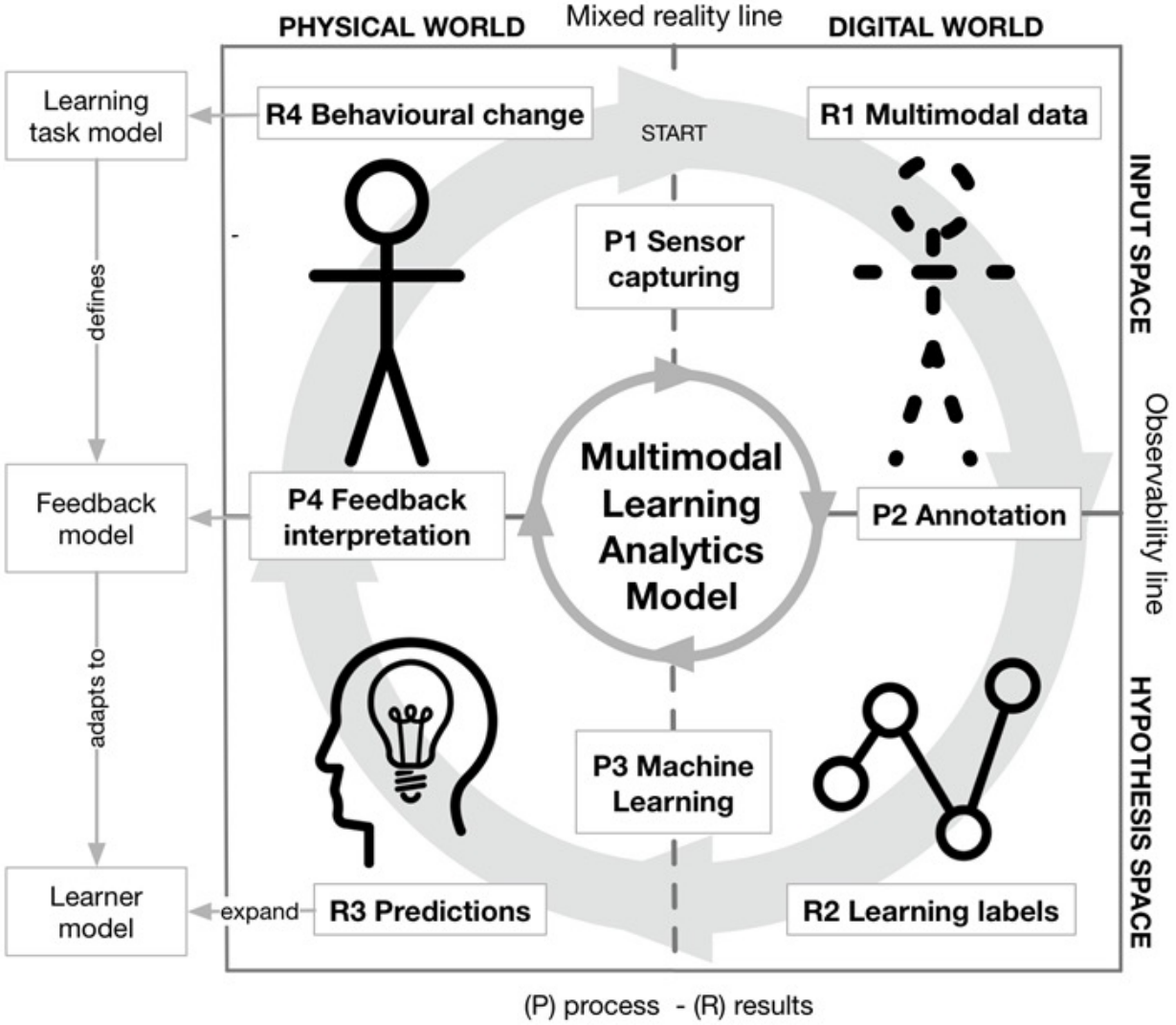

Di Mitri D, Schneider J, Specht M, Drachsler H. (2018). **From signals to knowledge: A conceptual model for multimodal learning analytics.** J Comput Assist Learn. 2018;34:338–349.

Multimodal Learning Analytics

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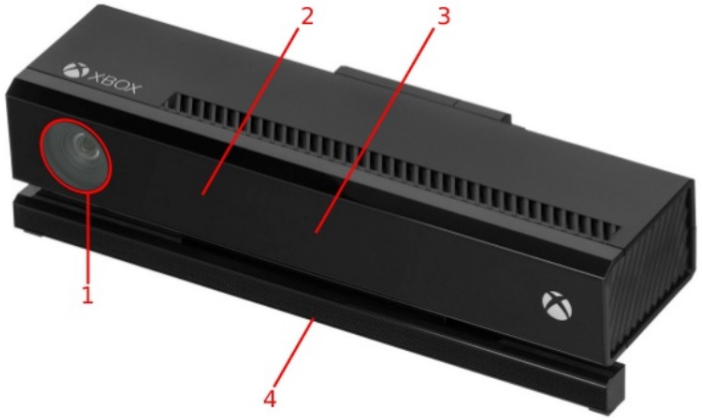

Figure 6.5: The Kinect v2 with 1: Color Camera, 2: Microphone Array, 3: Infrared Camera, 4: Infrared Projector

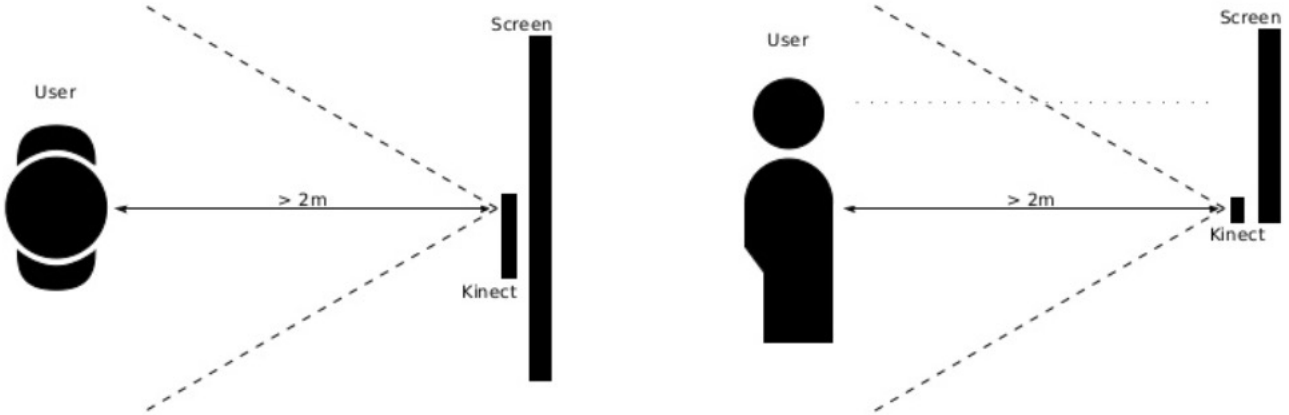

Figure 6.2: Setting up the DT. Left: top view. Right: profile view.

Di Mitri D, Schneider J, Specht M, Drachsler H. (2018). **From signals to knowledge: A conceptual model for multimodal learning analytics.** J Comput Assist Learn. 2018;34:338–349.

Multimodal Learning Analytics

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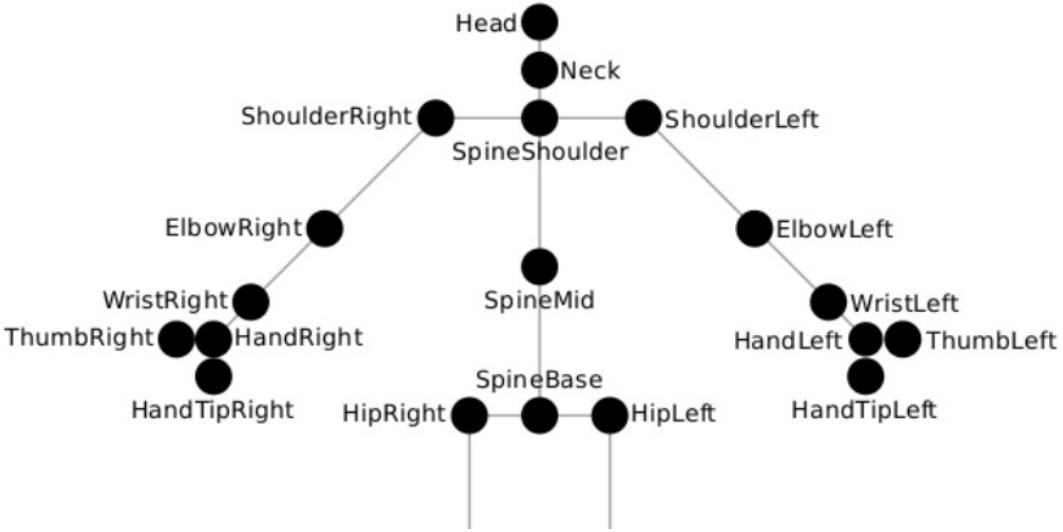

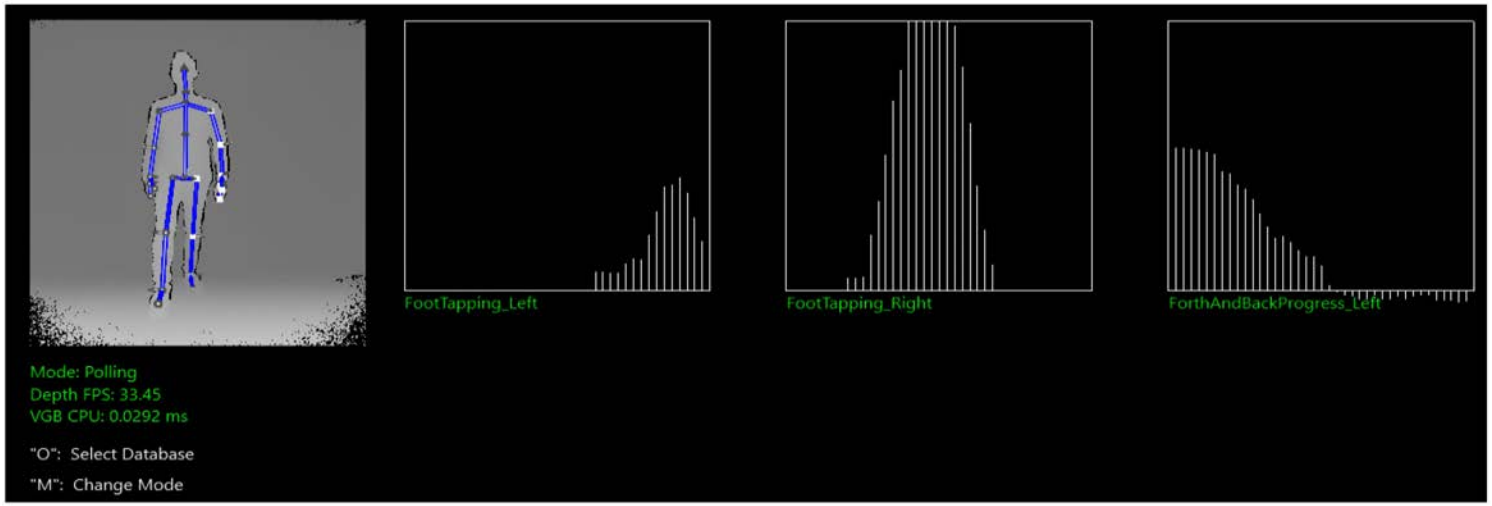

Di Mitri D, Schneider J, Specht M, Drachsler H. (2018). **From signals to knowledge: A conceptual model for multimodal learning analytics.** J Comput Assist Learn. 2018;34:338–349.

