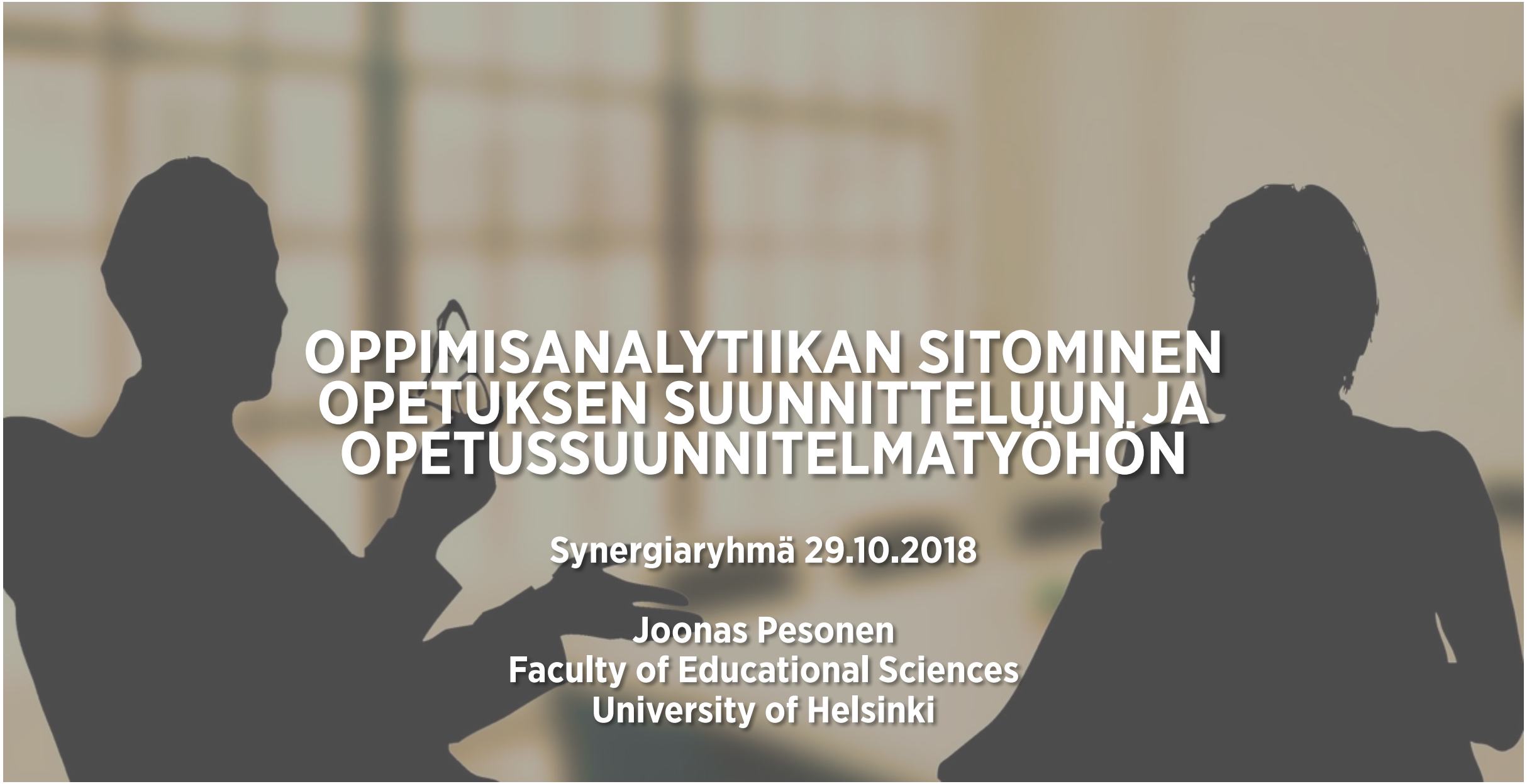


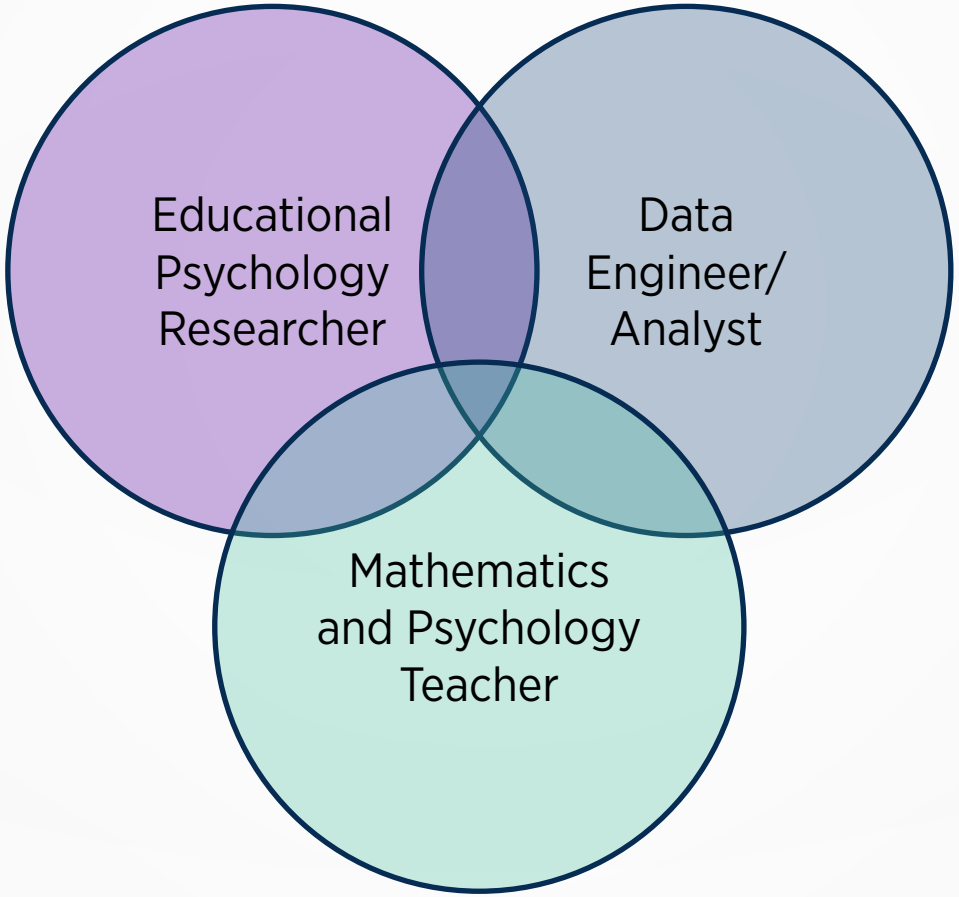
OPPIMISANALYTIIKAN SITOMINEN OPETUKSEN SUUNNITTELUUN JA OPETUSSUUNNITELMATYÖHÖN

Synergiaryhmä 29.10.2018

Joonas Pesonen
Faculty of Educational Sciences
University of Helsinki

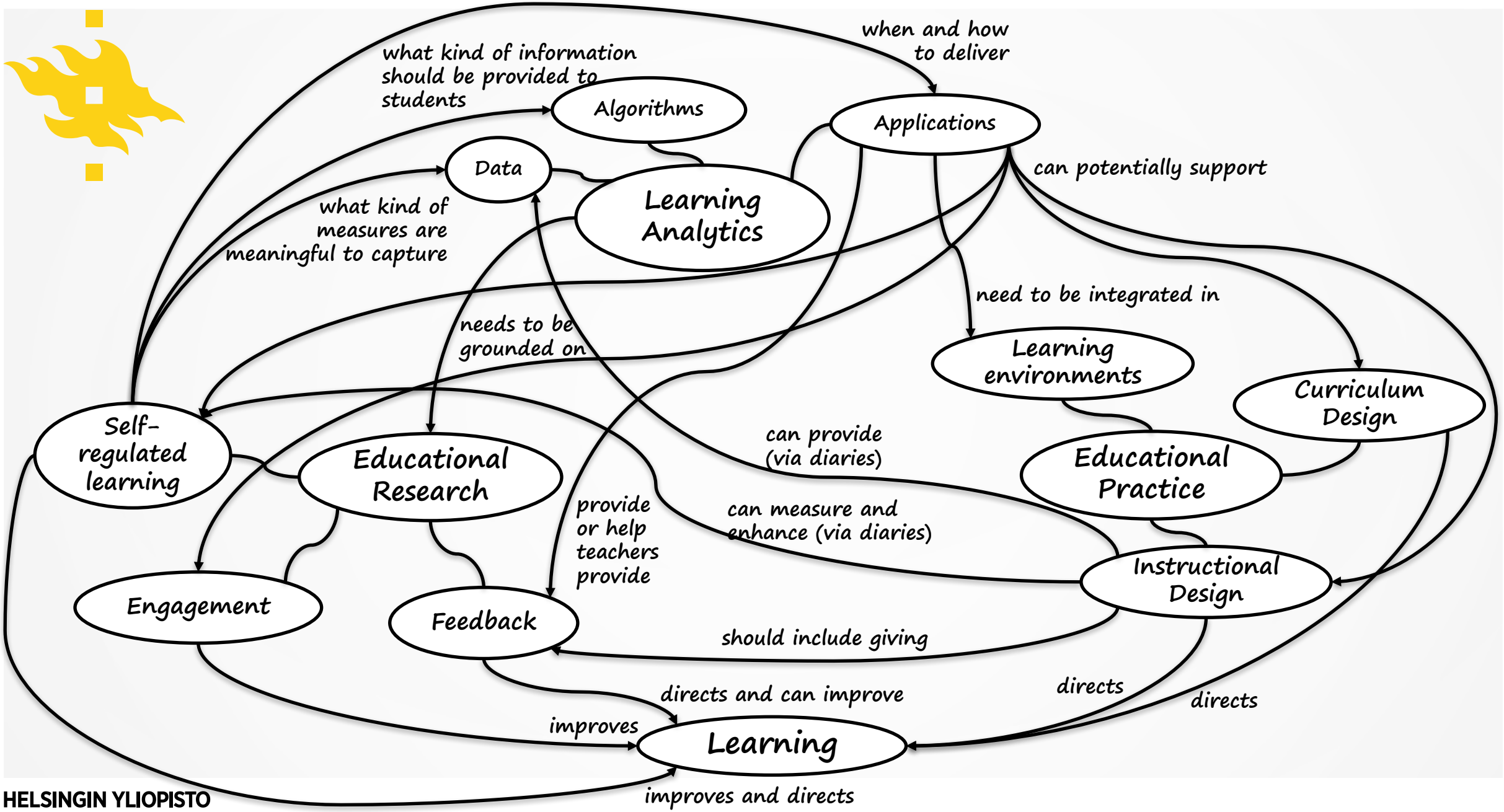
MY PERSONAL PERSPECTIVE ON LEARNING ANALYTICS

2018-
University of Helsinki



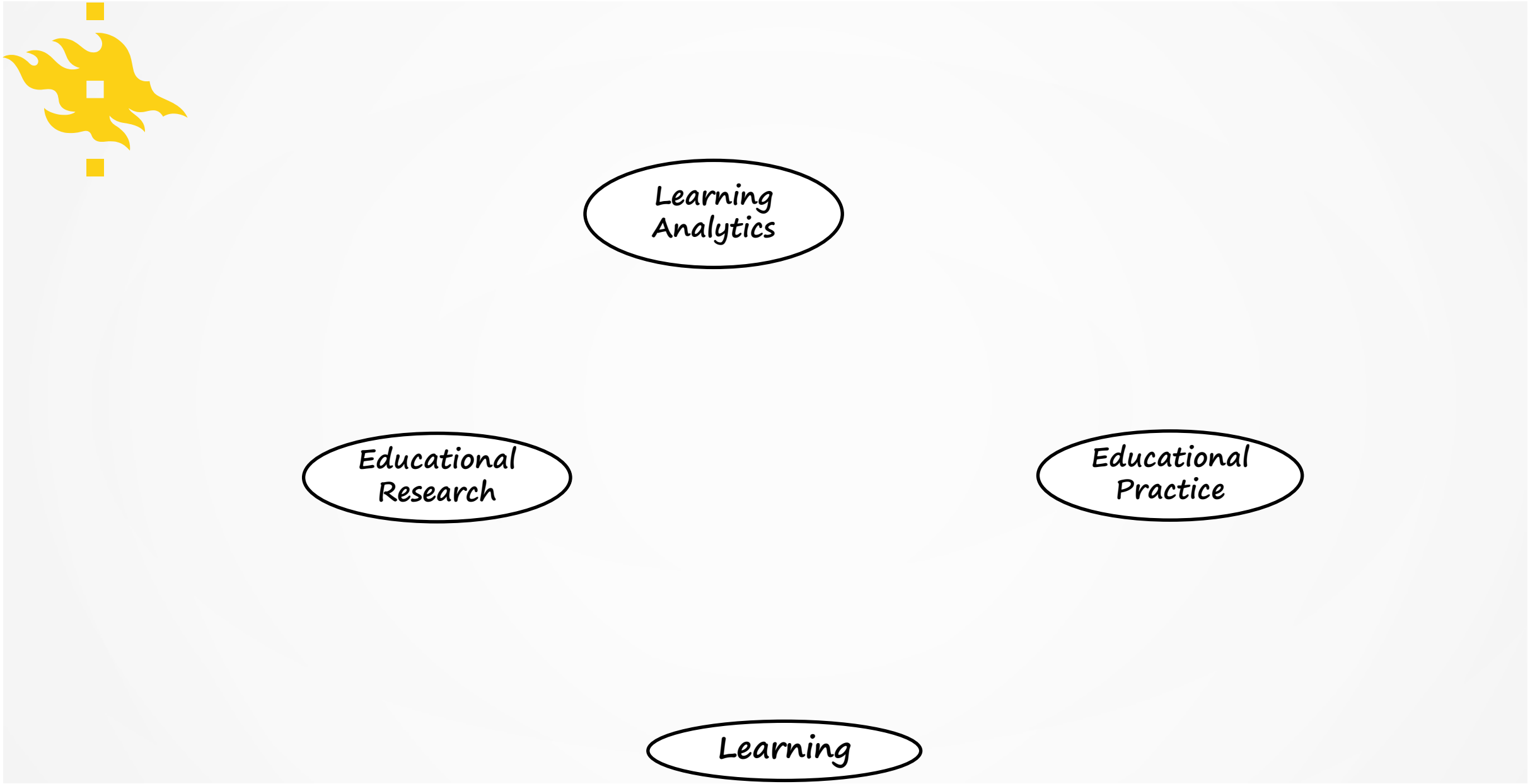
2017- Rapida Oy
2012-2017 CSC

M.Sc., University of Helsinki, 2013


when and how to deliver
what kind of information should be provided to students
Algorithms
Applications
Data
Learning Analytics
can potentially support
what kind of measures are meaningful to capture
need to be integrated in
needs to be grounded on
Learning environments
Curriculum Design
Self-regulated learning
Educational Research
can provide (via diaries)
Educational Practice
provide or help teachers provide
can measure and enhance (via diaries)
Instructional Design
Engagement
Feedback
should include giving
directs and can improve
directs
directs
improves
Learning
improves and directs

CONTENTS

1
LEARNING ANALYTICS & EDUCATIONAL RESEARCH


Learning Analytics
Educational Research
Educational Practice
Learning

LEARNING ANALYTICS DEFINITION

”the measurement, collection, analysis and reporting of data about learners and their contexts for purposes of understanding and optimizing learning and the environments in which it occurs”

1st International Conference on Learning Analytics and Knowledge (2010). Website. Available: https://tekri.athabascau.ca/analytics/.