Presentation Trainer

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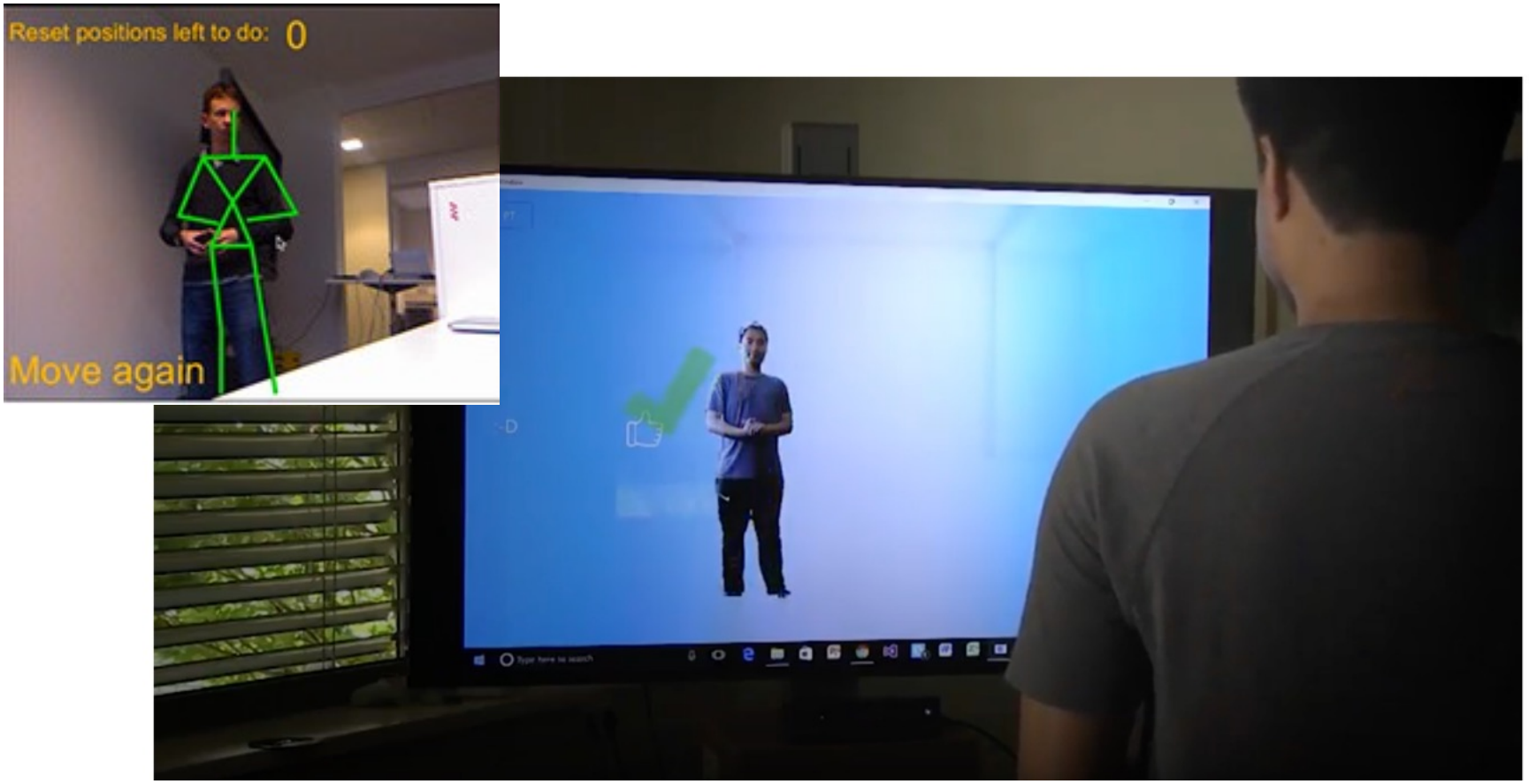

Schneider, J., Börner, D., Van Rosmalen, P., & Specht, M. (2015, November). **Presentation trainer, your public speaking multimodal coach**. In Proceedings of the 2015 ACM on International Conference on Multimodal Interaction (pp. 539-546). ACM. ISO 690

Presentation Trainer

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Schneider, J., Romano, G., & Drachsler, H. (2019). ***Beyond Reality—Extending a Presentation Trainer with an Immersive VR Module***. *Sensors*, *19*(16), 3457.

Salsa Trainer

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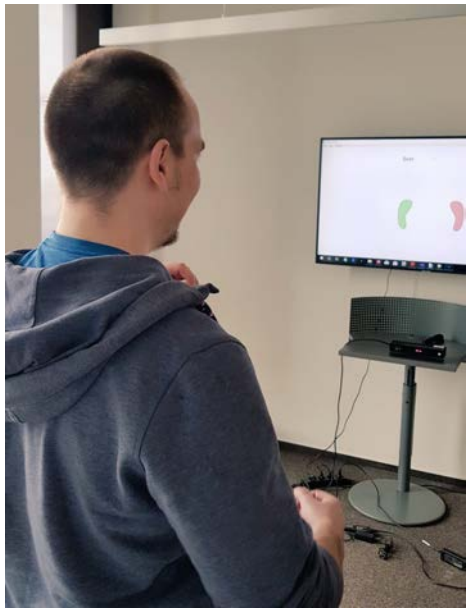
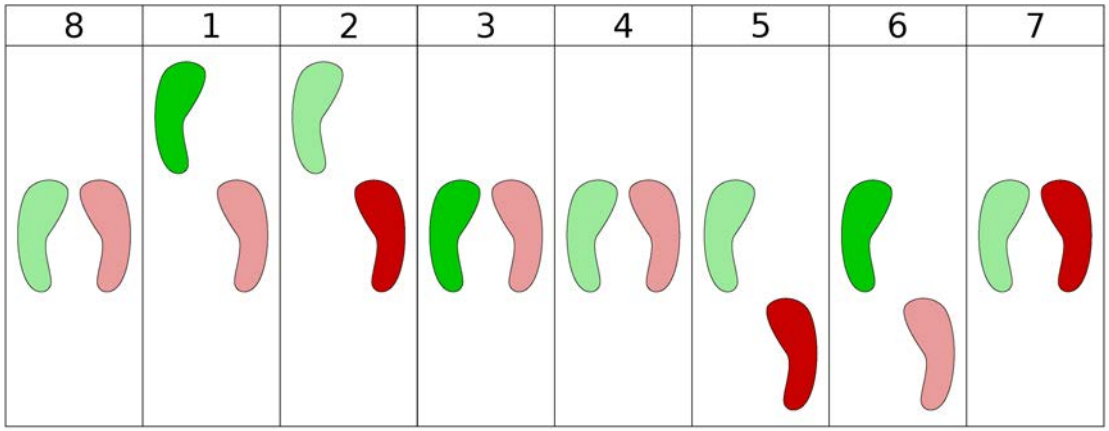
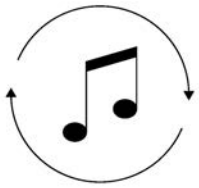


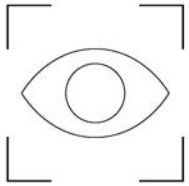
Gianluca Romano
Doctoral researcher

Dr. Jan Schneider
Postdoctoral researcher





Reset dancing



Look straight

Move Body

Smile

Romano, G., and Schneider, J., and Drachsler, H. (2019). ***Dancing Salsa with Machines Filling the Gap of Dancing Learning Solutions***. Sensors 2019, 17, 3661.

CPR Trainer

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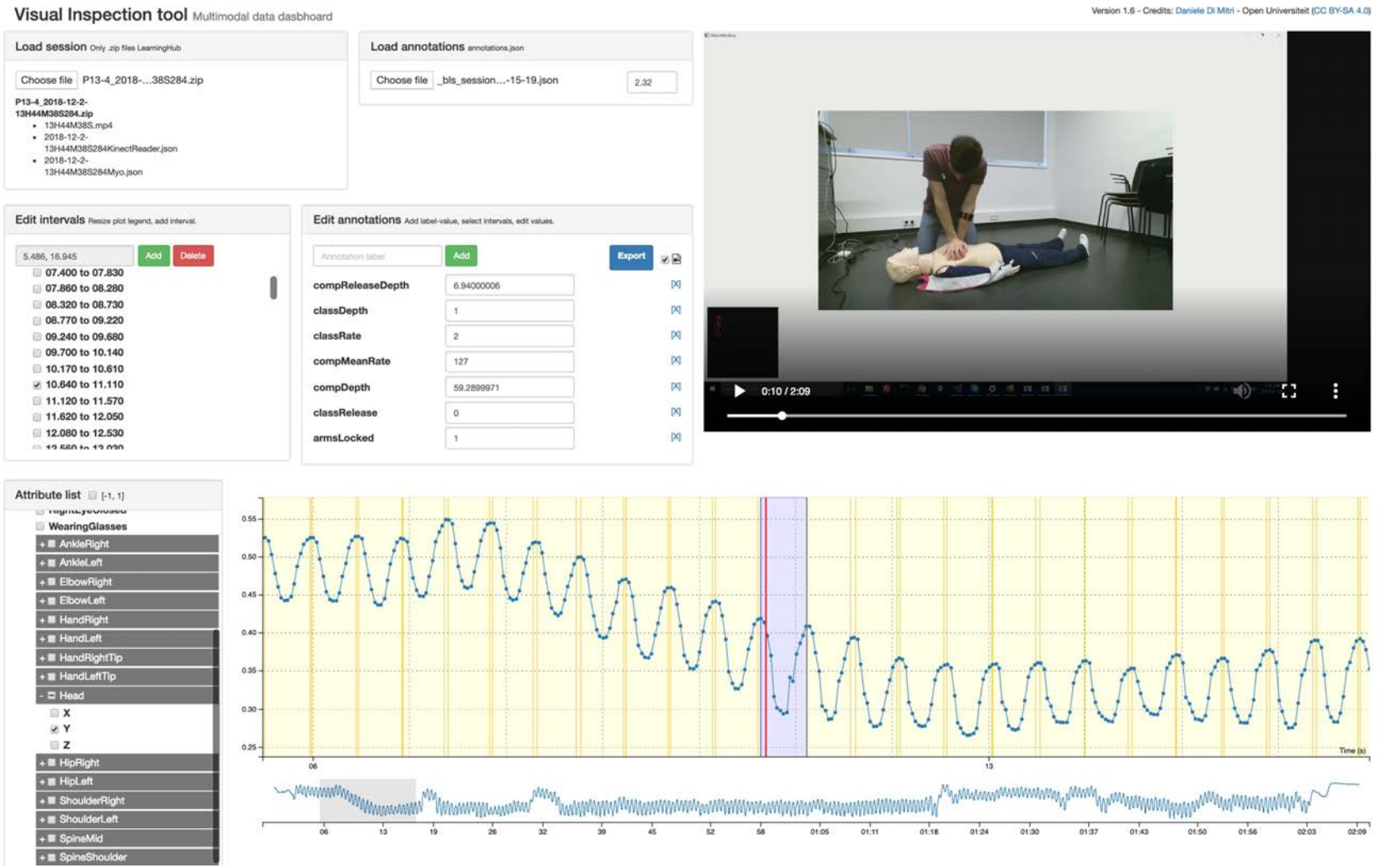

Di Mitri, D.; Schneider, J.; Specht, M.; Drachsler, H. (2019) ***Detecting Mistakes in CPR Training with Multimodal Data and Neural Networks.*** *Sensors* 2019, *17*, 3099.

MMLA for CSCL

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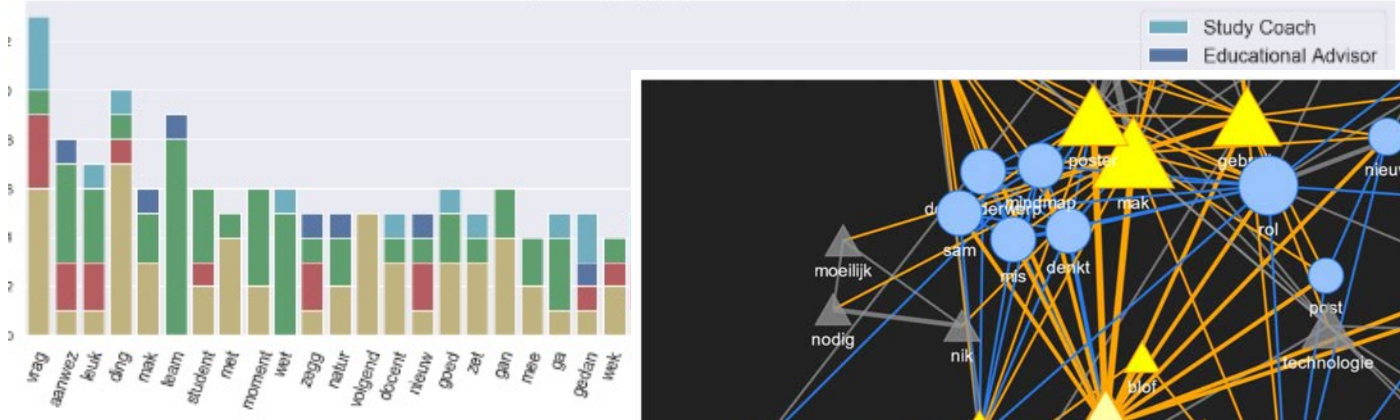
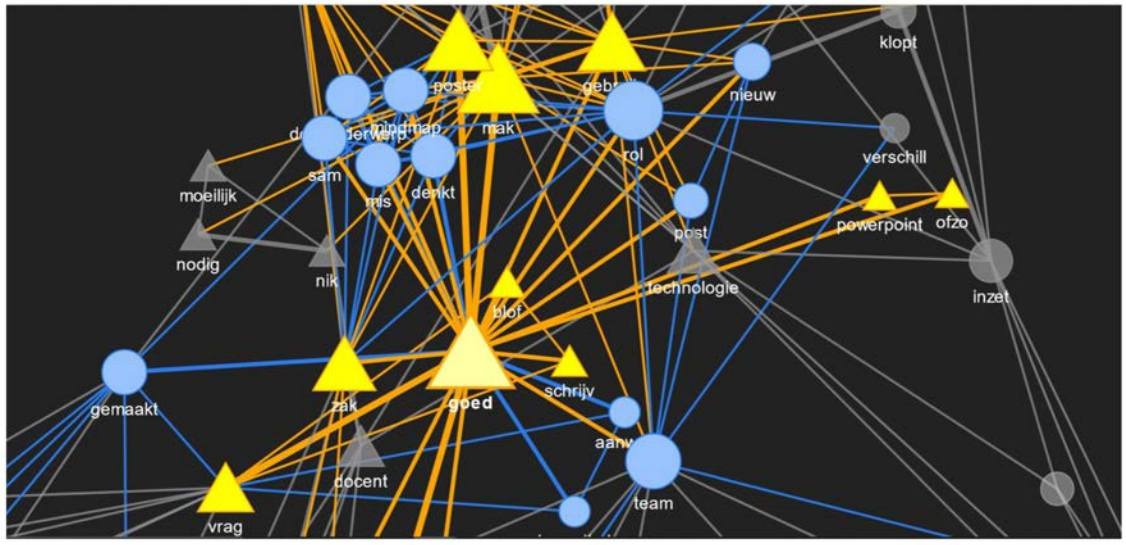
Sambit Praharaj
Doctoral researcher





Praharaj, S.; Scheffel, M.; Schmitz, M.; Sp
Analytics for Group Speech Data Using
https://doi.org/10.3390/s21093156

Praharaj, S., Scheffel, M., Drachsler, H. & Specht, M. (2018). ***Multimodal Analytics for Real-Time Feedback in Co-located Collaboration***. 13th European Conference on Technology Enhanced Learning, EC-TEL 2018, Leeds, UK, September 3-5, 2018, Proceedings (Lecture Notes in Computer Science, Vol. 11082, pp. 187-201). Cham: Springer

New AI grant

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CGL
Cologne Game Lab

Technology
Arts Sciences
TH Köln

DIPF
Leibniz-Institut für Bildungsforschung
und Bildungsinformation

RWTH AACHEN UNIVERSITY

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Sporthochschule Köln
German Sport University Cologne

Structure

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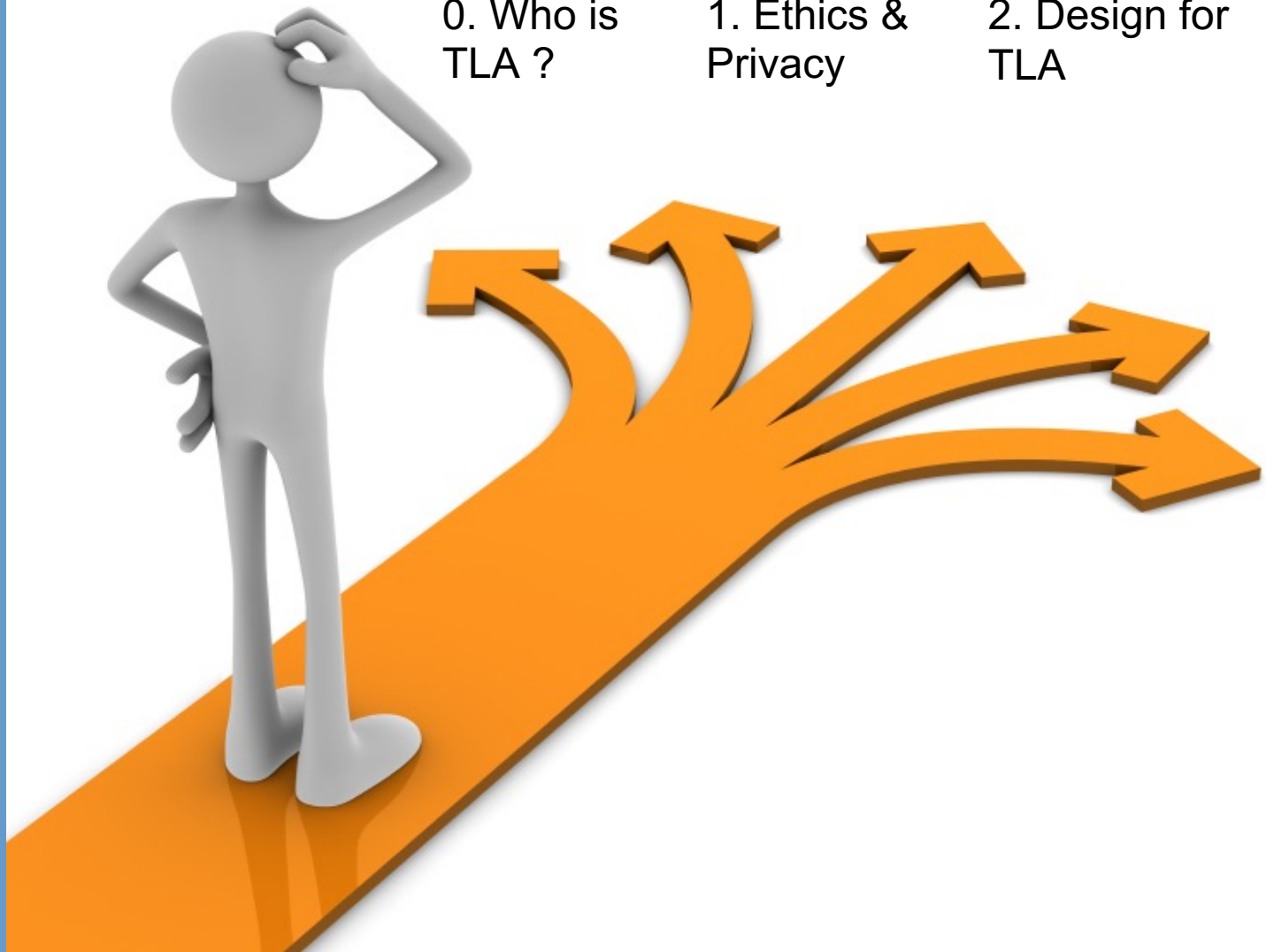
0. Who is TLA ?