FUNDAMENTAL QUESTIONS OF LA (WINNE 2017)

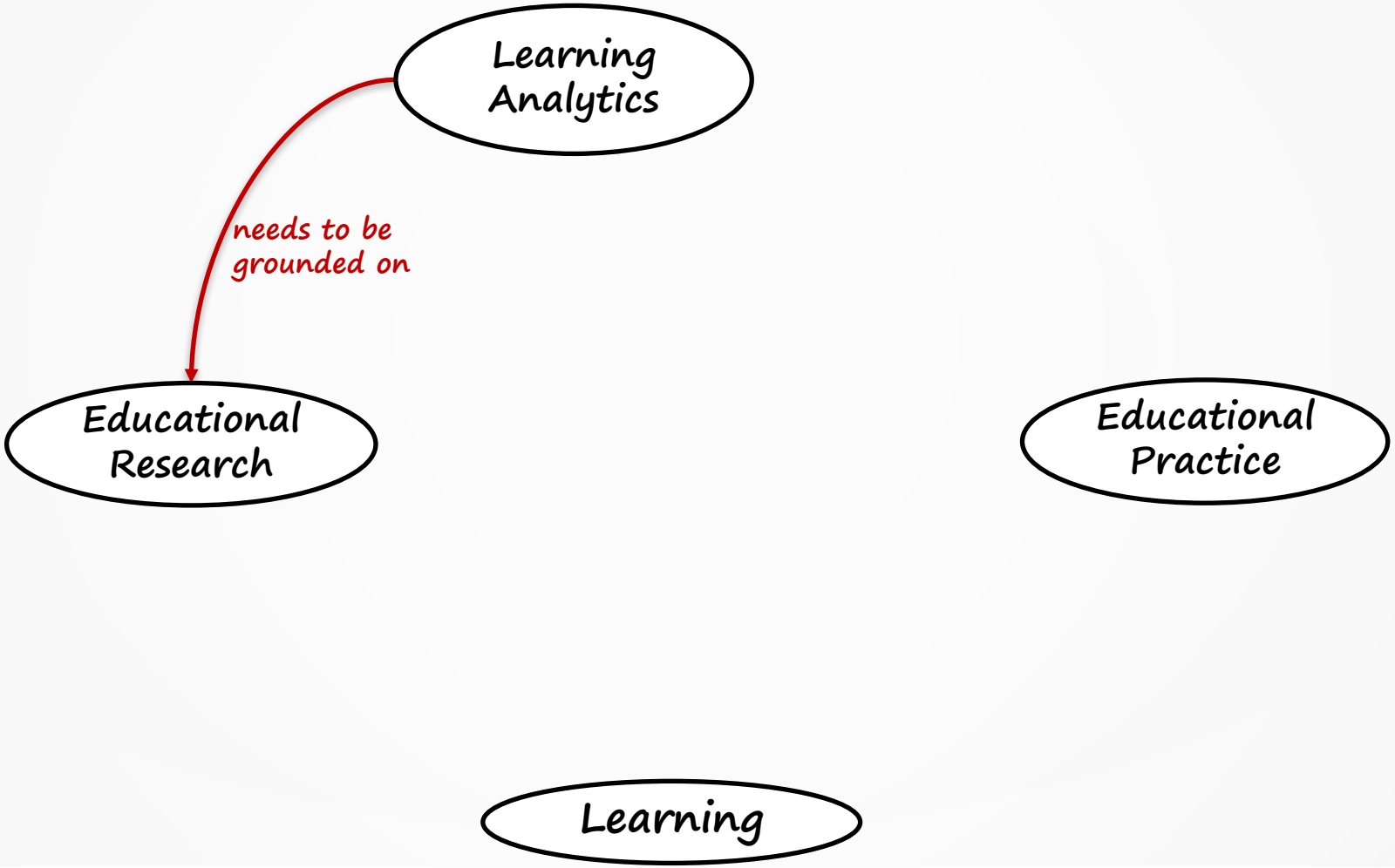
1. What data should be gathered?
2. What kind of LA interventions are valid?
3. Who generates data?
4. Who receives learning analytics?
5. What are learning analytics supposed to help improve?
6. What standards should be used to gauge improvement?

Winne, P. H. (2017). Learning Analytics for Self-Regulated Learning. In Columbia University, USA, C. Lang, G. Siemens, University of Texas at Arlington, USA, A. Wise, New York University, USA, … University of Edinburgh, UK (Eds.), *Handbook of Learning Analytics* (First, pp. 241–249). Society for Learning Analytics Research (SoLAR).

GAŠEVIĆ, DAWSON & SIEMENS (2015)

*”Computational aspects of learning analytics need to be linked with the **existing educational research** if the field of learning analytics is to deliver to its promise to understand and optimize learning.”*

Gašević, D., Dawson, S., & Siemens, G. (2015). Let’s not forget: Learning analytics are about learning. *TechTrends*, *59*(1), 64–71.


Learning Analytics
needs to be grounded on
Educational Research
Educational Practice
Learning

JIVET ET AL. (2017)

- A review of 95 research papers on learning analytics dashboards
- Only 26 of dashboards relied on educational concepts and were empirically evaluated

”This might indicate, that development of these tools is still driven by the need to leverage the learning data available, rather than a clear pedagogical focus of improving learning”

Jivet, I., Scheffel, M., Drachsler, H., & Specht, M. (2017). Awareness Is Not Enough: Pitfalls of Learning Analytics Dashboards in the Educational Practice. In *Data Driven Approaches in Digital Education* (pp. 82–96). Springer International Publishing.

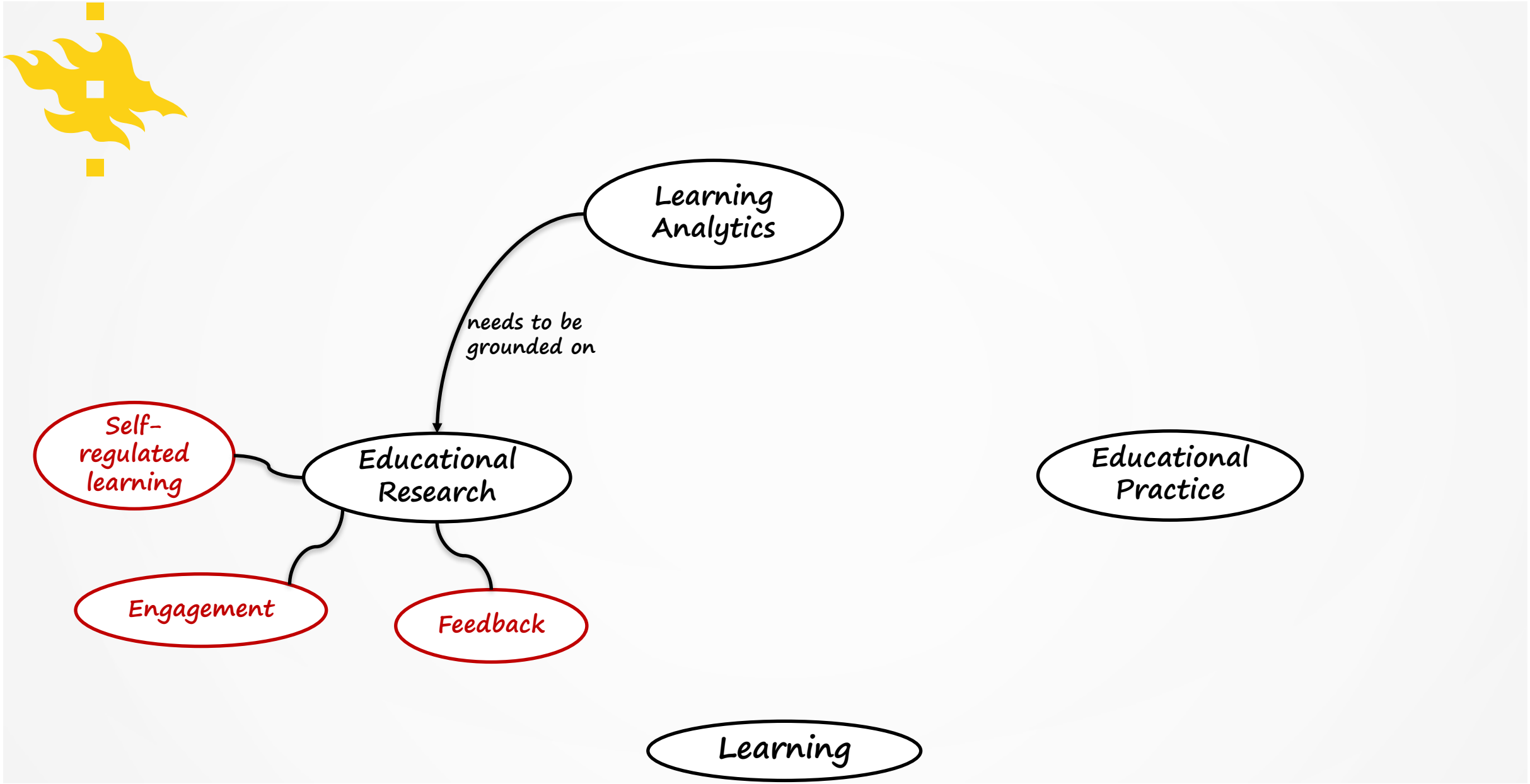
WHICH EDUCATIONAL THEORIES LA NEEDS TO BE LINKED WITH?

A few suggestions...

Self-regulated learning

Student engagement

Feedback


Learning Analytics
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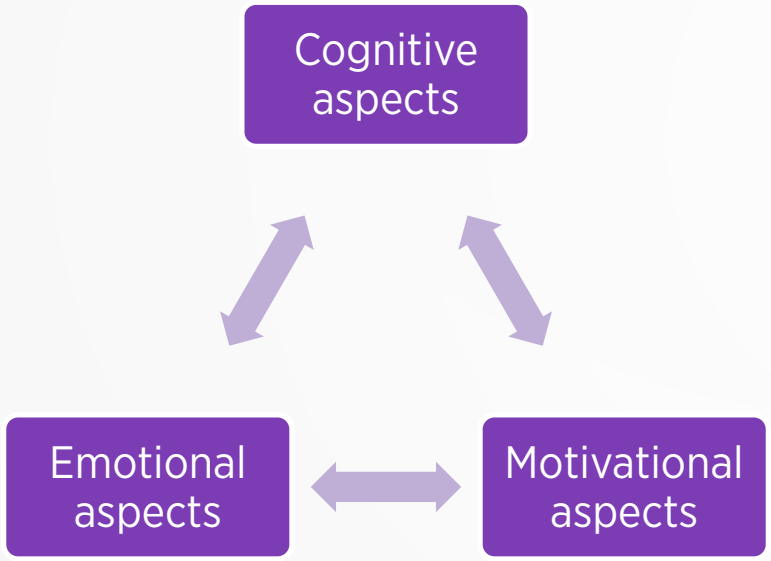
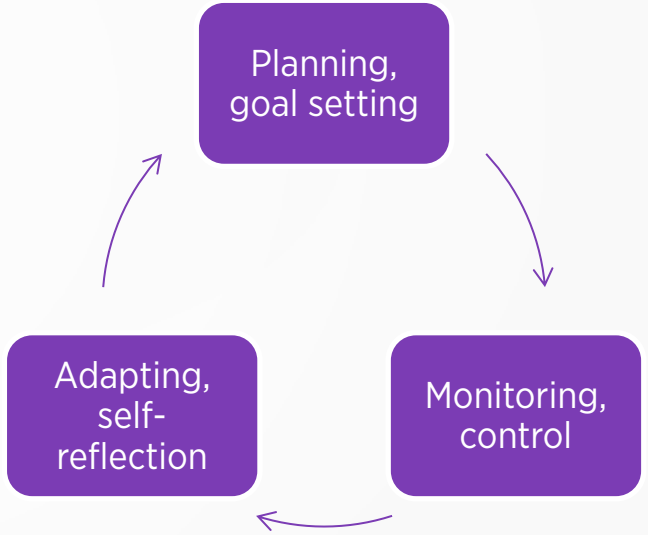
Self-regulated learning
Educational Research
Educational Practice
Engagement
Feedback
Learning

SELF-REGULATED LEARNING (SRL)

- Self-regulated learning is a core conceptual framework to understand the cognitive, motivational, and emotional aspects of learning (Panadero 2017)



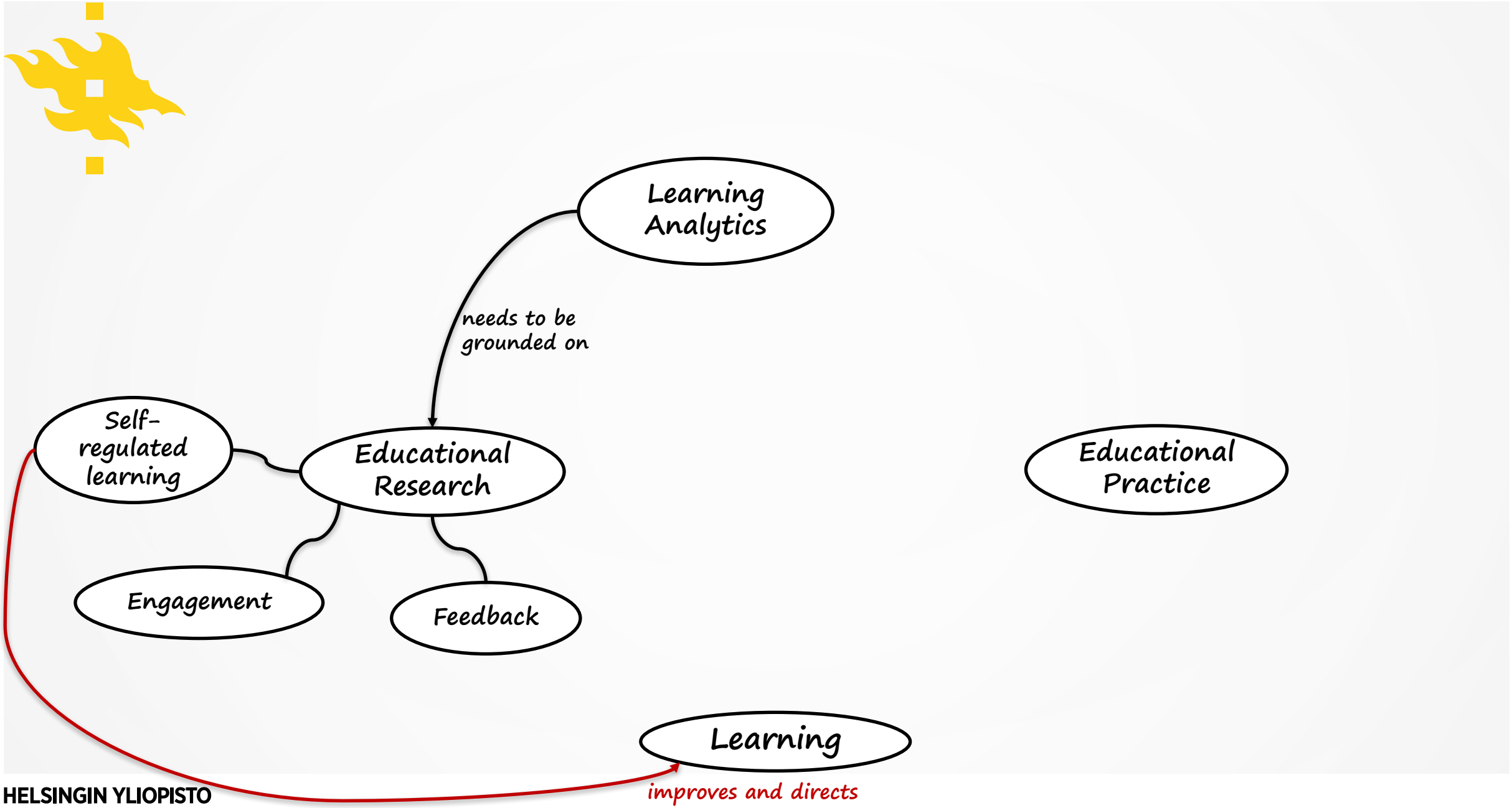


Panadero, E. (2017). A Review of Self-regulated Learning: Six Models and Four Directions for Research. *Frontiers in Psychology*, *8*, 422.