1. Ethics & Privacy

2. Design for TLA



3.Psychomotor competence support

4. Cognitive competence support

5. Computational Psychometrics

Meta-Cognitive support

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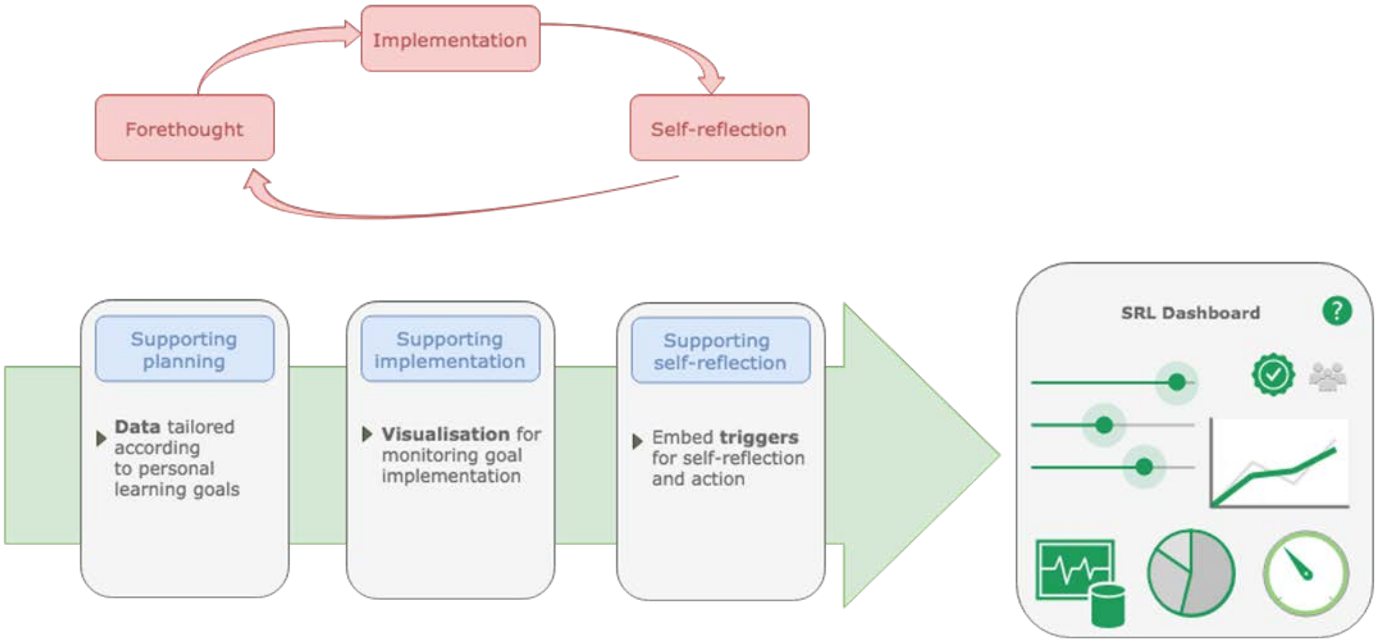
Ioana Jivet



Jivet, I., Scheffel, M., Drachsler, H., and Specht, M. (2017). **Awareness is not enough. Pitfalls of learning analytics dashboards in the educational practise**. EC-TEL 2017.

Jivet, Scheffel, Specht, and Drachsler. 2018. **License to evaluate: Preparing learning analytics dashboards for educational practice.** LAK2018, Sydney.

Meta-Cognitive support

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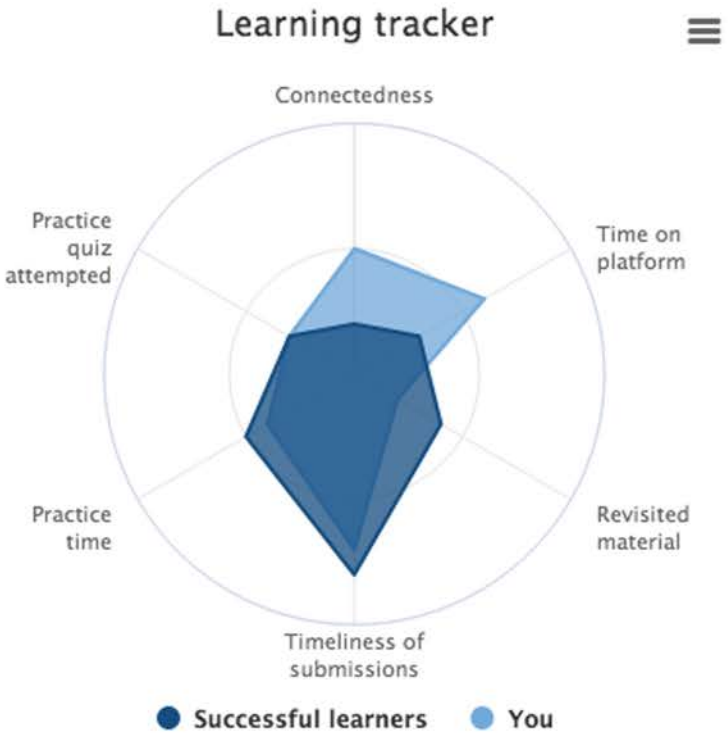
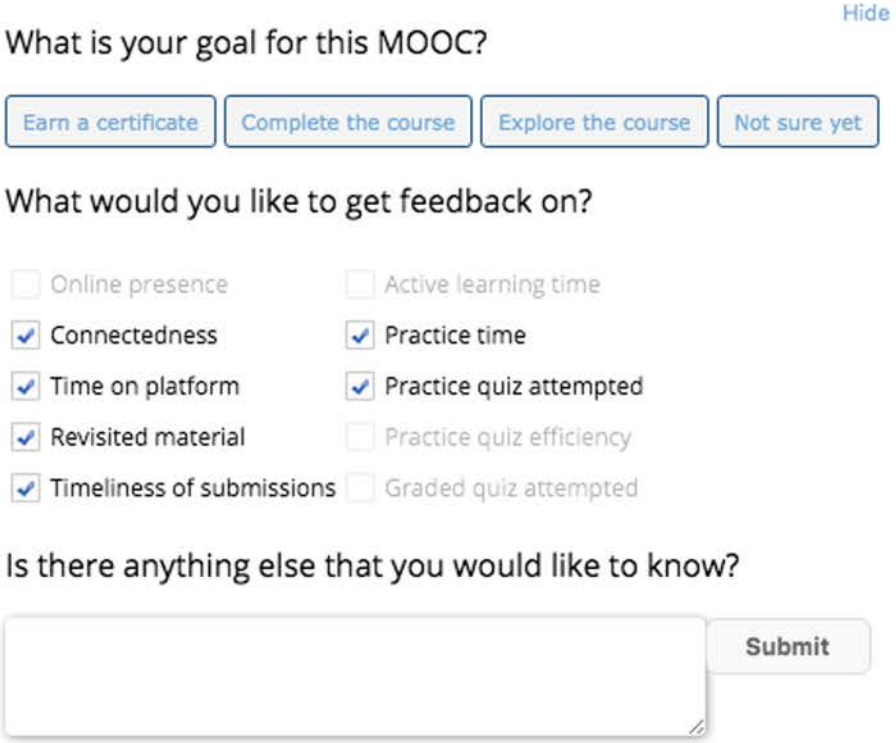


A. What *indicators do* learners choose?



B. Is there a relationship between the way learners formulate their goals and the indicators they choose to monitor?

Jivet, I., Wong, J., Scheffel, M., Valle Torre, M., Specht, M., and Drachsler, H. 2021. ***Quantum of Choice: How learners' feedback monitoring decisions, goals and self-regulated learning skills are related.*** In LAK21: 11th International Learning Analytics and Knowledge Conference(LAK21). ACM. USA, 416–427.

Meta-Cognitive support

Behav. Indicat.

Content Indicat.

Table 2: The number (#L) and percentage (%L) of learners that selected 3, 4, 5 or 6 indicators in each course.

	Total (N=401)		AHE (N=200)		SDG (N=201)	
	#L	%L	#L	%L	#L	%L
3 indicators	101	25.2%	39	19.5%	62	30.8%
4 indicators	54	13.5%	22	11.0%	32	15.9%
5 indicators	69	17.2%	28	14.0%	41	20.4%
6 indicators	177	44.1%	111	55.5%	66	32.8%

Jivet, I., Wong, J., Scheffel, M., Valle Torre, M., Specht, M., and Drachsler, H. 2021. ***Quantum of Choice: How learners' feedback monitoring decisions, goals and self-regulated learning skills are related.*** In LAK21: 11th International Learning Analytics and Knowledge Conference(LAK21). ACM. USA, 416–427.