SELF-REGULATED LEARNING (SRL)

- SRL interventions are successful ways to improve students' learning! (Dignath & Büttner, 2008; Sitzmann & Ely, 2011)
- SRL interventions include e.g.
  - Self-assessment
  - Concept mapping
  - Learning diaries
  - Learning analytics dashboards

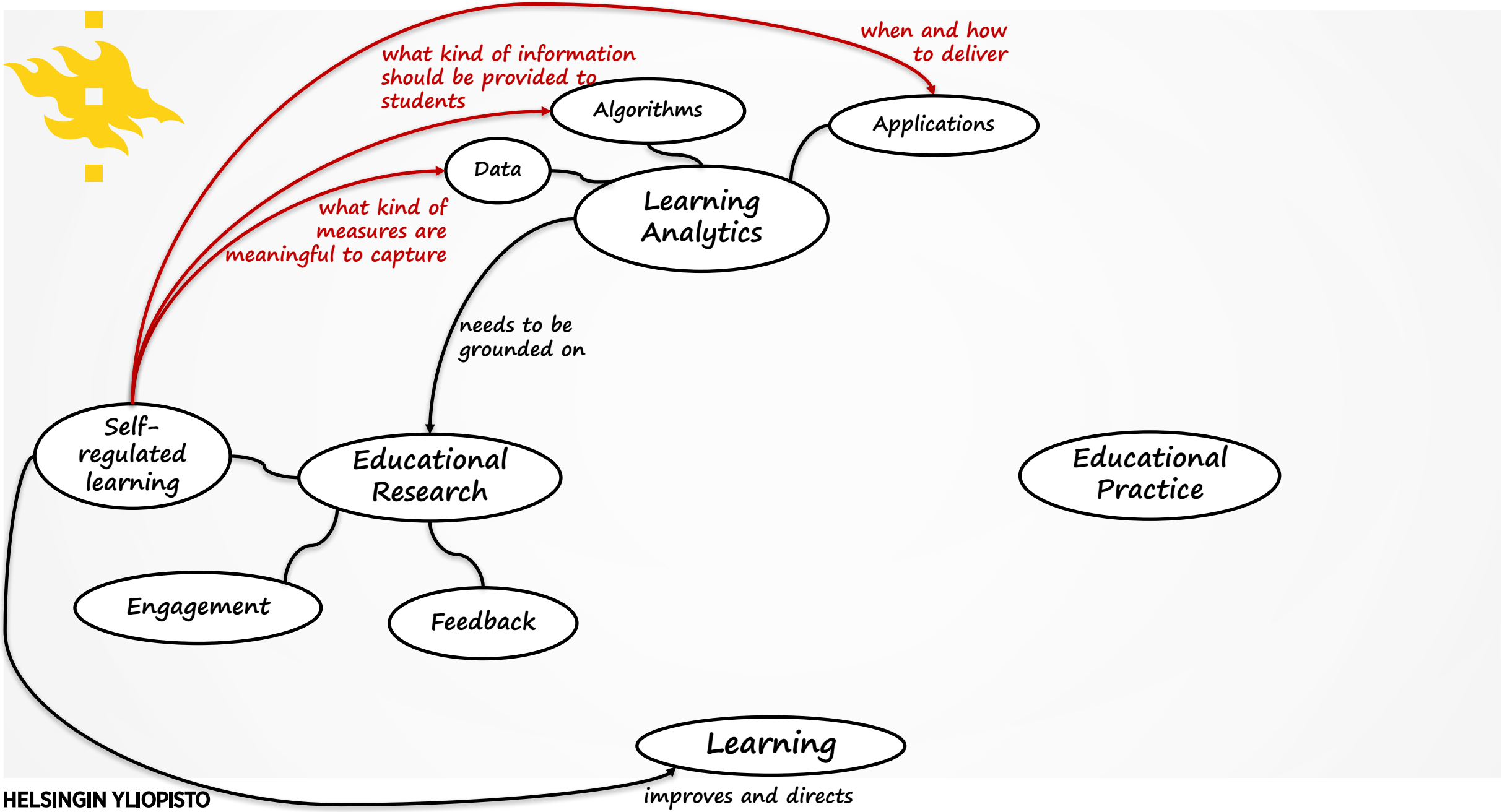
Dignath, C., & Büttner, G. (2008). Components of fostering self-regulated learning among students. A meta-analysis on intervention studies at primary and secondary school level. *Metacognition and Learning*, *3*(3), 231–264.
Sitzmann, T., & Ely, K. (2011). A meta-analysis of self-regulated learning in work-related training and educational attainment: what we know and where we need to go. *Psychological Bulletin*, *137*(3), 421–442.


Learning Analytics
needs to be grounded on
Self-regulated learning
Educational Research
Educational Practice
Engagement
Feedback
Learning
improves and directs

SRL AND LEARNING ANALYTICS

- SRL theory can guide (Winne, 2017)
  - what kind of measures are meaningful to capture
  - how and when to deliver the analytics
  - what kind of information should be provided to students to support SRL

Winne, P. H. (2017). Learning Analytics for Self-Regulated Learning. In Columbia University, USA, C. Lang, G. Siemens, University of Texas at Arlington, USA, A. Wise, New York University, USA, … University of Edinburgh, UK (Eds.), *Handbook of Learning Analytics* (First, pp. 241–249). Society for Learning Analytics Research (SoLAR).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Self-regulated learning
Educational Research
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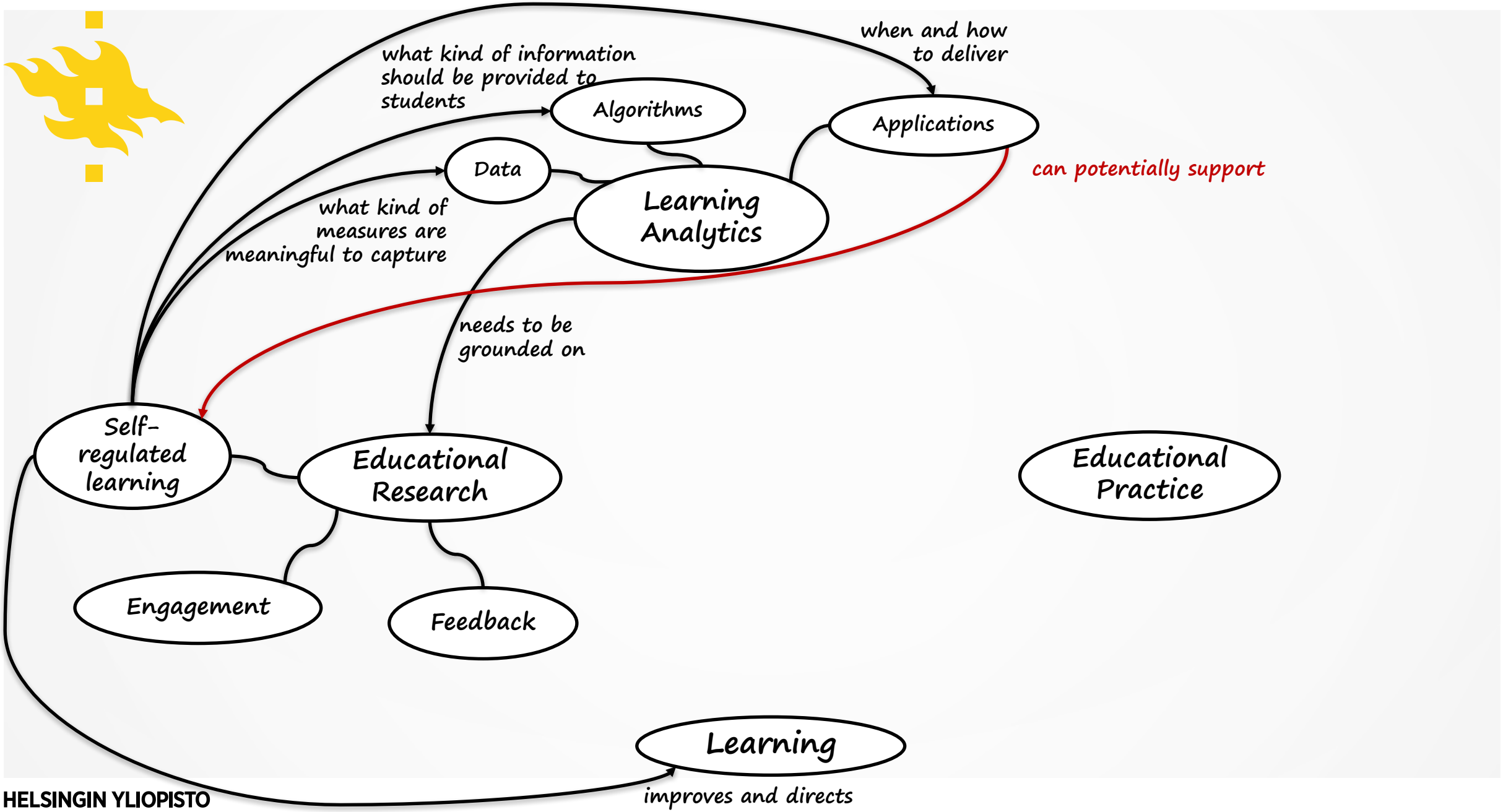
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Learning Analytics
what kind of measures are meaningful to capture
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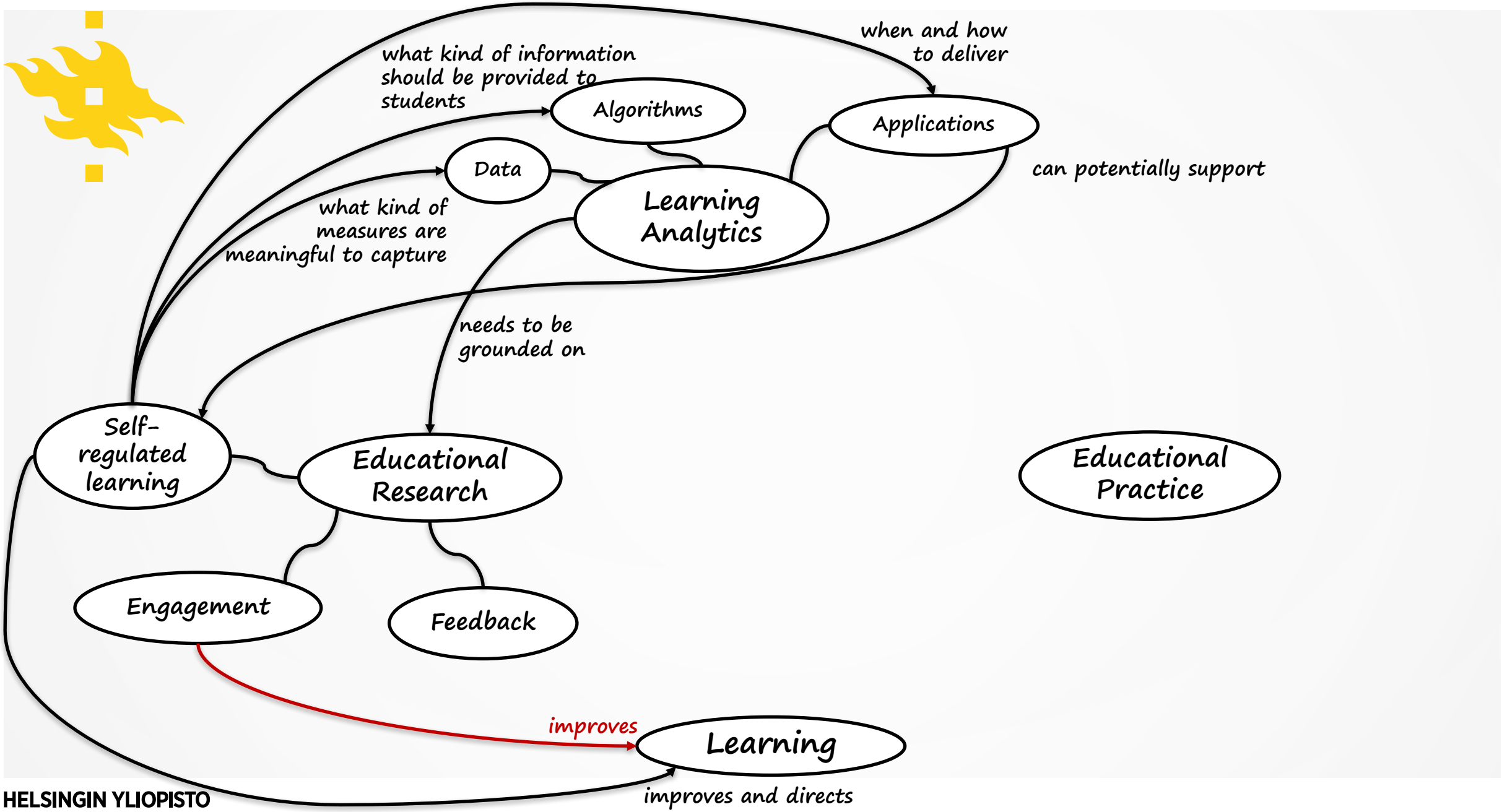
Self-regulated learning
Educational Research
Educational Practice
Engagement
Feedback
Learning
improves and directs

STUDENT ENGAGEMENT

- Higher education students' engagement in their studies is associated with higher learning and achievement measures (Trowler, 2010) and lower risk for study burnout (Salmela-Aro & Read, 2017)

Trowler, V. (2010). Student engagement literature review. *The Higher Education Academy*, *11*, 1–15.
Salmela-Aro, K., & Read, S. (2017). Study engagement and burnout profiles among Finnish higher education students. *Burnout Research*, *7*, 21–28.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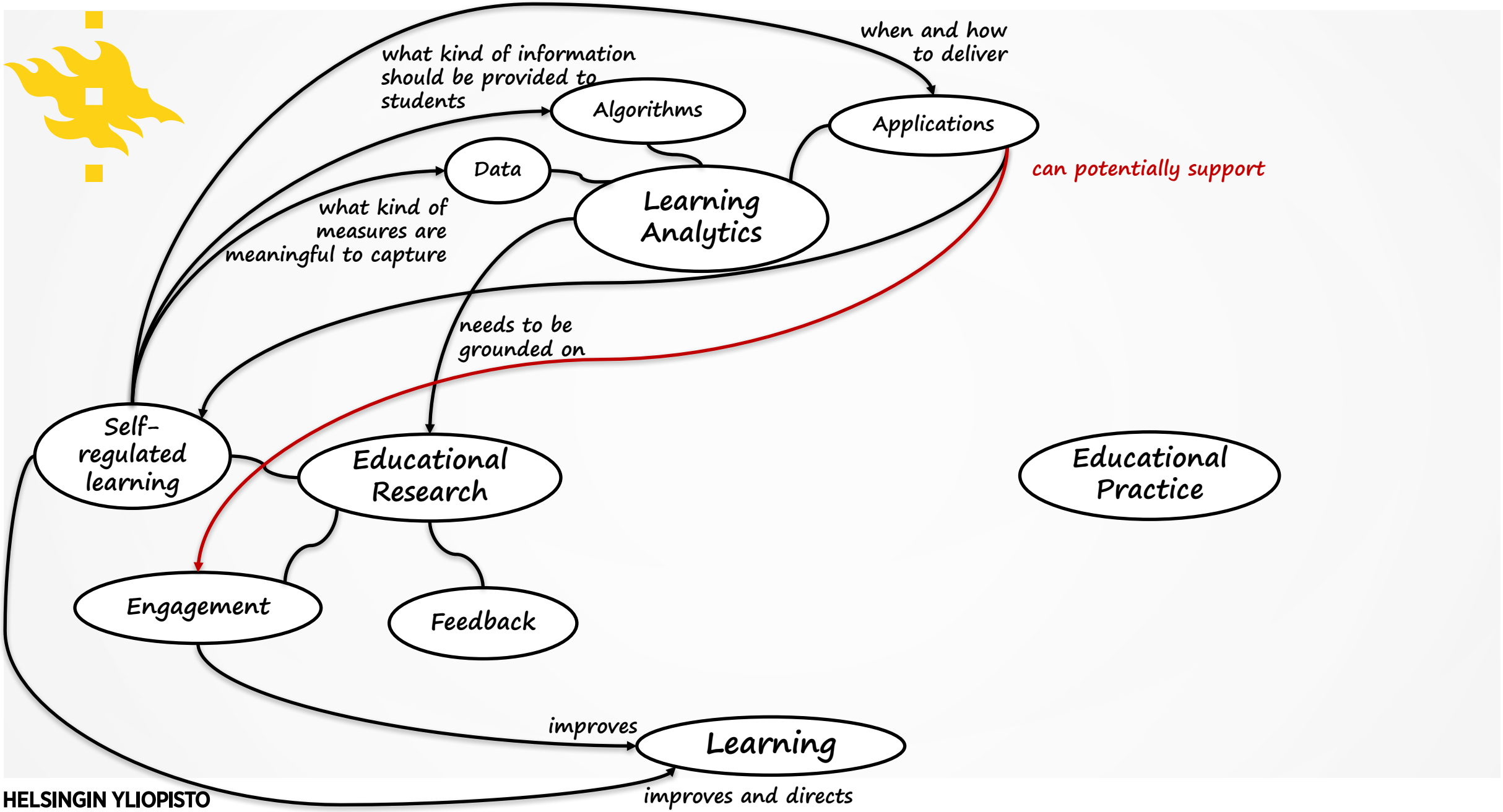
what kind of information should be provided to students
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Educational Research
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improves
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improves and directs

CONSTRUCT VALIDITY?