Structure

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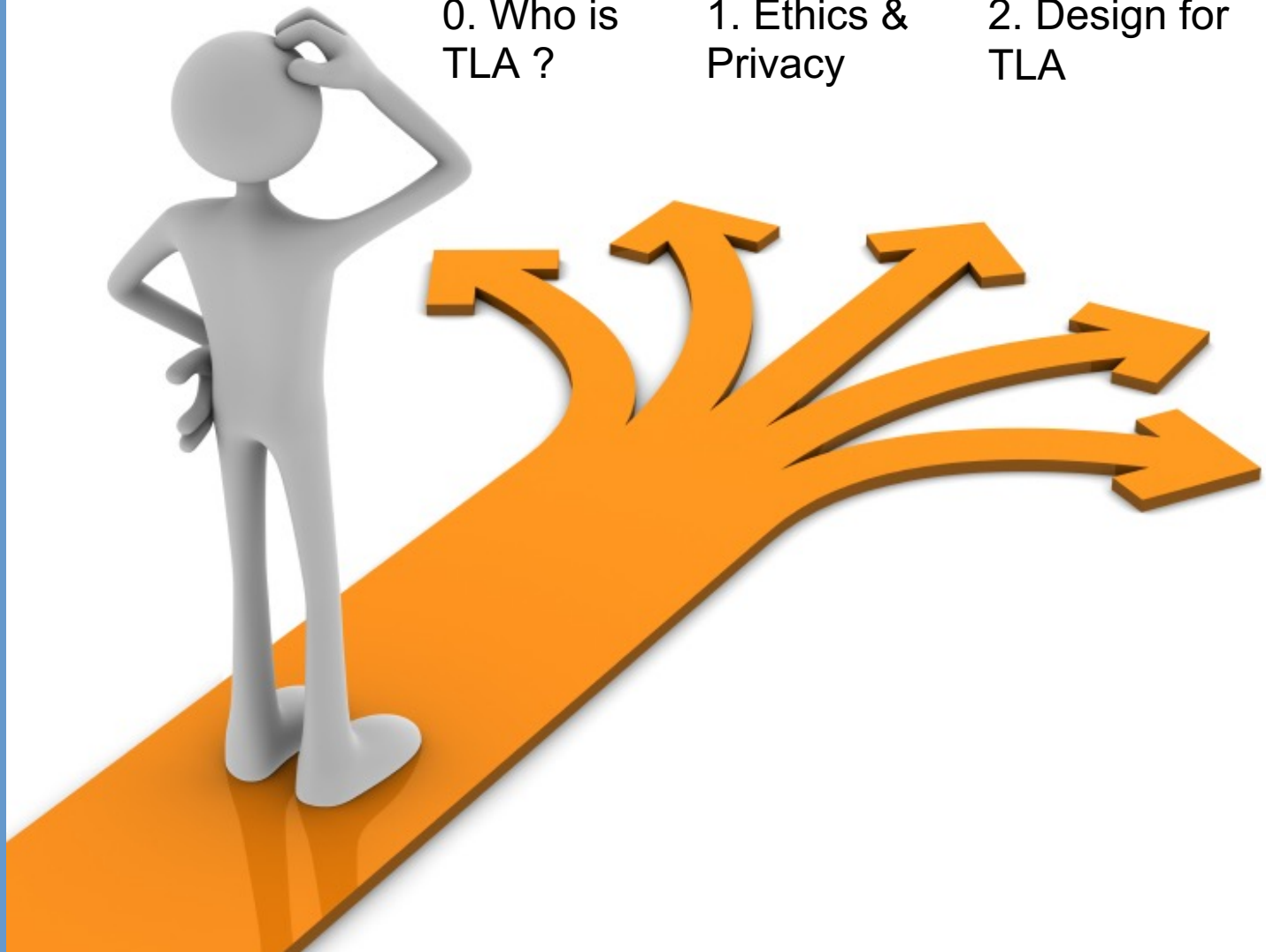

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Computational Psychometrics

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Prof. Dr. Holger Horz

Prof. Dr. Andreas Frey

Prof. Dr. Frank Goldhammer

Prof. Dr. Alexander Tillmann

Dr. Joshua Weidlich
Postdoctoral researcher

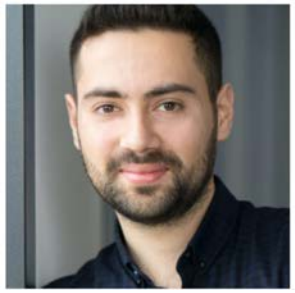
Dr. Jane Yau
Postdoctoral researcher

Dr. Ioana Jivet

Dr. David Weiß

Daniel Biedermann
Doctoral researcher

Onur Karademir
Doctoral researcher



Sebastian Gombert
Doctoral researcher

Computational Psychometrics

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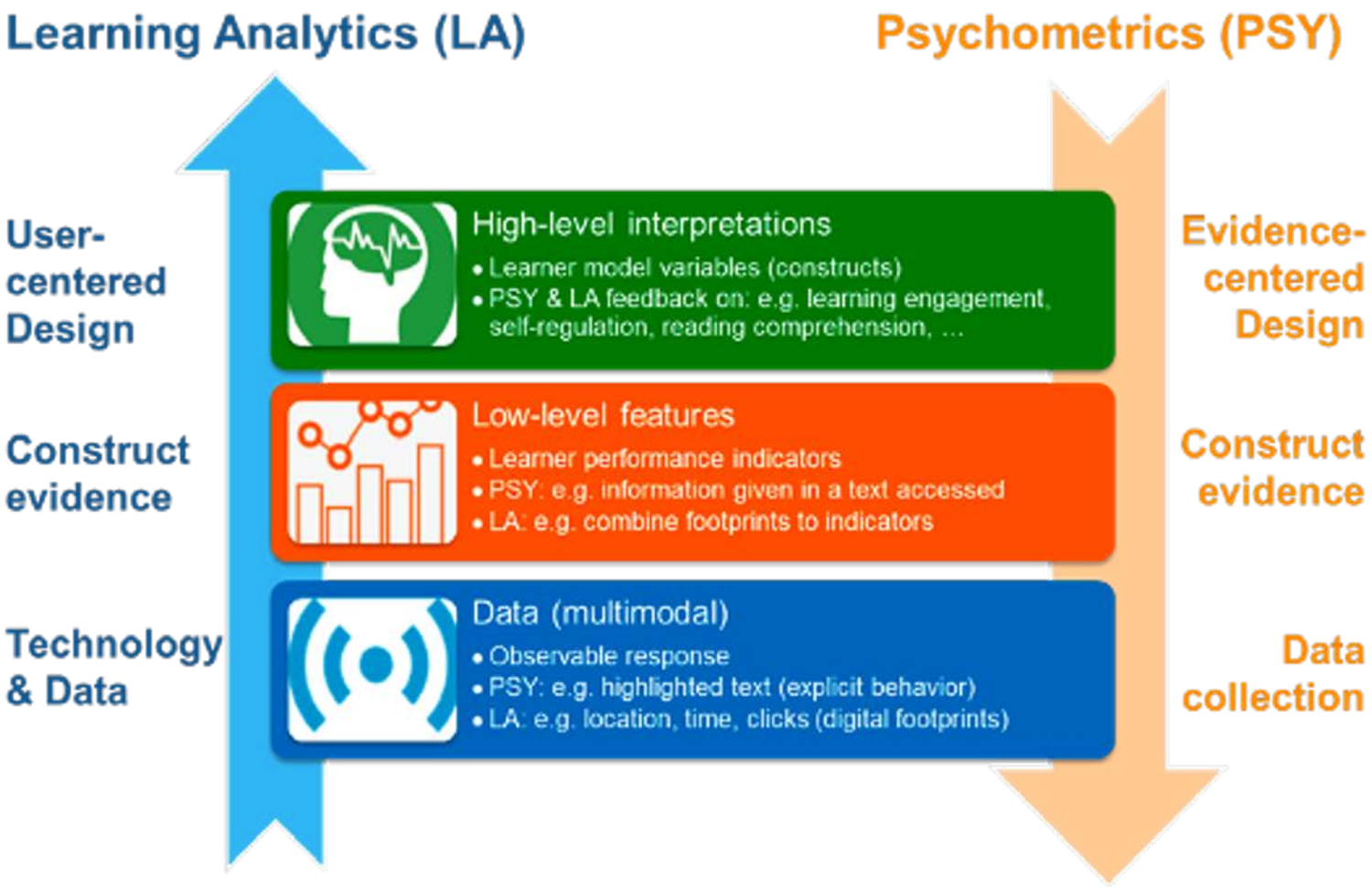

Drachsler, H. J., & Goldhammer, F. (2020). ***Learning Analytics and eAssessment: Towards Computational Psychometrics by Combining Psychometrics with Learning Analytic***s. In D. Burgos (Ed.), *Radical Solutions and Learning Analytics: Personalised Learning and Teaching Through Big Data* (pp. 67-80). Springer Nature Singapore. Lecture Notes in Educational Technology https://doi.org/10.1007/978-981-15-4526-9_5

Computational Psychometrics

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DiFA

Digital Formative Assessment –
Unfolding its full potential by combining psychometrics with learning analytics

HICOF-DL
Highly Informative and Competence-based Feedback for Digital Learning

HESSEN
Ministerium für Digitale Strategie und Entwicklung
Distr@l – Förderprogramm Digitalisierung stärken

Computational Psychometrics

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- Formative & Summative Assessment
- Evaluation of learning and competence development
- LA supported Process & Competence Model
- Feedback on learning process & learning outcomes