”Engagement” in educational research

A validated inventory with nine multiple-choice questions

”Engagement” in some learning analytics applications

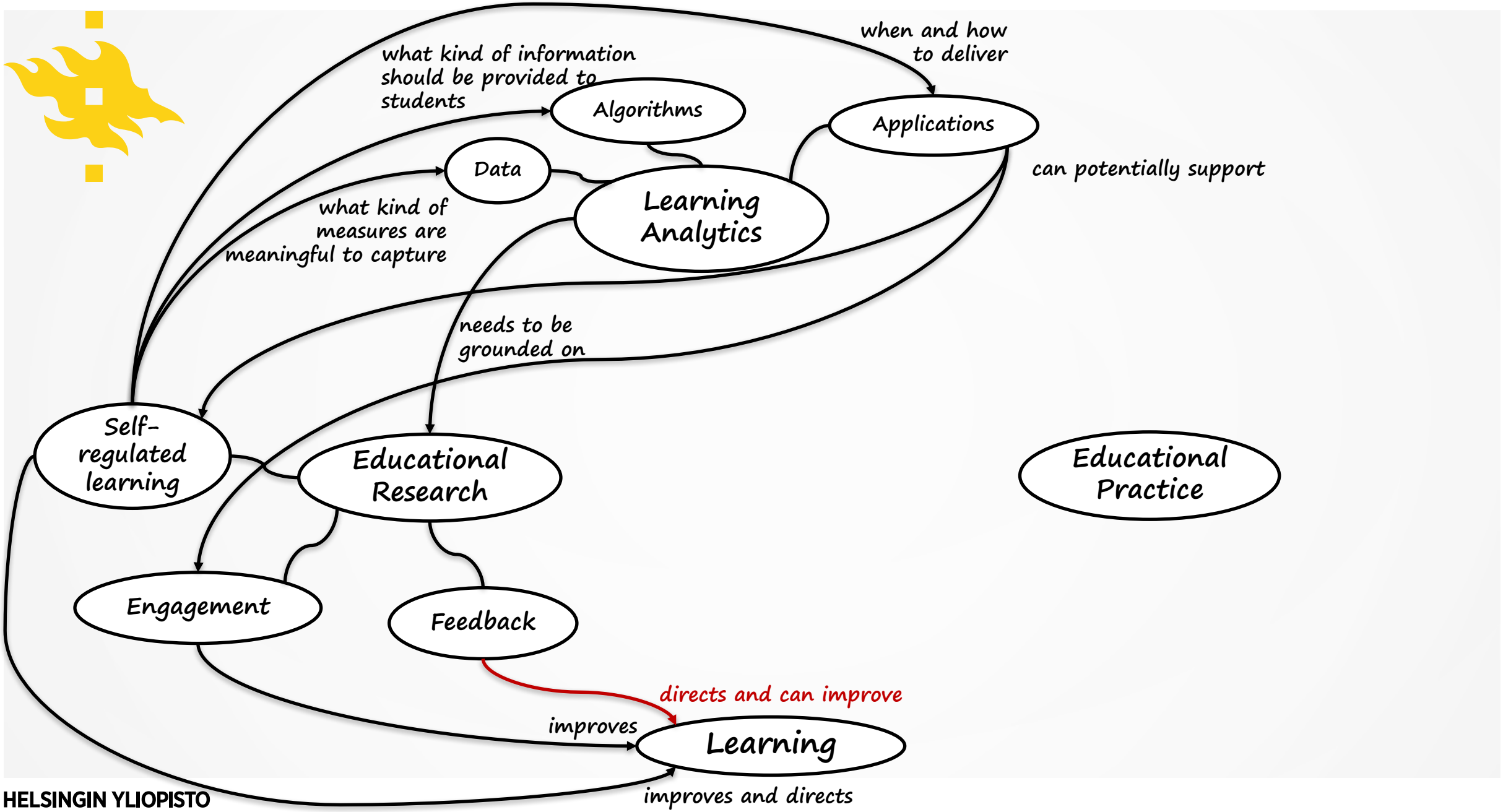
Number of clicks on an LMS

Salmela-Aro, K., & Upadaya, K. (2012). The Schoolwork Engagement Inventory. *European Journal of Psychological Assessment: Official Organ of the European Association of Psychological Assessment*, *28*(1), 60–67.

FEEDBACK

- Feedback is one of the most powerful influences on learning and achievement (Hattie & Timperley, 2007)
  - Effective feedback answers three questions: Where am I going? How am I going? Where to next?

Hattie, J., & Timperley, H. (2007). The Power of Feedback. *Review of Educational Research*, *77*(1), 81–112.


what kind of information should be provided to students
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Hattie, J., & Timperley, H. (2007). The Power of Feedback. *Review of Educational Research*, *77*(1), 81–112.
Sedrakyan, G., Malmberg, J., Verbert, K., Järvelä, S., & Kirschner, P. A. (2018). Linking learning behavior analytics and learning science concepts: Designing a learning analytics dashboard for feedback to support learning regulation. *Computers in Human Behavior*.

FEEDBACK

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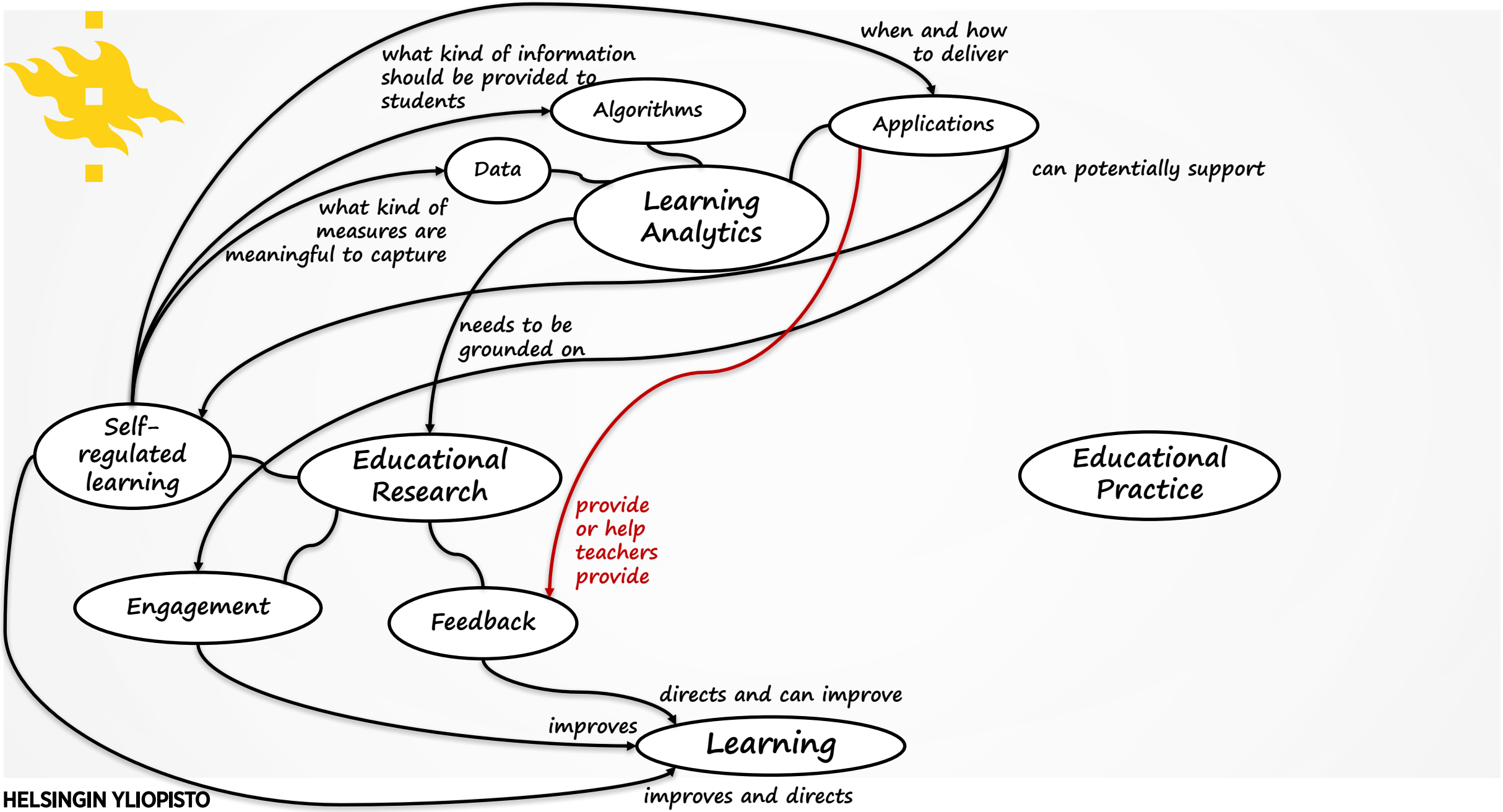
  - Effective feedback answers three questions: Where am I going? How am I going? Where to next?
- Learning analytics dashboards are feedback instruments and should be examined within conceptual framework of feedback (Sedrakyan et al., 2018)
- With learning analytics methods, the provision of personalised feedback can be scaled up (Pardo et al., 2017)

Hattie, J., & Timperley, H. (2007). The Power of Feedback. *Review of Educational Research*, *77*(1), 81–112.
Sedrakyan, G., Malmberg, J., Verbert, K., Järvelä, S., & Kirschner, P. A. (2018). Linking learning behavior analytics and learning science concepts: Designing a learning analytics dashboard for feedback to support learning regulation. *Computers in Human Behavior*.
Pardo, A., Jovanovic, J., Dawson, S., Gašević, D., & Mirriahi, N. (2017). Using learning analytics to scale the provision of personalised feedback. *British Journal of Educational Technology: Journal of the Council for Educational Technology*.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Educational Practice
provide or help teachers provide
Engagement
Feedback
directs and can improve
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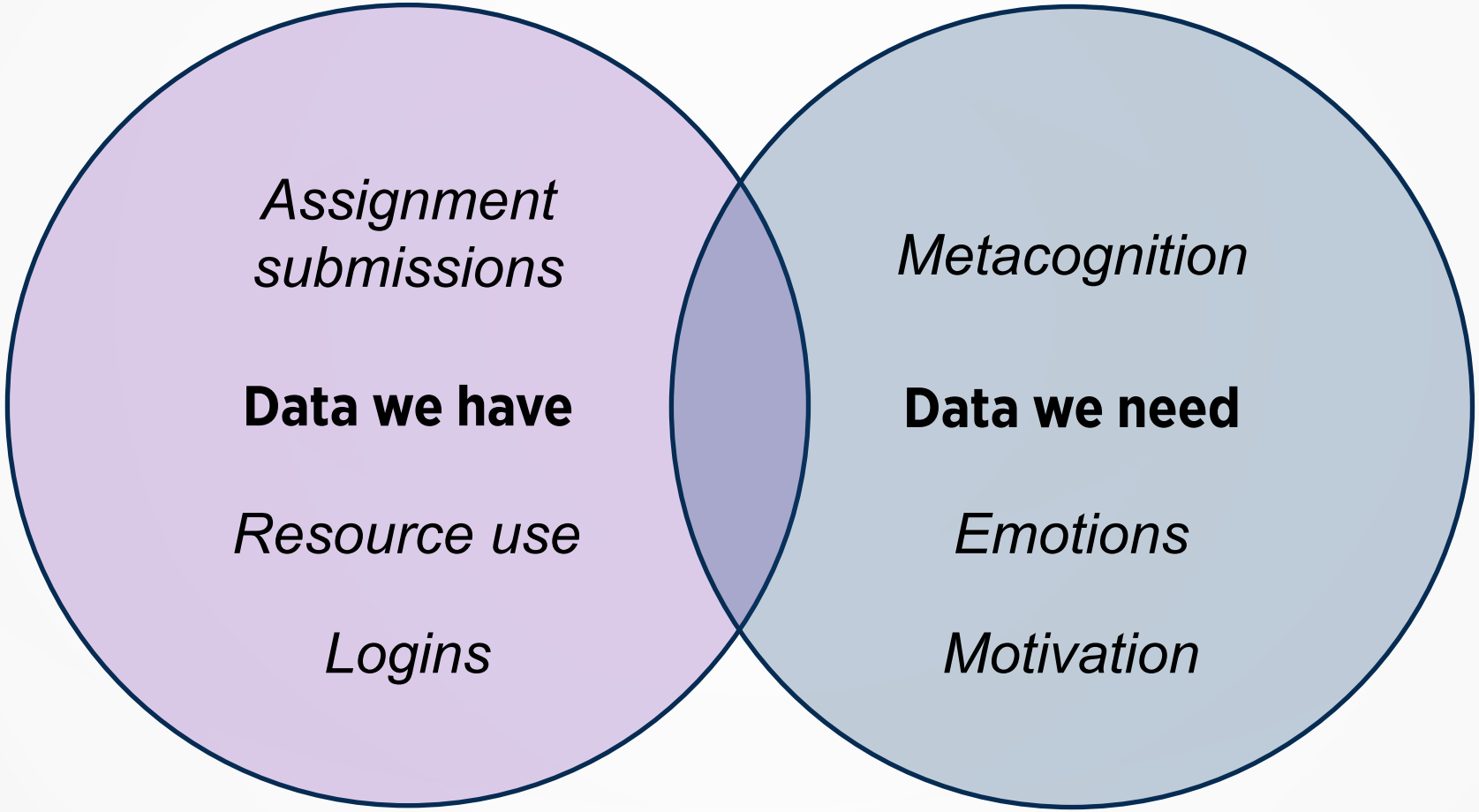
Learning
improves and directs

DATA GAP


Assignment submissions
Data we have
Resource use
Logins
Metacognition
Data we need
Emotions
Motivation

AZEVEDO (2015)

Data type	Method/Tool	Cognition	Metacognition	Emotion	Motivation
Process	Screen recordings	YES	YES	NO	NO
	Think-aloud	YES	YES	MAYBE	MAYBE
	Eye-tracking	YES	YES	MAYBE	MAYBE
	Log files	YES	NO	NO	NO
	Facial expressions	NO	NO	YES	NO
	Physiological sensors	YES	NO	YES	MAYBE
Product	Quizzes	YES	NO	NO	NO
	Summaries	YES	NO	NO	NO
Self-reports	Questionnaires	YES	YES	YES	YES
Knowledge Construction	Note-taking and drawing	YES	NO	NO	NO
	Classroom discourse	YES	YES	YES	YES

Adapted from:
Azevedo, R. (2015). Defining and Measuring Engagement and Learning in Science: Conceptual, Theoretical, Methodological, and Analytical Issues. *Educational Psychologist*, *50*(1), 84–94.

AZEVEDO (2015)

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	Log files	YES	NO	NO	NO
	Facial expressions	NO	NO	YES	NO
	Physiological sensors	YES	NO	YES	MAYBE
Product	Quizzes	YES	NO	NO	NO
	Summaries	YES	NO	NO	NO
Self-reports	Questionnaires	YES	YES	YES	YES
Knowledge Construction	Note-taking and drawing	YES	NO	NO	NO
	Classroom discourse	YES	YES	YES	YES

We need process data to understand the dynamic nature of learning!

Adapted from:
Azevedo, R. (2015). Defining and Measuring Engagement and Learning in Science: Conceptual, Theoretical, Methodological, and Analytical Issues. *Educational Psychologist*, *50*(1), 84–94.

AZEVEDO (2015)

But data about emotion and motivation is crucial in understanding self-regulation of learning!

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Product	Quizzes	YES		NO	NO
	Summaries	YES	NO	NO	NO
Self-reports	Questionnaires	YES	YES	YES	YES
Knowledge Construction	Note-taking and drawing	YES	NO	NO	NO
	Classroom discourse	YES	YES	YES	YES

But data about emotion and motivation is crucial in understanding self-regulation of learning!

We need process data to be able to capture the dynamic nature of learning processes!

And these methods don't sound like they could be scaled up!

Adapted from:
Azevedo, R. (2015). Defining and Measuring Engagement and Learning in Science: Conceptual, Theoretical, Methodological, and Analytical Issues. *Educational Psychologist*, *50*(1), 84–94.

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	Eye-tracking	YES		MAYBE	MAYBE
		ES		NO	NO
		O		YES	NO
		ES		YES	MAYBE
Pro		ES		NO	NO
		ES	NO	NO	NO
Sel		ES	YES	YES	YES
Kn		ES	NO	NO	NO
		ES	YES	YES	YES

And these methods don't sound like they could be scaled up!

(Except in China, maybe...)

We need proc
able to captu
nature of lear

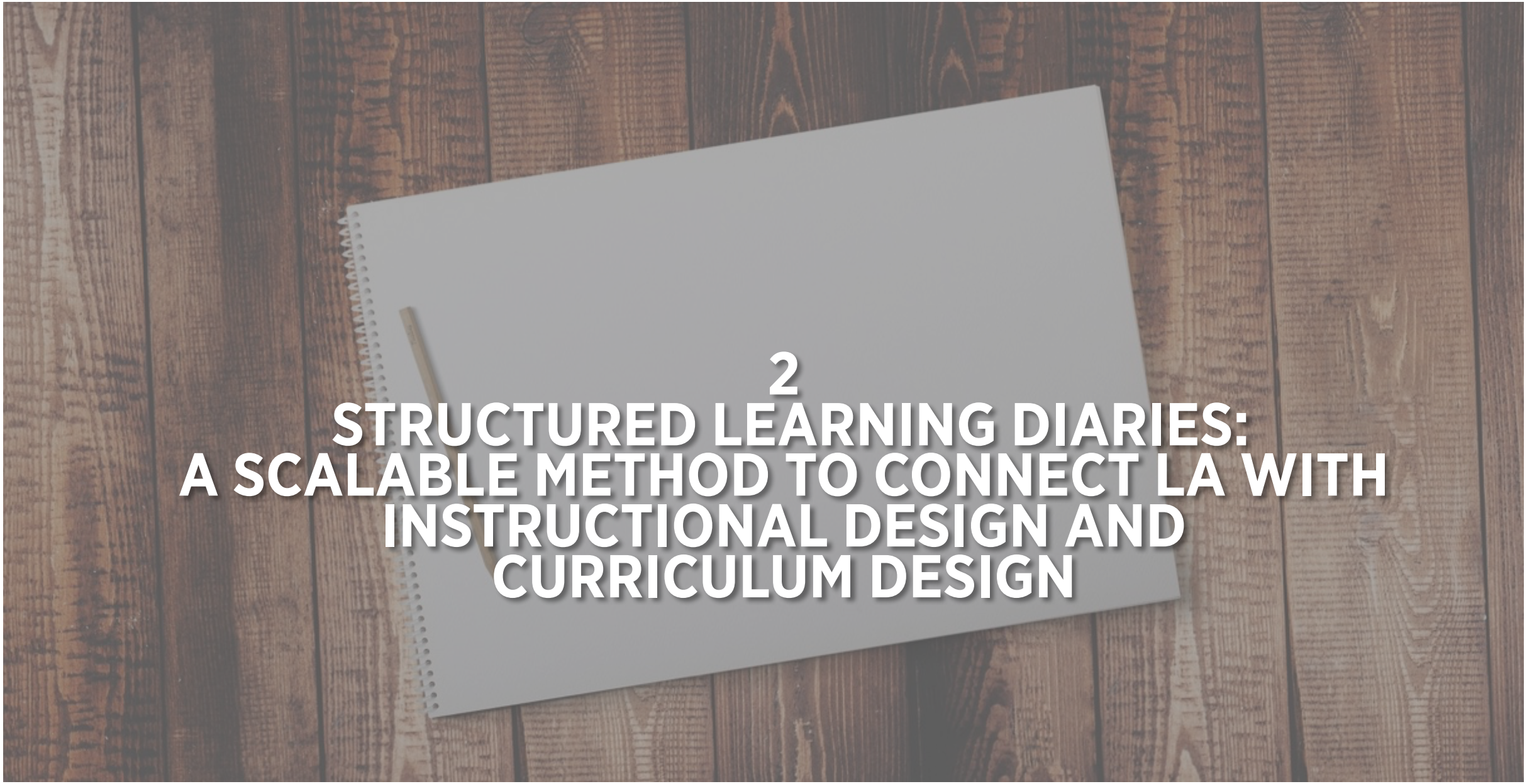
A school in China is monitoring students with facial recognition technology that scans the classroom every 30 seconds

Follow @BiNordic | Follow @BiNordic 2,946 followers

Tara Francis Chan | 21 May 2018 3:21 AM | 709

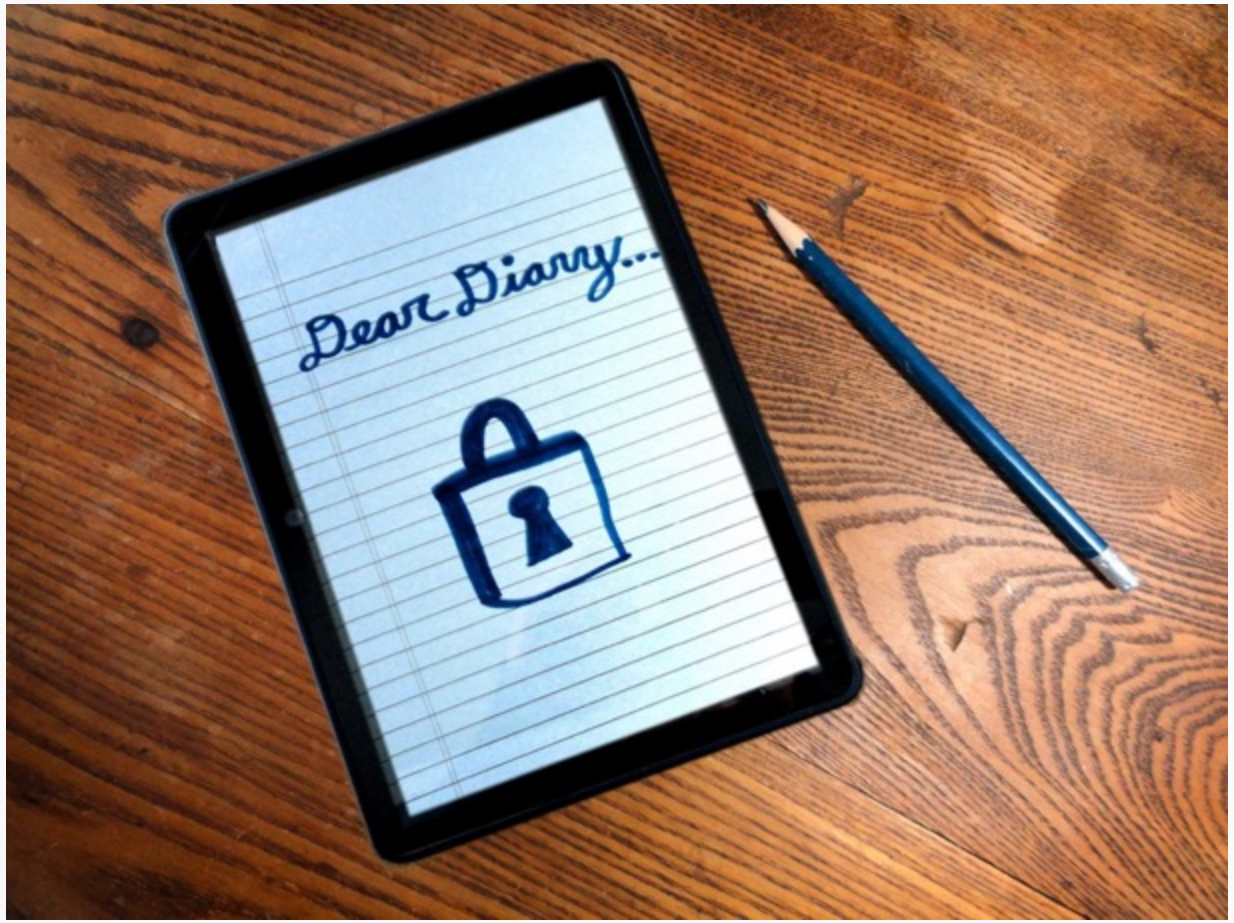
Adapted from
Azevedo, R. (
Methodologic

g in Science: Conceptual, Theoretical,
, 84–94.



2
STRUCTURED LEARNING DIARIES: A SCALABLE METHOD TO CONNECT LA WITH INSTRUCTIONAL DESIGN AND CURRICULUM DESIGN

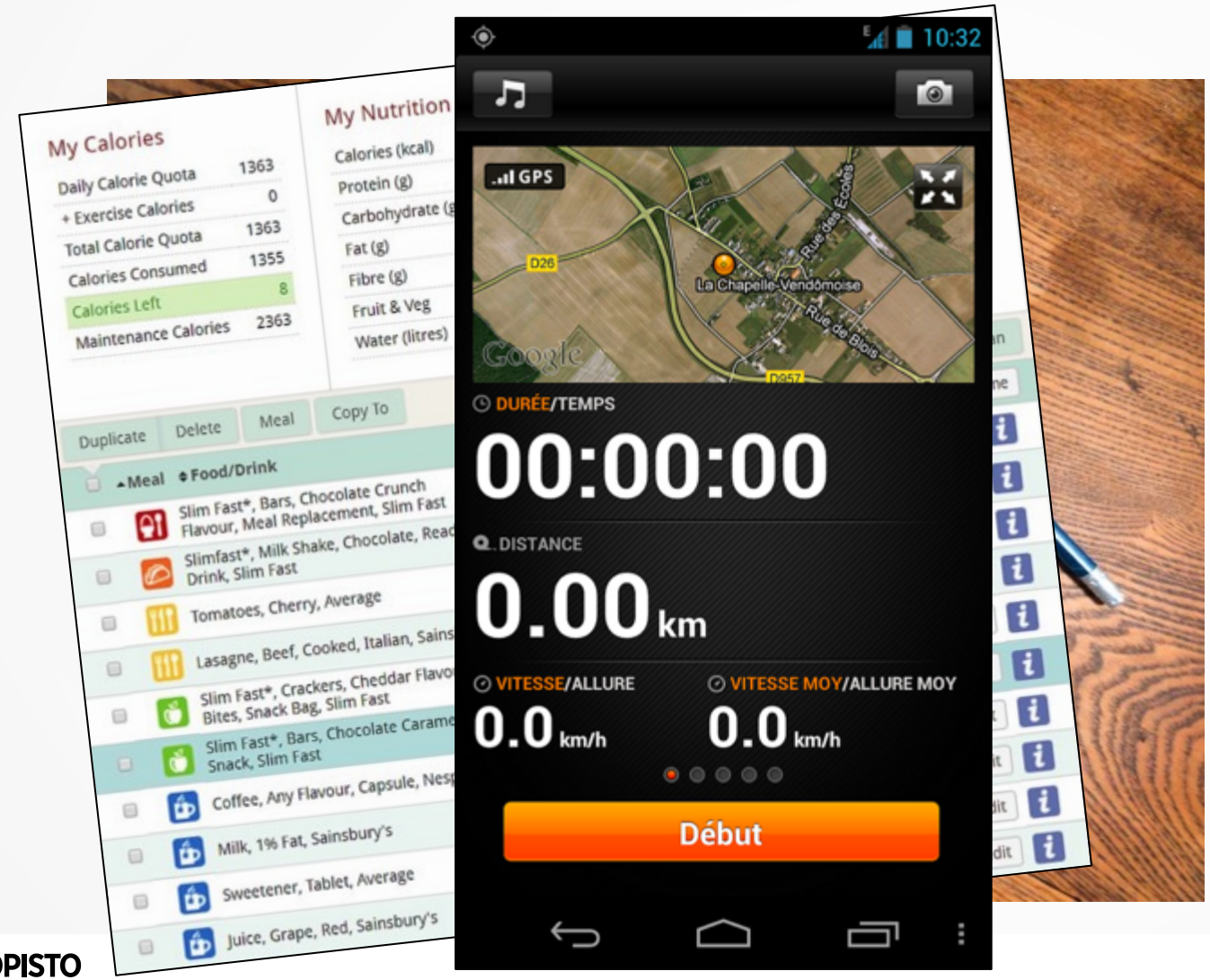
DIARIES



DIARIES


My Calories
Daily Calorie Quota 1363
+ Exercise Calories 0
Total Calorie Quota 1363
Calories Consumed 1355
Calories Left 8
Maintenance Calories 2363
My Nutrition Profile
Calories (kcal) 1355
Protein (g) 70.2
Carbohydrate (g) 138.9
Fat (g) 49.8
Fibre (g) 40.6
Fruit & Veg 2.1
Water (litres) 0.0
Carbohydrate
Protein
Fat
35.9%
41.7%
22.5%
Turn foods into a Food Plan
Duplicate Delete Meal Copy To
Show Time
Meal Food/Drink Servings Cals Prot Carbs Fat Fibre
Slim Fast*, Bars, Chocolate Crunch Flavour, Meal Replacement, Slim Fast 1 Bar/60g 210 13.2 22.8 4.8 9.0 Edit
Slimfast*, Milk Shake, Chocolate, Ready to Drink, Slim Fast 1 Bottle/325ml 211 14.9 26.0 5.2 4.9 Edit
Tomatoes, Cherry, Average 8 Tomatoes/120g 22 0.9 3.6 0.4 0.6 Edit
Lasagne, Beef, Cooked, Italian, Sainsbury's 1 Serving/375g 555 29.2 25.5 32.2 25.1 Edit
Slim Fast*, Crackers, Cheddar Flavour Bites, Snack Bag, Slim Fast 1 Pack/22g 92 2.1 16.1 2.0 0.6 Edit
Slim Fast*, Bars, Chocolate Caramel Treat, Snack, Slim Fast 1 Bar/26g 95 0.9 16.6 2.6 0.4 Edit
Coffee, Any Flavour, Capsule, Nespresso 1 Capsule/40g 1 0.0 0.0 0.0 0.0 Edit
Milk, 1% Fat, Sainsbury's 1 Serving/250ml 100 8.8 11.5 2.5 0.0 Edit
Sweetener, Tablet, Average 2 Tablets/0.2g 1 0.0 0.1 0.0 0.0 Edit
Juice, Grape, Red, Sainsbury's 100ml 69 0.1 16.6 0.0 0.0 Edit