Computational Psychometrics

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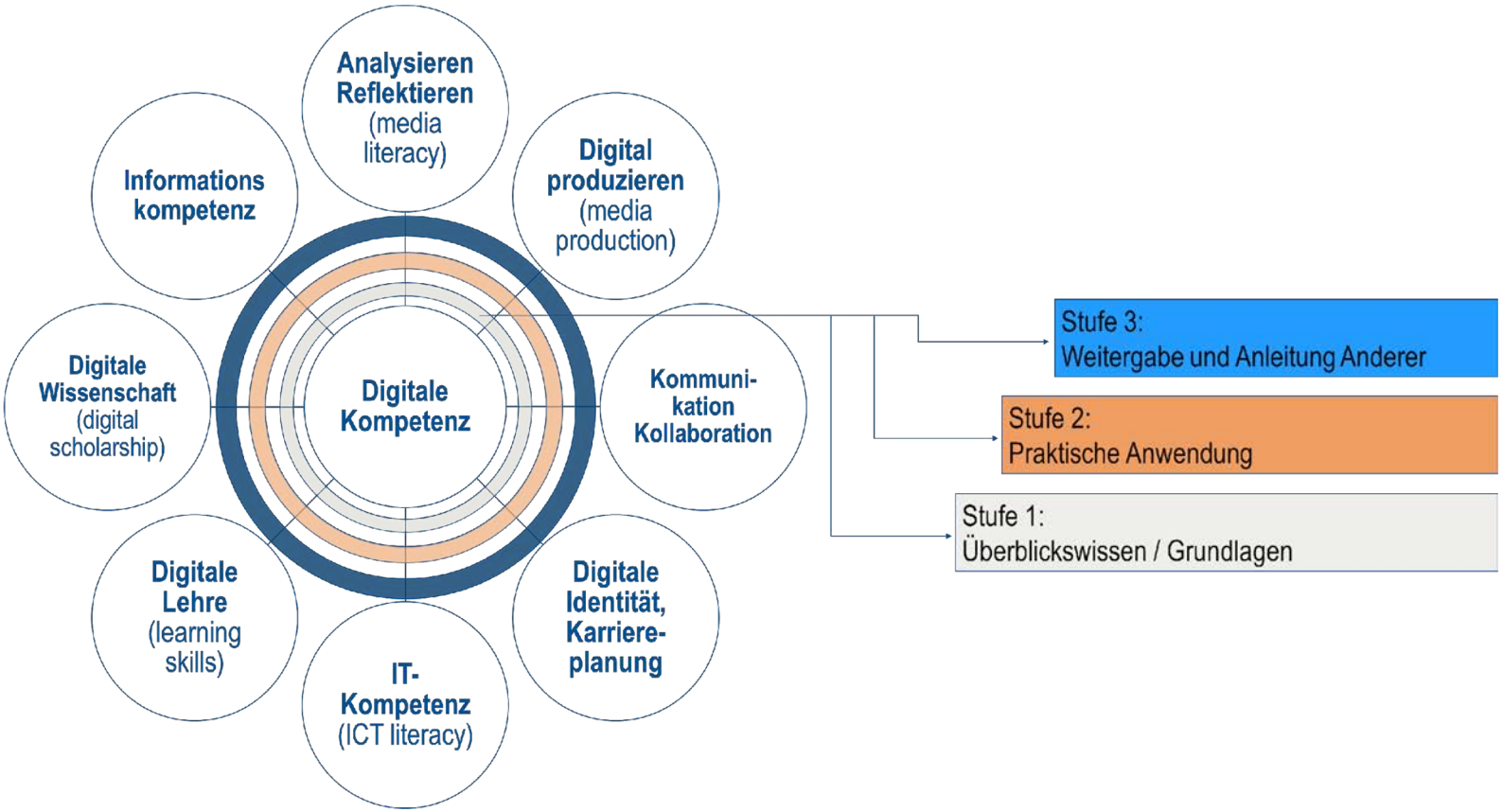

Eichhorn, M., Müller, R., & Tillmann, A. (2017). ***Entwicklung eines Kompetenzrasters zur Erfassung der " Digitalen Kompetenz"*** *von Hochschullehrenden* (pp. 209-219).

Computational Psychometrics

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Tabelle·1:·Theoretisches·Kompetenzmodell·

			Kognitives Anforderungsniveau					
Themenbereich	**2. Ebene**	**3. Ebene**	**Wissen**	**Verständnis**	**Anwendung**	**Analyse**	**Synthese**	**Beurteilung**
1. Grundlagen von Unterricht	1.1.1 Begriffklärungen							
	1.1.2 Normative Vorstellungen von Unterricht im Wandel der Zeit							
	1.1.3 Effektivität von Unterricht							
	1.1.4 Angebots-Nutzungs-Modell							
2. Grundlagen des Lernens	2.1 Lernen und Gedächtnis	2.1.1 Lernen						
		2.1.2 Gedächtnis						
		2.1.3 Informationsverarbeitung						
	2.2 Lerntheorien	2.2.1 Lernstrategien und Metakognition						
		2.2.2 Grundlagen bedeutender Lerntheorien						
	2.3 Differentielles Lernpotential	2.3.1 Kognitive Voraussetzungen						
		2.3.2 Motivationale Voraussetzungen						
		2.3.3 Umgang mit Heterogenität in der Klasse						
3. Inklusion	3.1 Grundlagen							
	3.2 Umsetzung							
	3.3 Effekte							
4. Unterrichtsqualität	4.1 Klassenführung	4.1.1 Sicht- und Tiefenstrukturen von Unterricht						
		4.1.2 Klassenführung als Tiefenstruktur						
		4.1.3 Die Studien von Kounin						
		4.1.4 Strategien der Klassenführung						
		4.1.5 Kann Klassenführung erlernt werden?						
	4.2 Kognitive Aktivierung	4.2.1 Kognitive Ebene des Unterrichts						
		4.2.2 Kognitive Aktivierung						
	4.3 Konstruktive Unterstützung	4.3.1 Konstruktive Unterstützung						
5. Unterrichtsgestaltung	5.1 Lehrkraftgesteuerte Methoden	5.1.1 Grundlagen der Unterrichtsgestaltung						
		5.1.2 Vortrag						
		5.1.3 Fragend-entwickelndes Gespräch						
		5.1.4 Direkte Instruktion						
	5.2 Schülerorientierte Methoden	5.2.1 Gruppenarbeit						
		5.2.2 Faktoren effektiver Gruppenarbeit						
		5.2.3 Kooperative Lernmethoden						
	5.3 Aufgabenorientierte Methoden	5.3.1 Offene Methoden						
		5.3.2 Grundprinzipien						
		5.3.3 Entdeckendes Lernen						
		5.3.4 Stationenarbeit						
		5.3.5 Effekte und Herausforderungen						
	5.4 Nutzung digitaler Medien	5.4.1 Grundlagen						
		5.4.2 Anwendungsbeispiele						

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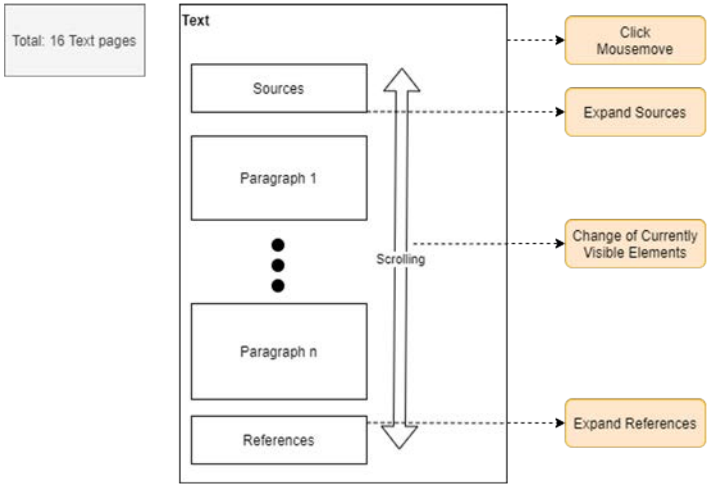
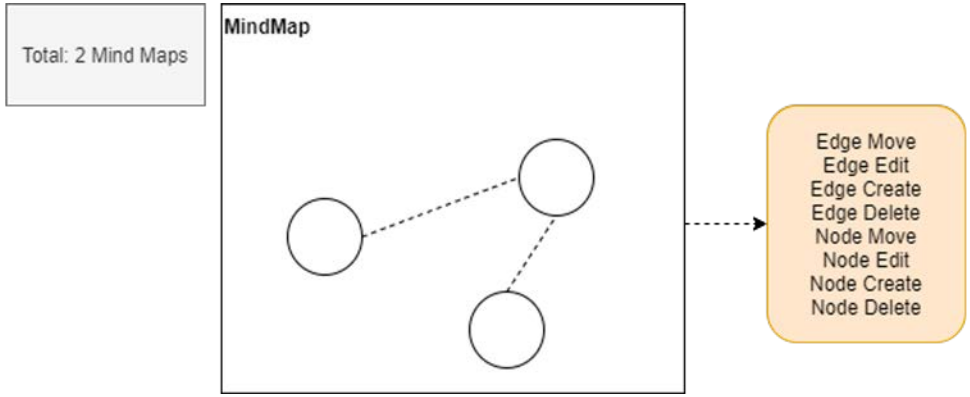
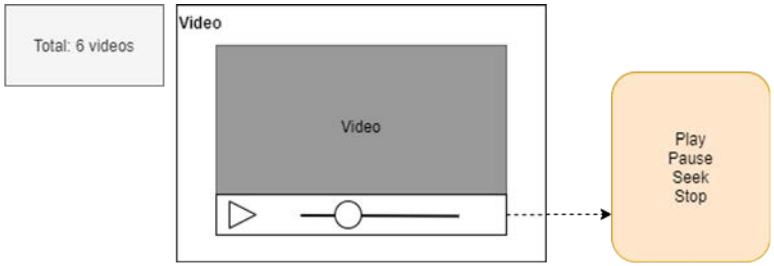
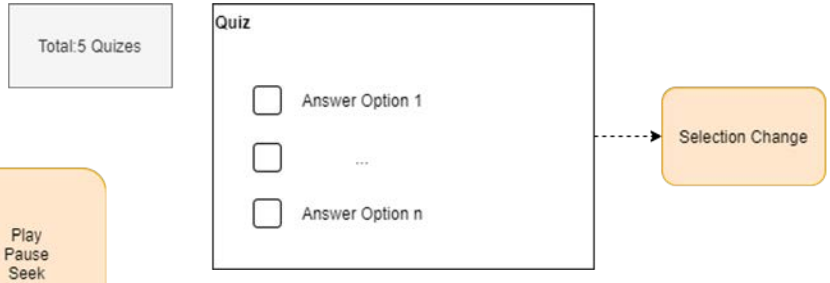




Daniel Biedermann

Doctoral researcher





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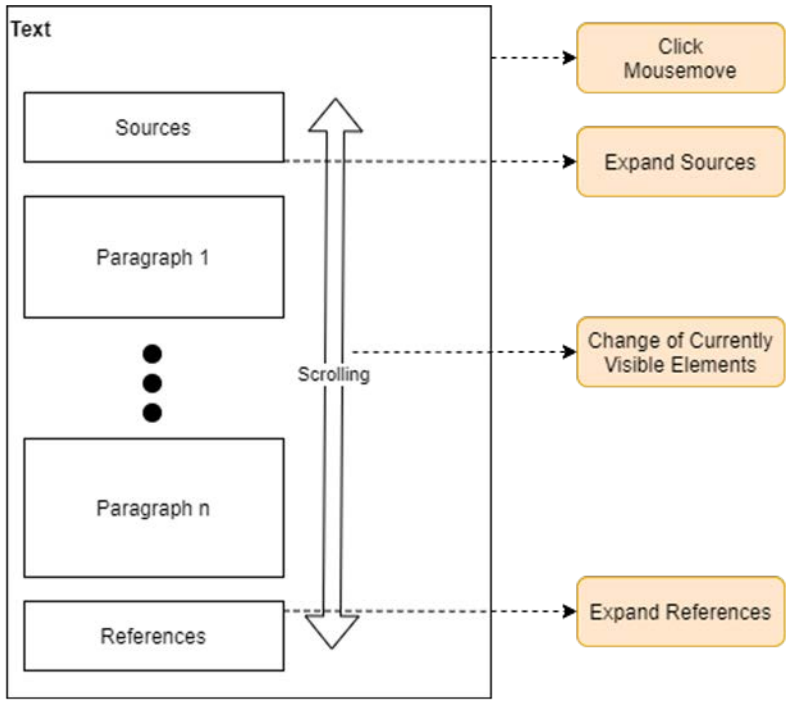