DIARIES


My Calories
Daily Calorie Quota 1363
+ Exercise Calories 0
Total Calorie Quota 1363
Calories Consumed 1355
Calories Left 8
Maintenance Calories 2363
My Nutrition
Calories (kcal)
Protein (g)
Carbohydrate (g)
Fat (g)
Fibre (g)
Fruit & Veg
Water (litres)
Duplicate
Delete
Meal
Copy To
Meal
Food/Drink
Slim Fast*, Bars, Chocolate Crunch Flavour, Meal Replacement, Slim Fast
Slimfast*, Milk Shake, Chocolate, Ready Drink, Slim Fast
Tomatoes, Cherry, Average
Lasagne, Beef, Cooked, Italian, Sainsbury's
Slim Fast*, Crackers, Cheddar Flavour Bites, Snack Bag, Slim Fast
Slim Fast*, Bars, Chocolate Caramel Snack, Slim Fast
Coffee, Any Flavour, Capsule, Nespresso
Milk, 1% Fat, Sainsbury's
Sweetener, Tablet, Average
Juice, Grape, Red, Sainsbury's
10:32
GPS
D26
La Chapelle-Vendômoise
Rue des Ecoles
Rue de Blois
Google
DURÉE/TEMPS
00:00:00
DISTANCE
0.00 km
VITESSE/ALLURE
0.0 km/h
VITESSE MOY/ALLURE MOY
0.0 km/h
Début

DIARIES


My Calories
Daily Calorie Quota 1363
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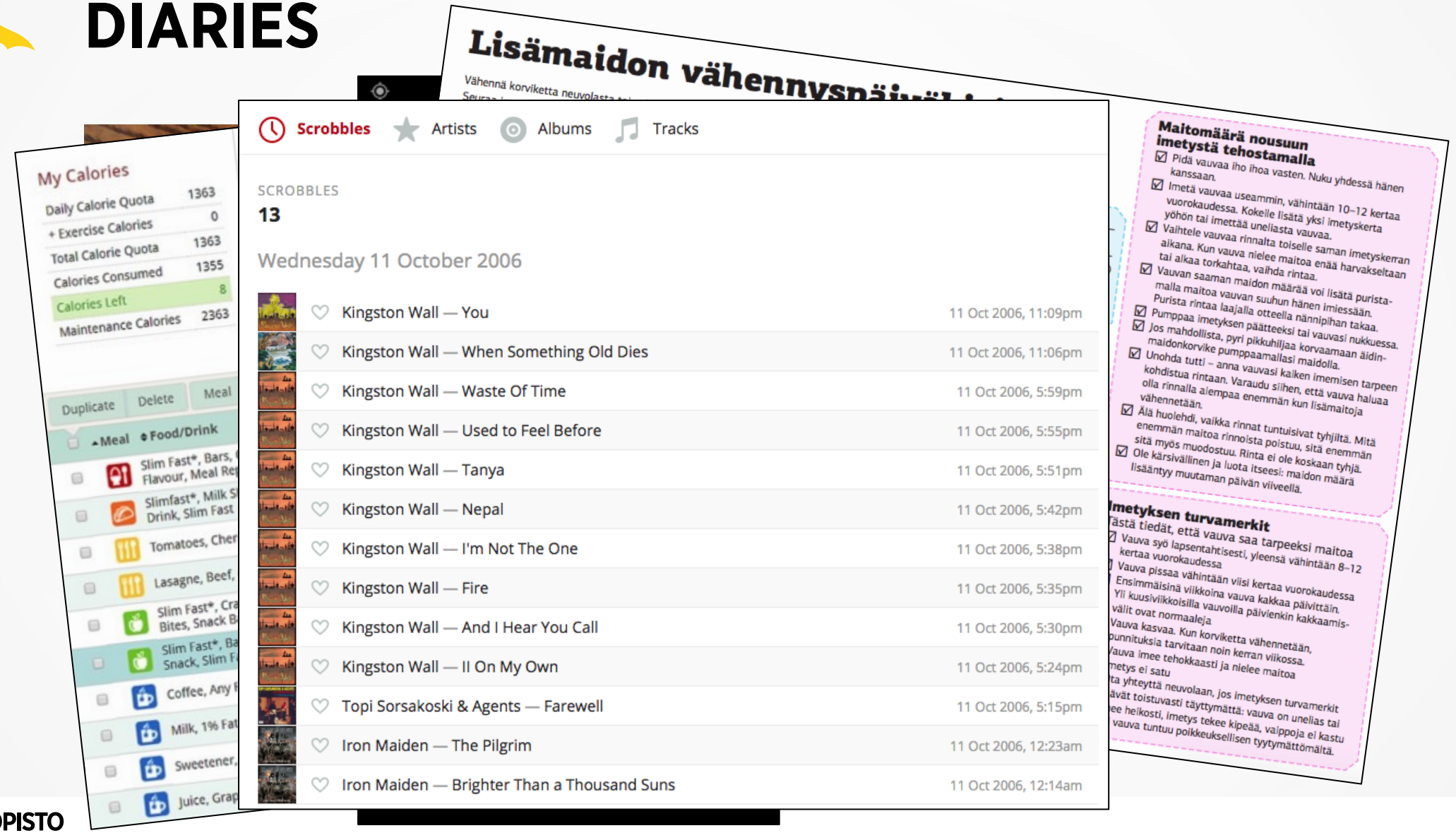
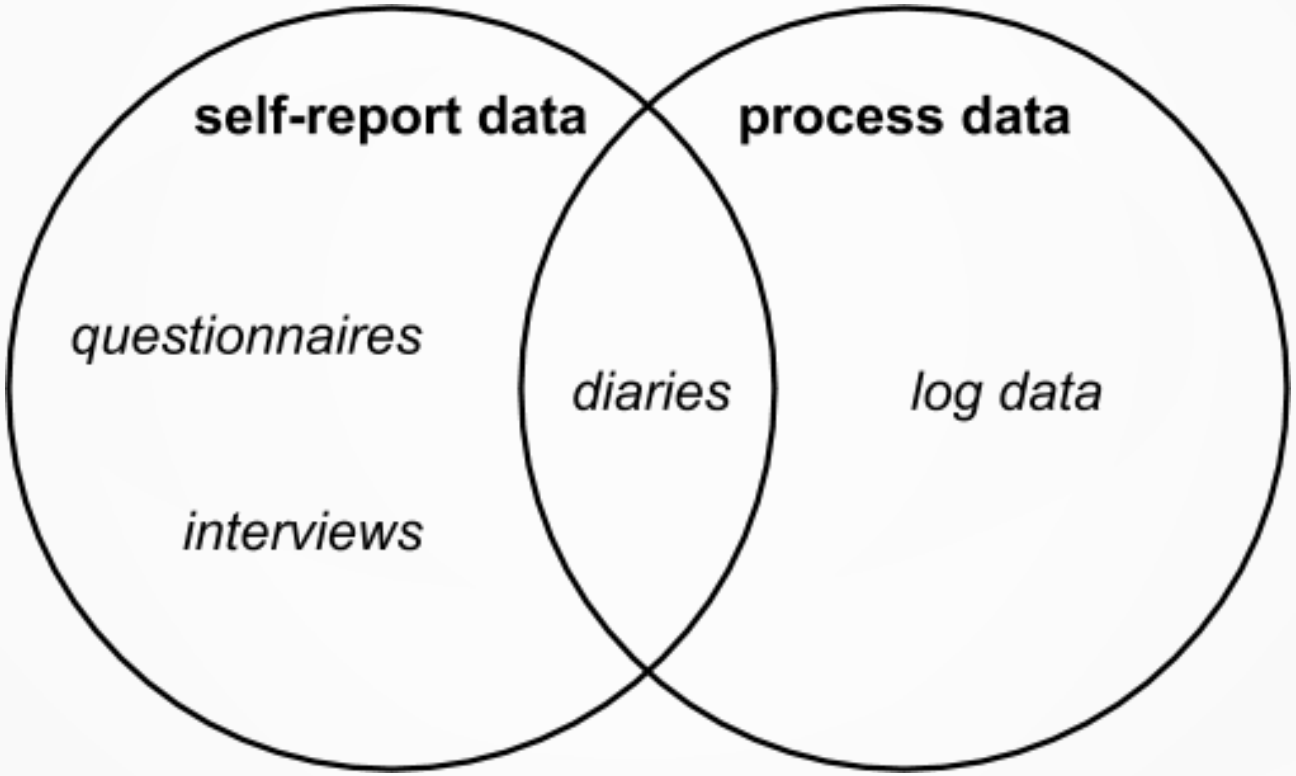
Total Calorie Quota 1363
Calories Consumed 1355
Calories Left 8
Maintenance Calories 2363
My Nutrition
Calories (kcal)
Protein (g)
Carbohydrate (g)
Fat (g)
Fibre (g)
Fruit & Veg
Water (litres)
Duplicate
Delete
Meal
Copy To
Meal
Food/Drink
Slim Fast*, Bars, Chocolate Crunch Flavour, Meal Replacement, Slim Fast
Slimfast*, Milk Shake, Chocolate, Ready Drink, Slim Fast
Tomatoes, Cherry, Average
Lasagne, Beef, Cooked, Italian, Sainsbury's
Slim Fast*, Crackers, Cheddar Flavour Bites, Snack Bag, Slim Fast
Slim Fast*, Bars, Chocolate Caramel Snack, Slim Fast
Coffee, Any Flavour, Capsule, Nespresso
Milk, 1% Fat, Sainsbury's
Sweetener, Tablet, Average
Juice, Grape, Red, Sainsbury's
Début
Lisämaidon vähennyspäiväkirja
Vähennä korviketta neuvolasta tai sairaalasta saamasi kirjallisen ohjeen mukaan.
Seuraa imetyksen turvamerkkien täyttymistä päiväkirjan avulla.
Päivämäärä
Korvikkeen määrä / syöntikerta
Korvikeannoksia / vrk
Imetyksiä ja lypsyjä
Vauva pissasi
Vauva kakkasi
Turvamerkit täyttyivät
Viikko takana!
On seuraavan punnituksen ja korvikkeen vähennyssuunnitelman aika.
Maitomäärä nousuun imetystä tehostamalla
Pidä vauvaa iho ihoa vasten. Nuku yhdessä hänen kanssaan.
Imetä vauvaa useammin, vähintään 10–12 kertaa vuorokaudessa. Kokeile lisätä yksi imetyskerta yöhön tai imettää uneliasta vauvaa.
Vaihtele vauvaa rinnalta toiselle saman imetyskerran aikana. Kun vauva nielee maitoa enää harvakseltaan tai alkaa torkahtaa, vaihda rintaa.
Vauvan saaman maidon määrää voi lisätä puristamalla maitoa vauvan suuhun hänen imiessään. Purista rintaa laajalla otteella nännipihan takaa.
Pumppaa imetyksen päätteeksi tai vauvasi nukkuessa.
Jos mahdollista, pyri pikkuhiljaa korvaamaan äidinmaidonkorvike pumppaamallasi maidolla.
Unohda tutti – anna vauvasi kaiken imemisen tarpeen kohdistua rintaan. Varaudu siihen, että vauva haluaa olla rinnalla aiempaa enemmän kun lisämaitoja vähennetään.
Älä huolehdi, vaikka rinnat tuntuisivat tyhjiltä. Mitä enemmän maitoa rinnoista poistuu, sitä enemmän sitä myös muodostuu. Rinta ei ole koskaan tyhjä.
Ole kärsivällinen ja luota itseesi: maidon määrä lisääntyy muutaman päivän viiveellä.
Imetyksen turvamerkit
Tästä tiedät, että vauva saa tarpeeksi maitoa
Vauva syö lapsentahtisesti, yleensä vähintään 8–12 kertaa vuorokaudessa
Vauva pissaa vähintään viisi kertaa vuorokaudessa
Ensimmäisinä viikkoina vauva kakkaa päivittäin. Yli kuusiviikkoisilla vauvoilla päivienkin kakkaamisvälit ovat normaaleja
Vauva kasvaa. Kun korviketta vähennetään, punnituksia tarvitaan noin kerran viikossa.
Vauva imee tehokkaasti ja nielee maitoa
Imetys ei satu
Ota yhteyttä neuvolaan, jos imetyksen turvamerkit jäävät toistuvasti täyttymättä: vauva on unelias tai imee heikosti, imetys tekee kipeää, vaippoja ei kastu tai vauva tuntuu poikkeuksellisen tyytymättömältä.

DIARIES


My Calories
Daily Calorie Quota 1363
+ Exercise Calories 0
Total Calorie Quota 1363
Calories Consumed 1355
Calories Left 8
Maintenance Calories 2363
Duplicate
Delete
Meal
Meal
Food/Drink
Scrobbles
Artists
Albums
Tracks
SCROBBLES
13
Wednesday 11 October 2006
Kingston Wall — You 11 Oct 2006, 11:09pm
Kingston Wall — When Something Old Dies 11 Oct 2006, 11:06pm
Kingston Wall — Waste Of Time 11 Oct 2006, 5:59pm
Kingston Wall — Used to Feel Before 11 Oct 2006, 5:55pm
Kingston Wall — Tanya 11 Oct 2006, 5:51pm
Kingston Wall — Nepal 11 Oct 2006, 5:42pm
Kingston Wall — I'm Not The One 11 Oct 2006, 5:38pm
Kingston Wall — Fire 11 Oct 2006, 5:35pm
Kingston Wall — And I Hear You Call 11 Oct 2006, 5:30pm
Kingston Wall — II On My Own 11 Oct 2006, 5:24pm
Topi Sorsakoski & Agents — Farewell 11 Oct 2006, 5:15pm
Iron Maiden — The Pilgrim 11 Oct 2006, 12:23am
Iron Maiden — Brighter Than a Thousand Suns 11 Oct 2006, 12:14am
Lisämaidon vähennyspäivä
Maitomäärä nousuun imetystä tehostamalla
Imetyksen turvamerkit

DIARIES AS SELF-REPORTED PROCESS DATA

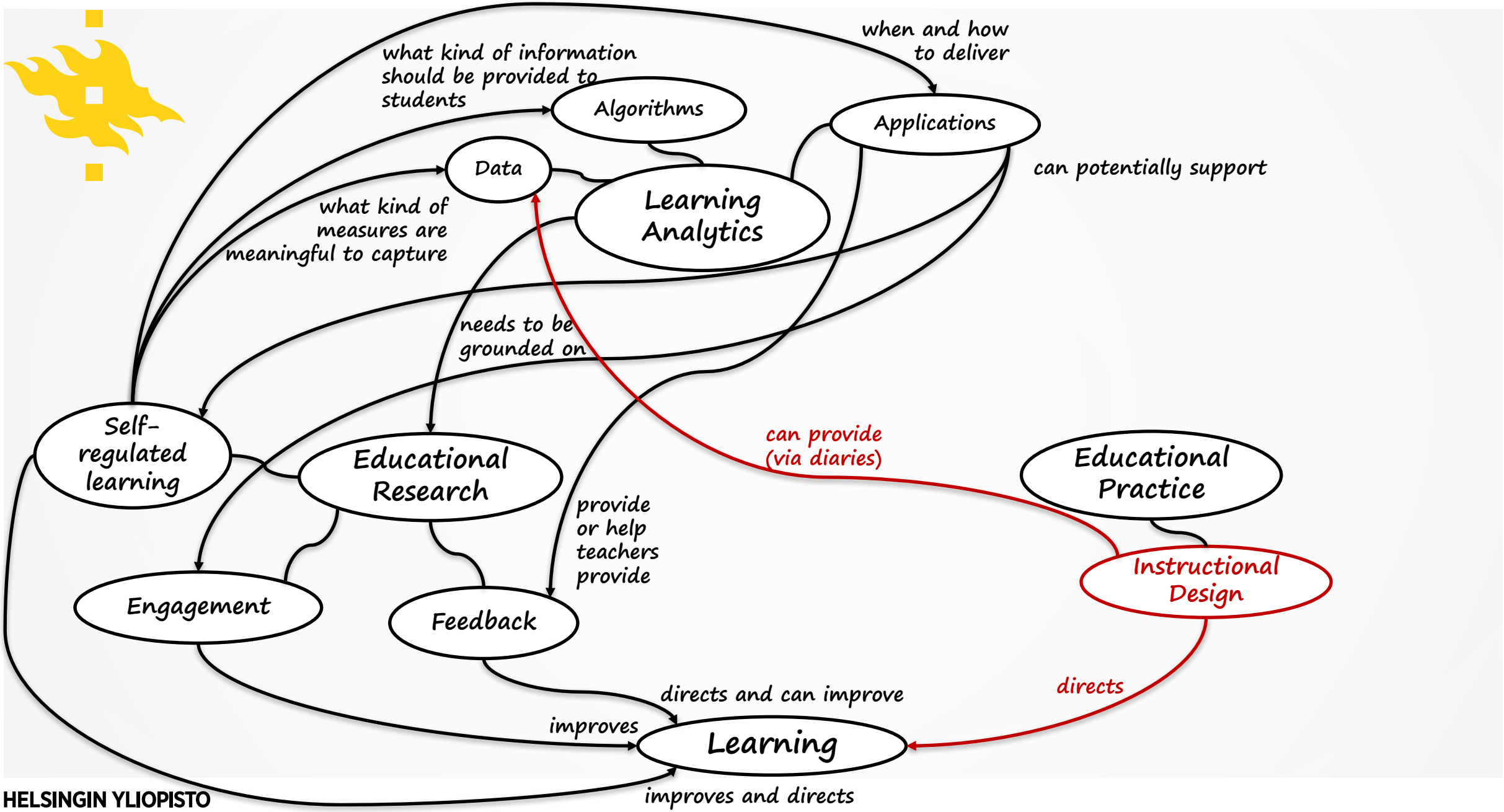


Data type	Method/Tool	Cognition	Metacognition	Emotion	Motivation
Process	Screen recordings	YES	YES	NO	NO
	Think-aloud	YES	YES	MAYBE	MAYBE
	Eye-tracking	YES	YES	MAYBE	MAYBE
	Log files	YES	NO	NO	NO
	Facial expressions	NO	NO	YES	NO
	Physiological sensors	YES	NO	YES	MAYBE
	Diaries!	*YES!*	*YES!*	*YES!*	*YES!*
Product	Quizzes	YES	NO	NO	NO
	Summaries	YES	NO	NO	NO
Self-reports	Questionnaires	YES	YES	YES	YES
Knowledge Construction	Note-taking and drawing	YES	NO	NO	NO
	Classroom discourse	YES	YES	YES	YES

(STRUCTURED) LEARNING DIARIES

- Diaries permit real-time recording of learning processes and have high ecological validity (Schmitz et al., 2011)

Schmitz, B., Klug, J., & Schmidt, M. (2011). Assessing self-regulated learning using diary measures with university students. *Handbook of Self-Regulation of Learning and Performance*, 251–266.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Data
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can potentially support
what kind of measures are meaningful to capture
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directs
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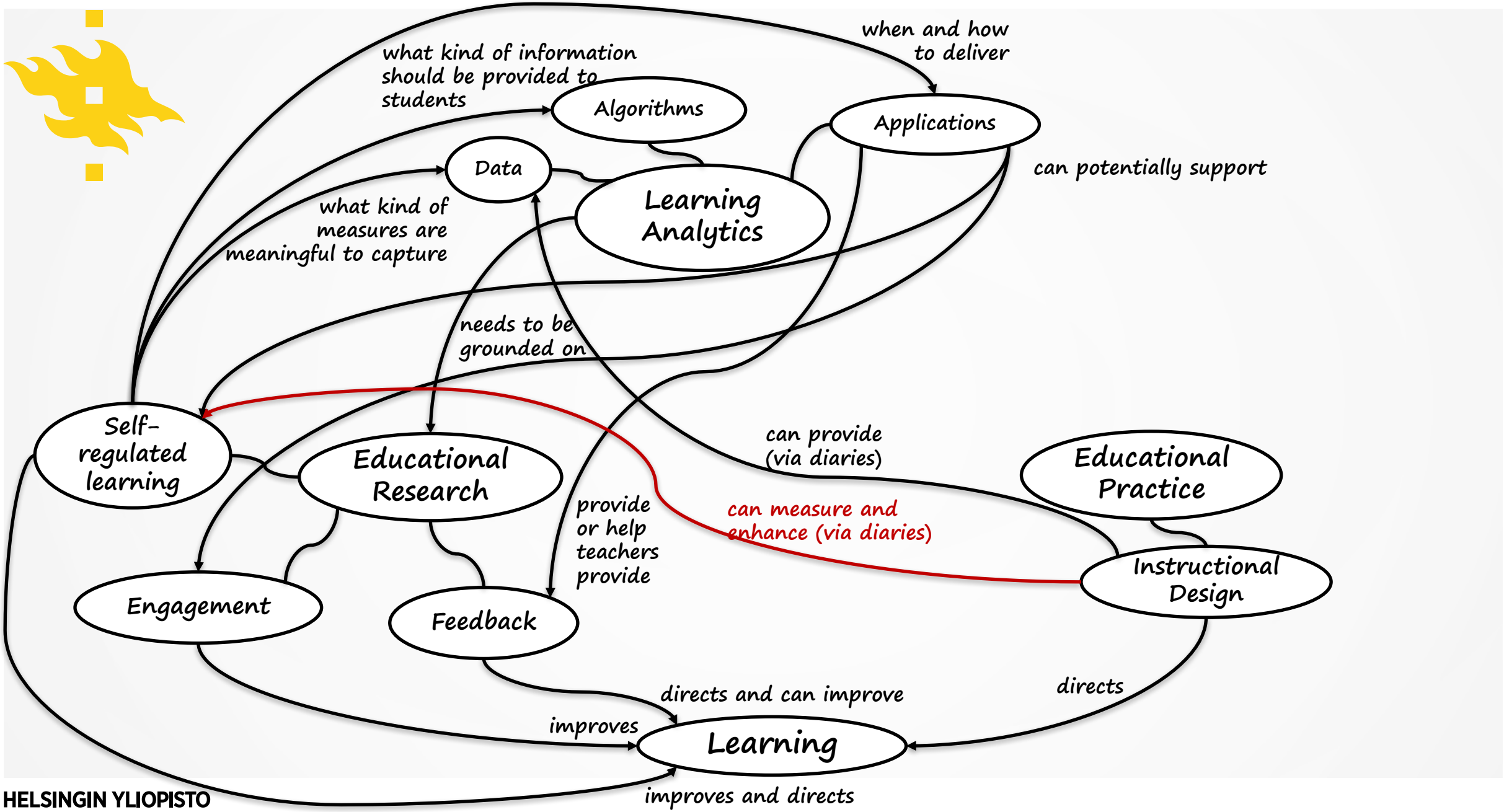
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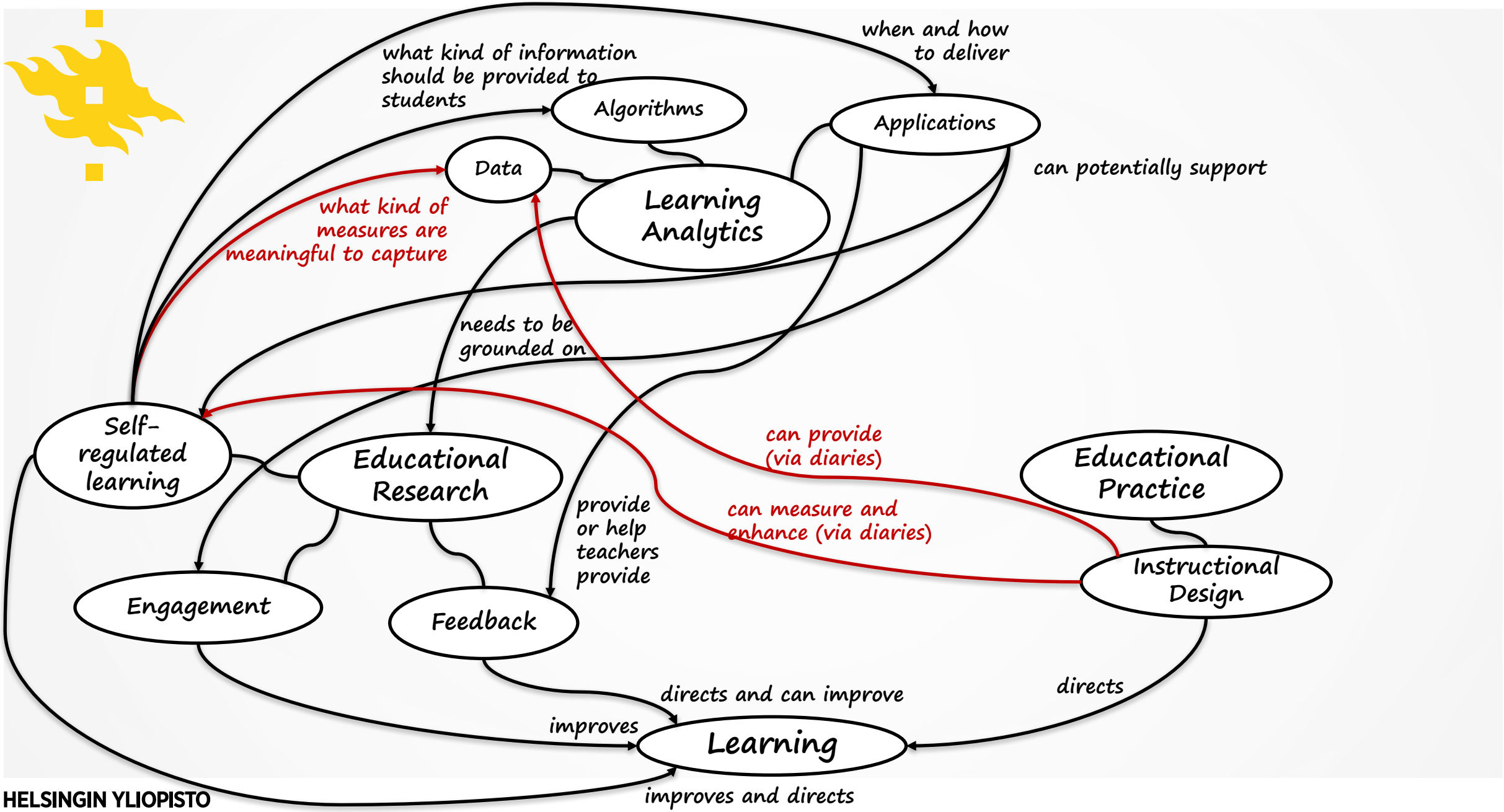
- Diaries are measurement + intervetion instruments than can be used to measure and enhance students' self-regulation skills (Panadero, Klug & Järvelä, 2016)
- Diaries allow using existing, validated research instruments (e.g. motivation and emotion questionnaires) (Klug et al., 2011)

Schmitz, B., Klug, J., & Schmidt, M. (2011). Assessing self-regulated learning using diary measures with university students. *Handbook of Self-Regulation of Learning and Performance*, 251–266.
Panadero, E., Klug, J., & Järvelä, S. (2016). Third wave of measurement in the self-regulated learning field: when measurement and intervention come hand in hand. *Scandinavian Journal of Educational Research*, *60*(6), 723–735.
Klug, J., Ogrin, S., Keller, S., Ihringer, A., & Schmitz, B. (2011). A plea for self-regulated learning as a process: modelling, measuring and intervening. *Psychological Test and Assessment Modeling*, *53*(1), 51–72.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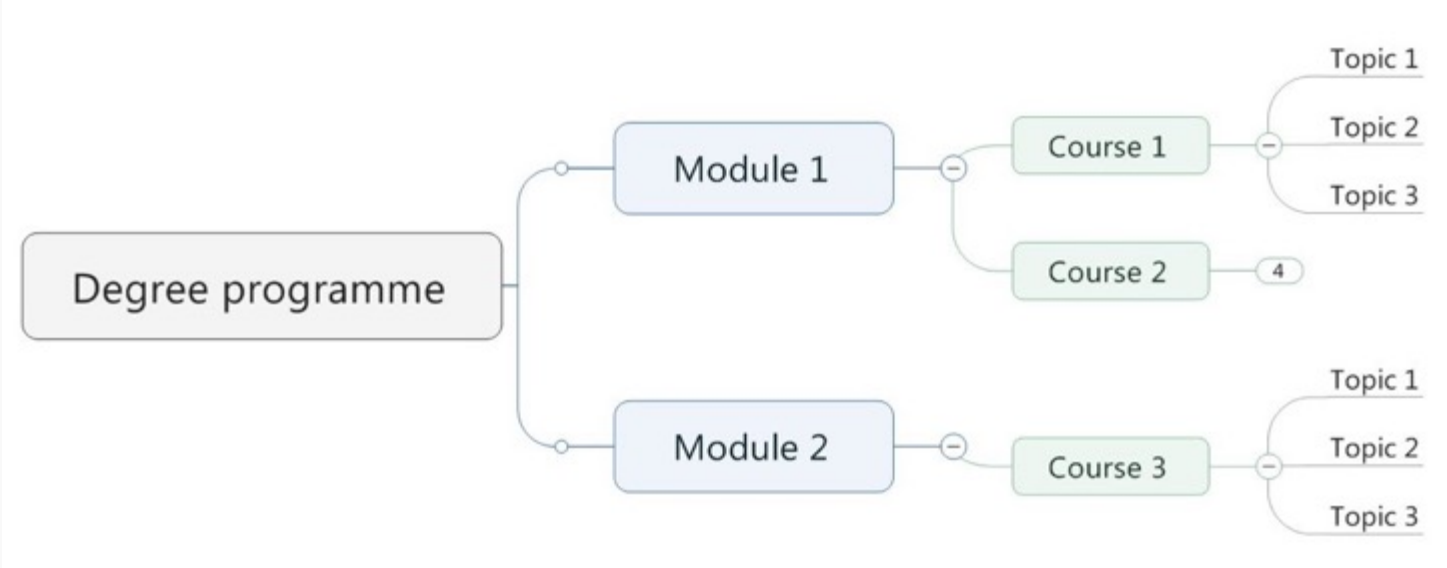
EDUCATIONAL MAPPING (WILLCOX & HUANG, 2017)

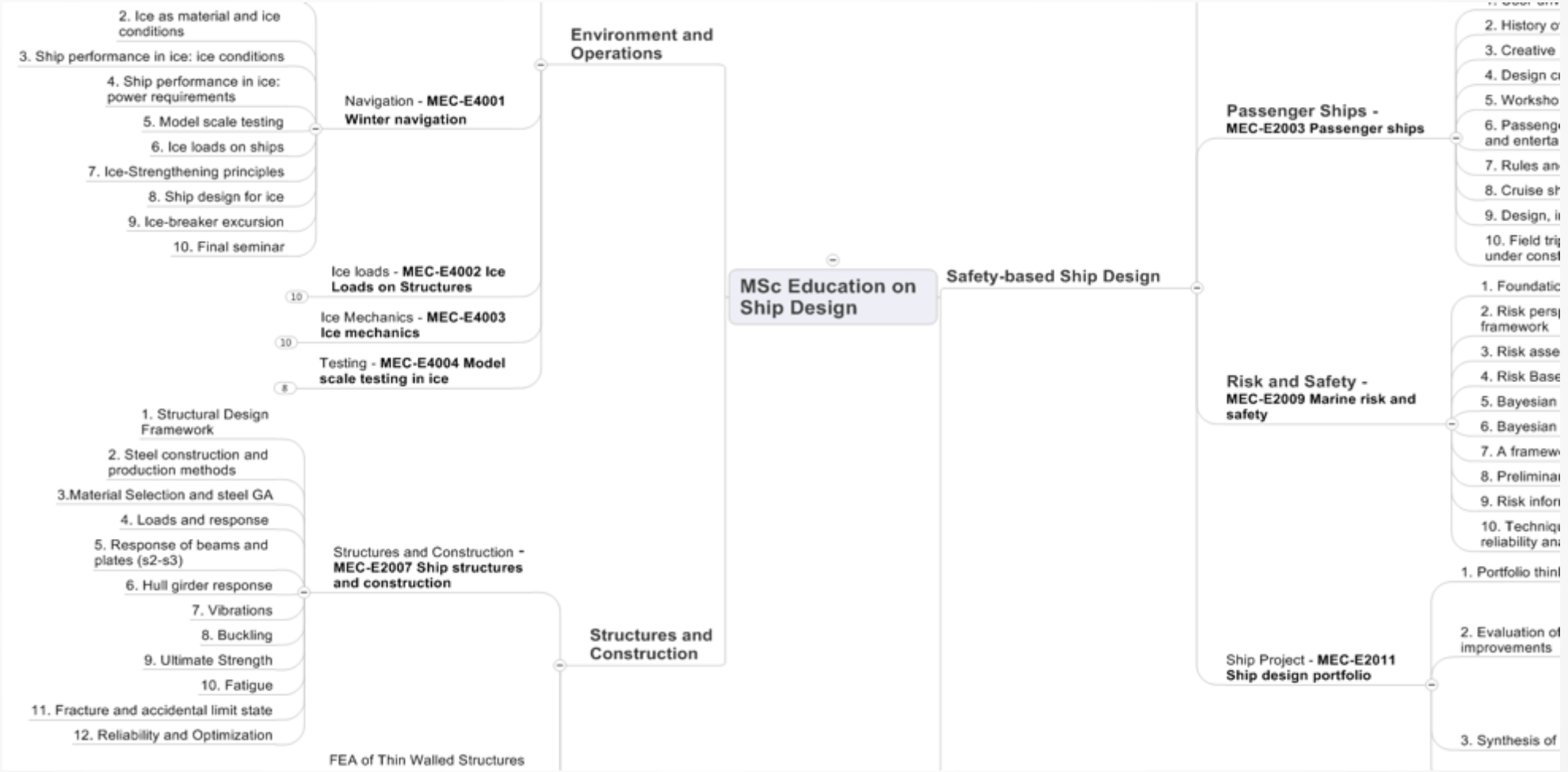
- Curriculum as a network model
- Process of analyzing an educational system to identify entities, relationships and attributes
- Entities (programs, modules, courses, concepts, learning outcomes etc.) and relationships between them form a graph structure, which can then be used to represent, visualize and analyze educational data at scale