Number of Events per User total

Click
M: 994.45
SD: 747.39

Mousemove
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SD: 1746.40

Expand Sources
M: 6.11
SD: 20.73

Expand References
M: 3.44
SD: 11.01

Daniel Biedermann
Doctoral researcher

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Adaptive feedback on text

ID	Dimension	Status	Observable Action	Measure
3001	Sourcing	Included in 3010	Attending source	Number of times clicking on "source" link next to learning resource
3002	Sourcing	https://gitlab.tba-hosting	Attending source	Number of times clicking on "source" link next to learning resource **after** assignment (this refers to quiz/Selbsttes
3009	Sourcing	https://gitlab.tba-hosting	Proactive Sourcing	Number of times clicking on "source" link next to learning resource in first 10% of processing time (alternatively,
3010	Sourcing	https://gitlab.tba-hosting	Multiple Sourcing	Number of times a "source" link has been clicked multiple times (probably contextualization, might happen when
3011	Sourcing	https://		
3012	Sourcing	pendin		
3013	Sourcing	https://		
3014	Sourcing	https://		
3015	Sourcing	https://		
3016	Sourcing	pendin		
3017	Sourcing	pendin		
3018a	Sourcing	pendin		
3018b	Sourcing	pendin		
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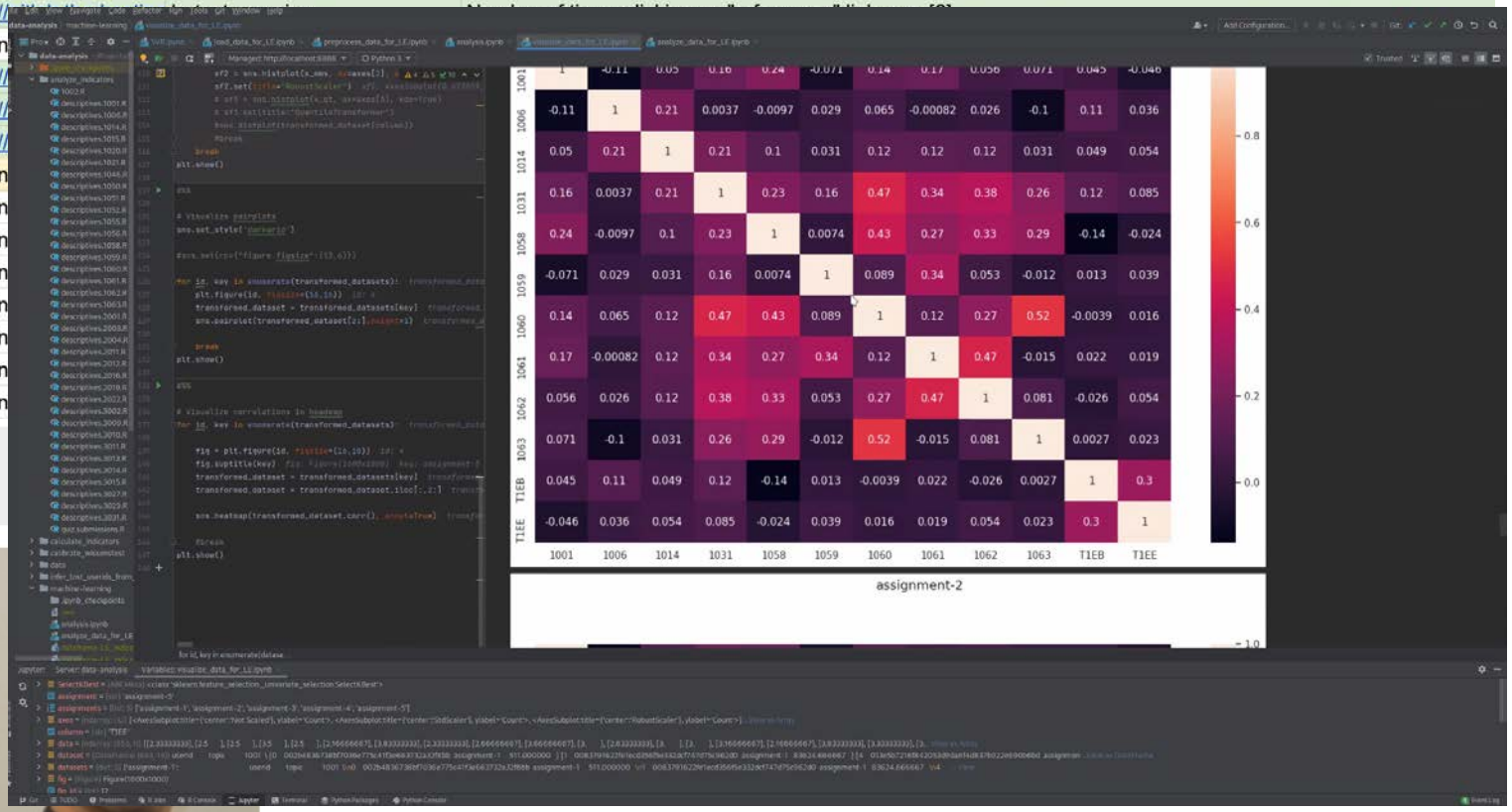

Daniel Biedermann
Doctoral researcher

Feedback Hattie & Timperley 2007

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Purpose
To reduce discrepancies between current understandings/performance and a desired goal

The discrepancy can be reduced by:

Students
- Increased effort and employment of more effective strategies *OR*
- Abandoning, blurring, or lowering the goals

Teachers
- Providing appropriate challenging and specific goals
- Assisting students to reach them through effective learning strategies and feedback

Effective feedback answers three questions

Where am I going? (the goals)	Feed Up
How am I going?	Feed Back
Where to next?	Feed Forward

Each feedback question works at four levels:

Task level	Process level	Self-regulation level	Self level
How well tasks are understood/performed	The main process needed to understand/perform tasks	Self-monitoring, directing, and regulating of actions	Personal evaluations and affect (usually positive) about the learner

Dr. Jane Yau
Postdoctoral researcher

Hattie, J., & Timperley, H. (2007). ***The Power of Feedback. Review of Educational Research***, 77(1), 81–112. https://doi.org/10.3102/003465430298487

High Informative Feedback

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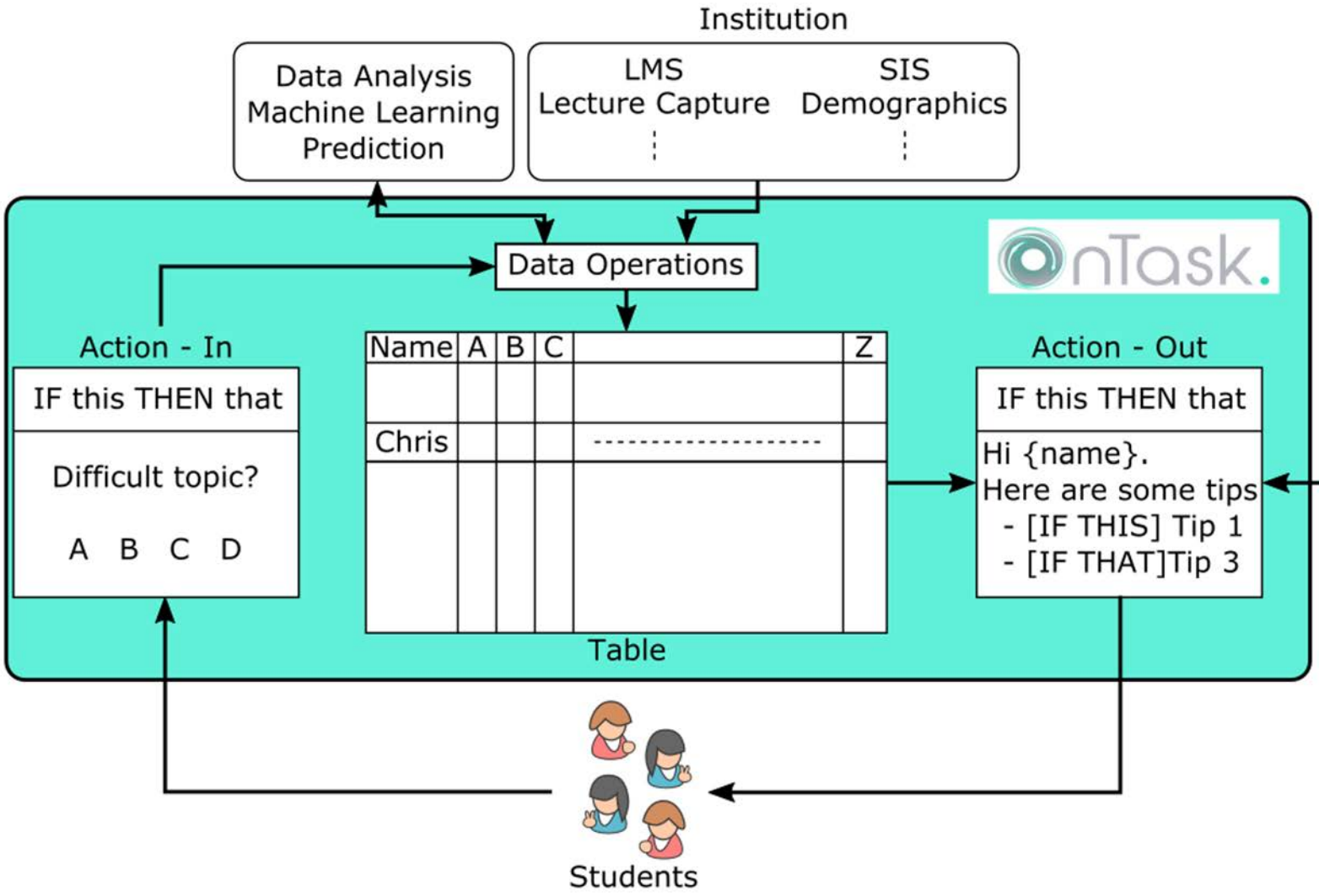
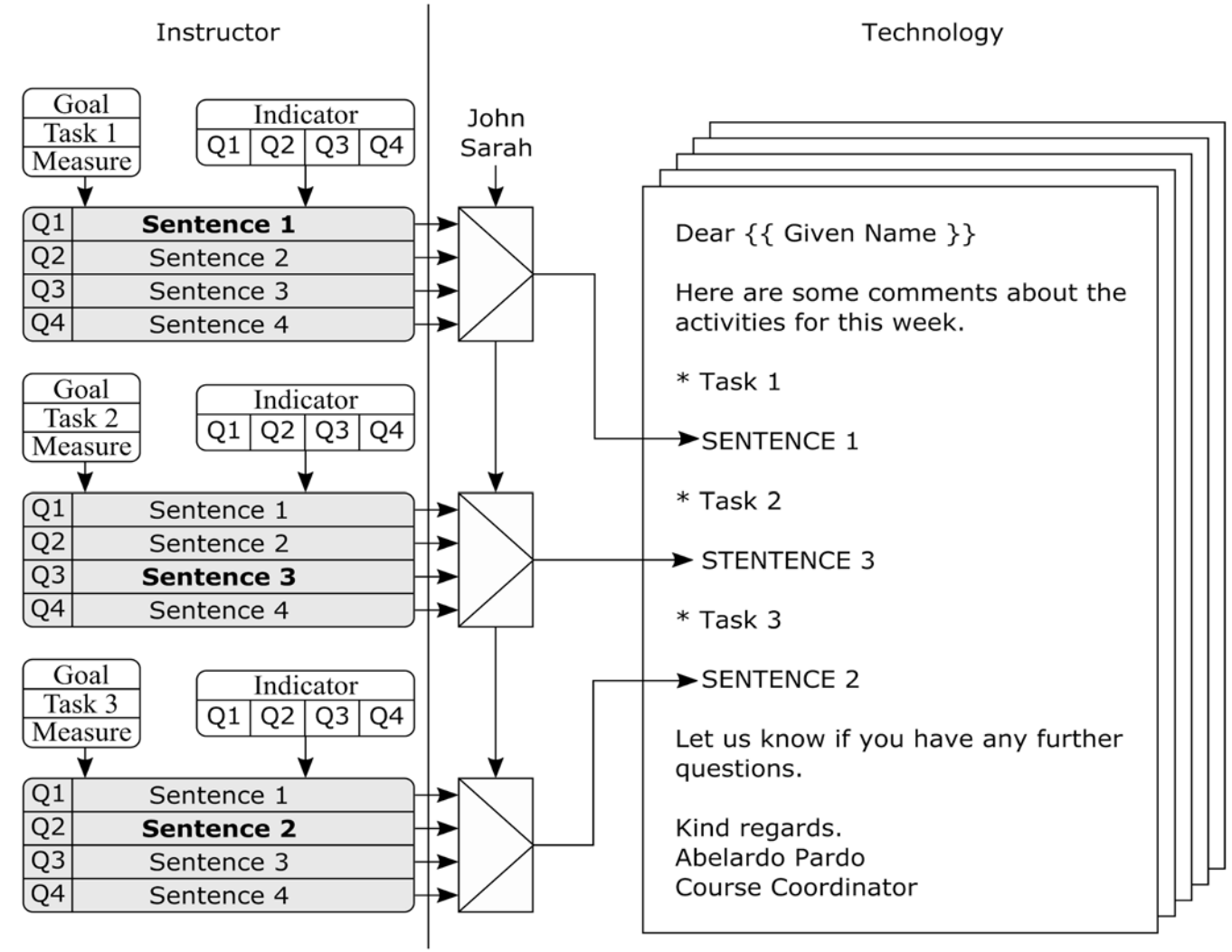


Pardo, A., Bartimote, K., Shum, S. B., Dawson, S., Gao, J., Gašević, D., ... & Vigentini, L. (2018). **OnTask: Delivering data-informed, personalized learning support actions.** Journal of Learning Analytics, 5(3), 235-249. https://learning-analytics.info/index.php/JLA/article/view/5988

High Informative Feedback



Dr. Ioana Jivet

Tornike Giorgashvili

Pardo, A., Bartimote, K., Shum, S. B., Dawson, S., Gao, J., Gašević, D., ... & Vigentini, L. (2018). **OnTask: Delivering data-informed, personalized learning support actions.** Journal of Learning Analytics, 5(3), 235-249. https://learning-analytics.info/index.php/JLA/article/view/5988

High Informative Feedback

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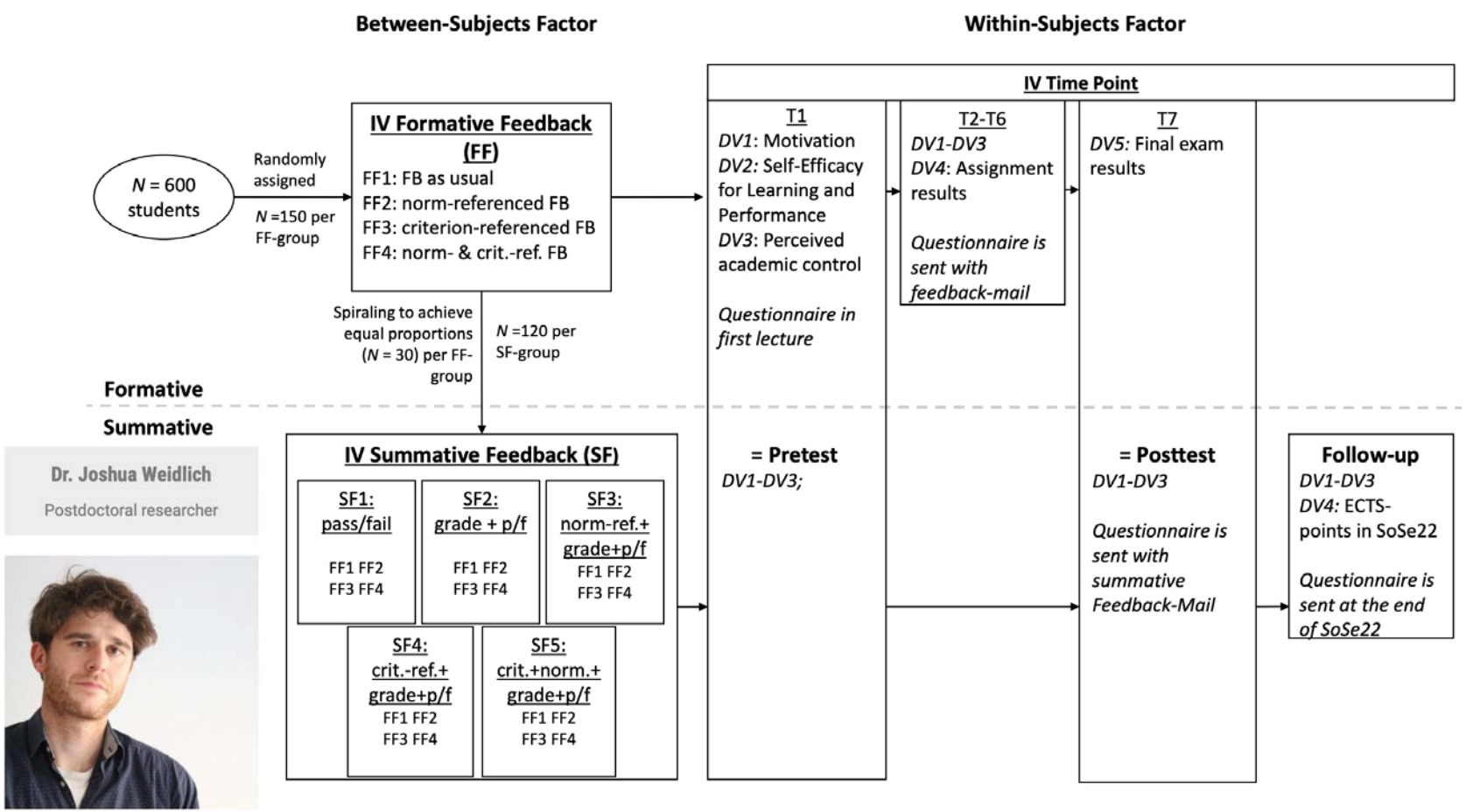
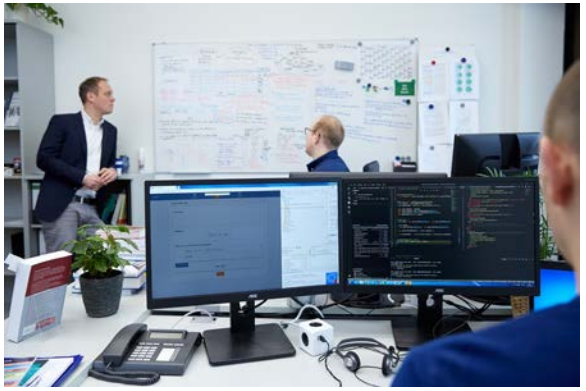
What is the effect of different formative and summative feedback types for assignment results, exam performance, and affective student variables?



Dr. Joshua Weidlich
Postdoctoral researcher

Questions?



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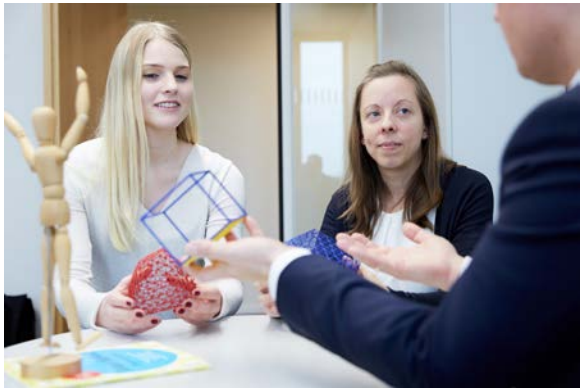
@hdrachsler

drachsler@dipf.de



https://www.linkedin.com/in/hendrikdrachsler