Willcox, K. E., & Huang, L. (2017). Network models for mapping educational data. *Design Science*, *3*. https://doi.org/10.1017/dsj.2017.18

CURRICULAR CONCEPT MAP

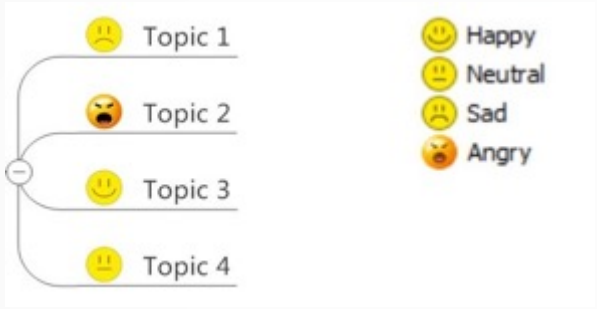


CURRICULAR CONCEPT MAP

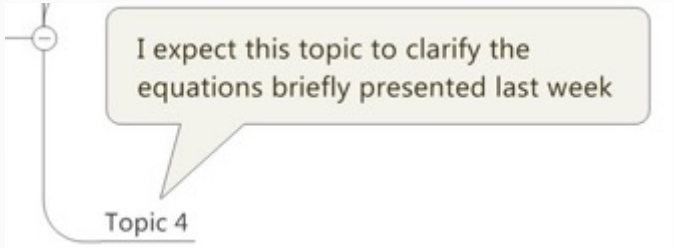


CURRICULAR CONCEPT MAPS AS STRUCTURED LEARNING DIARIES

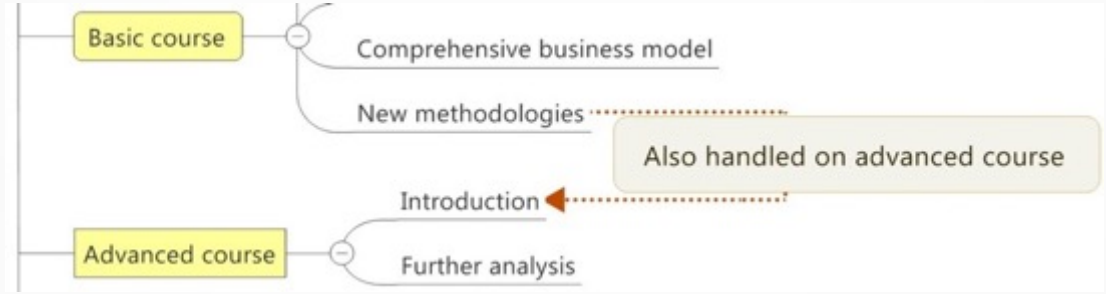
Standardized items



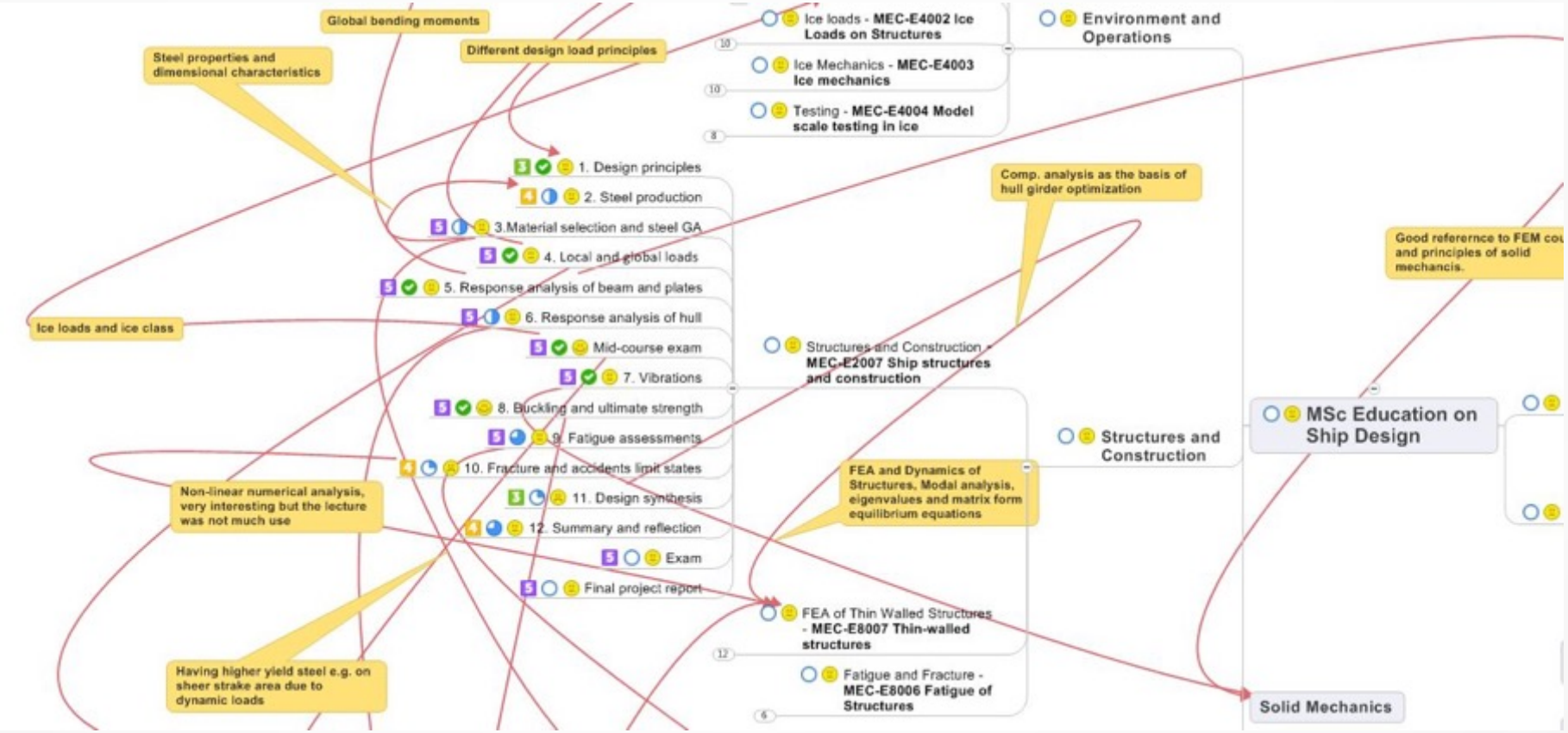
Open items

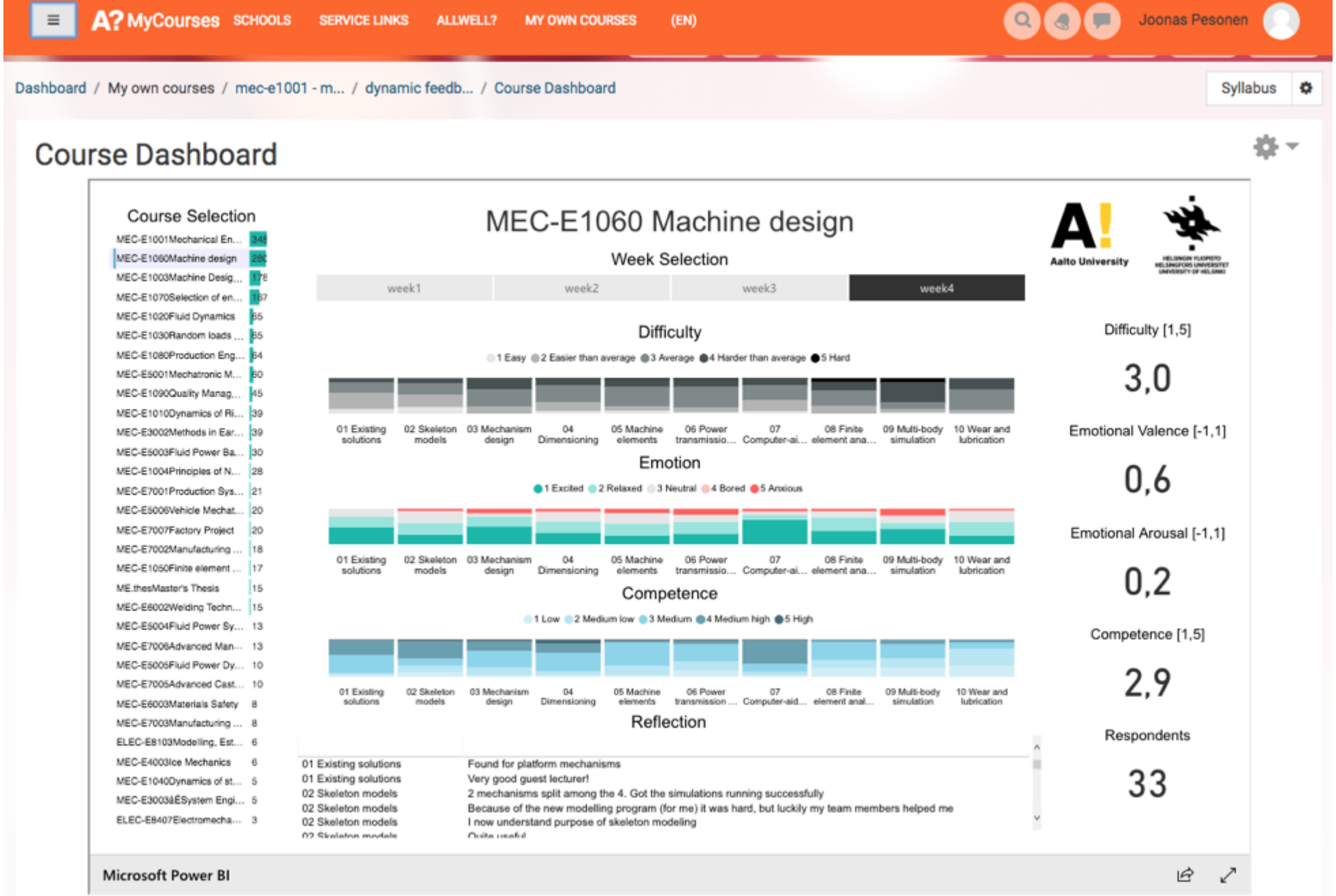


Relationship items

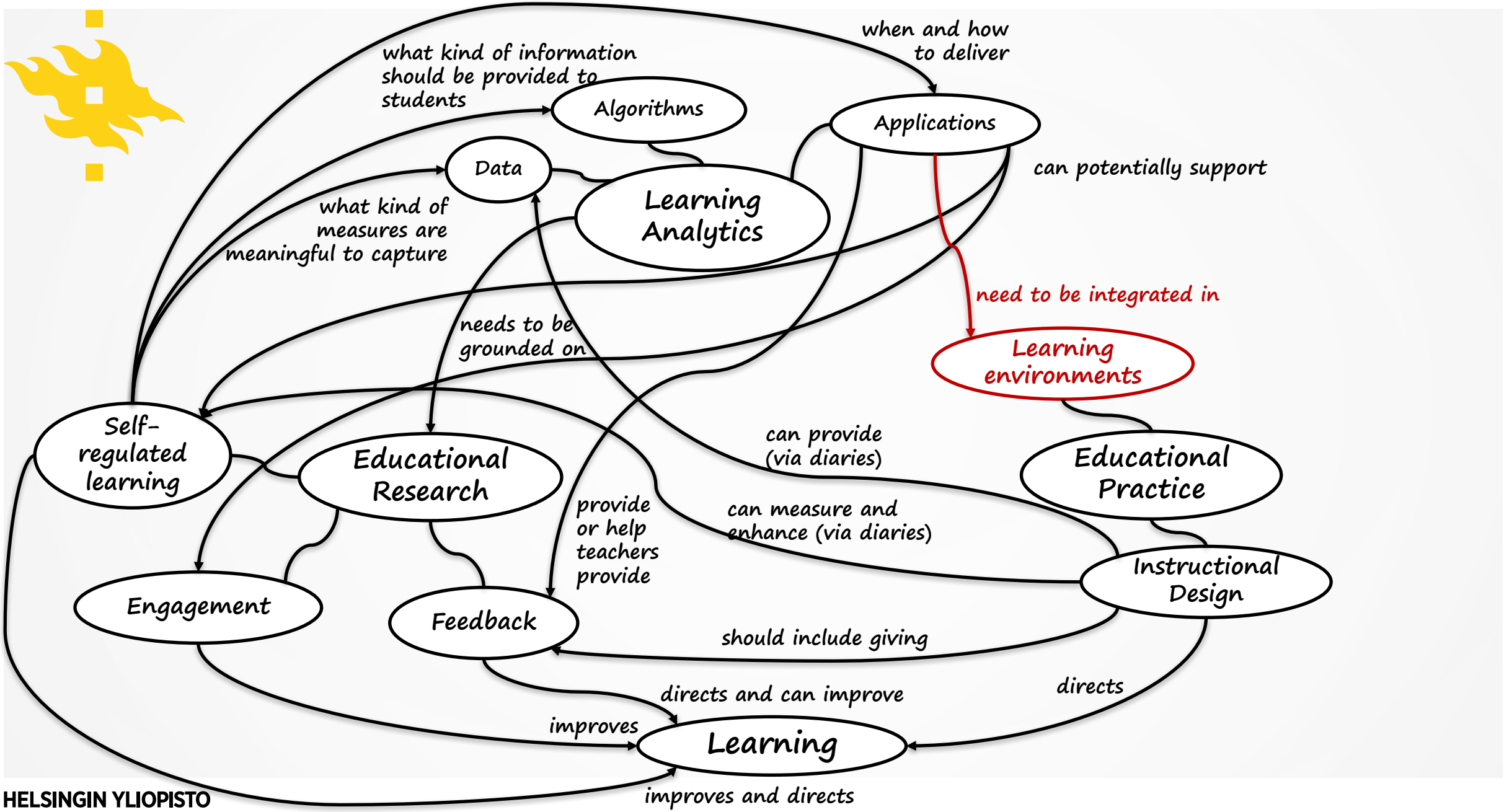


CURRICULAR CONCEPT MAPS AS STRUCTURED LEARNING DIARIES





Course Dashboard. This dashboard will be updated with real data after weekly Structured Learning Diary submission deadlines.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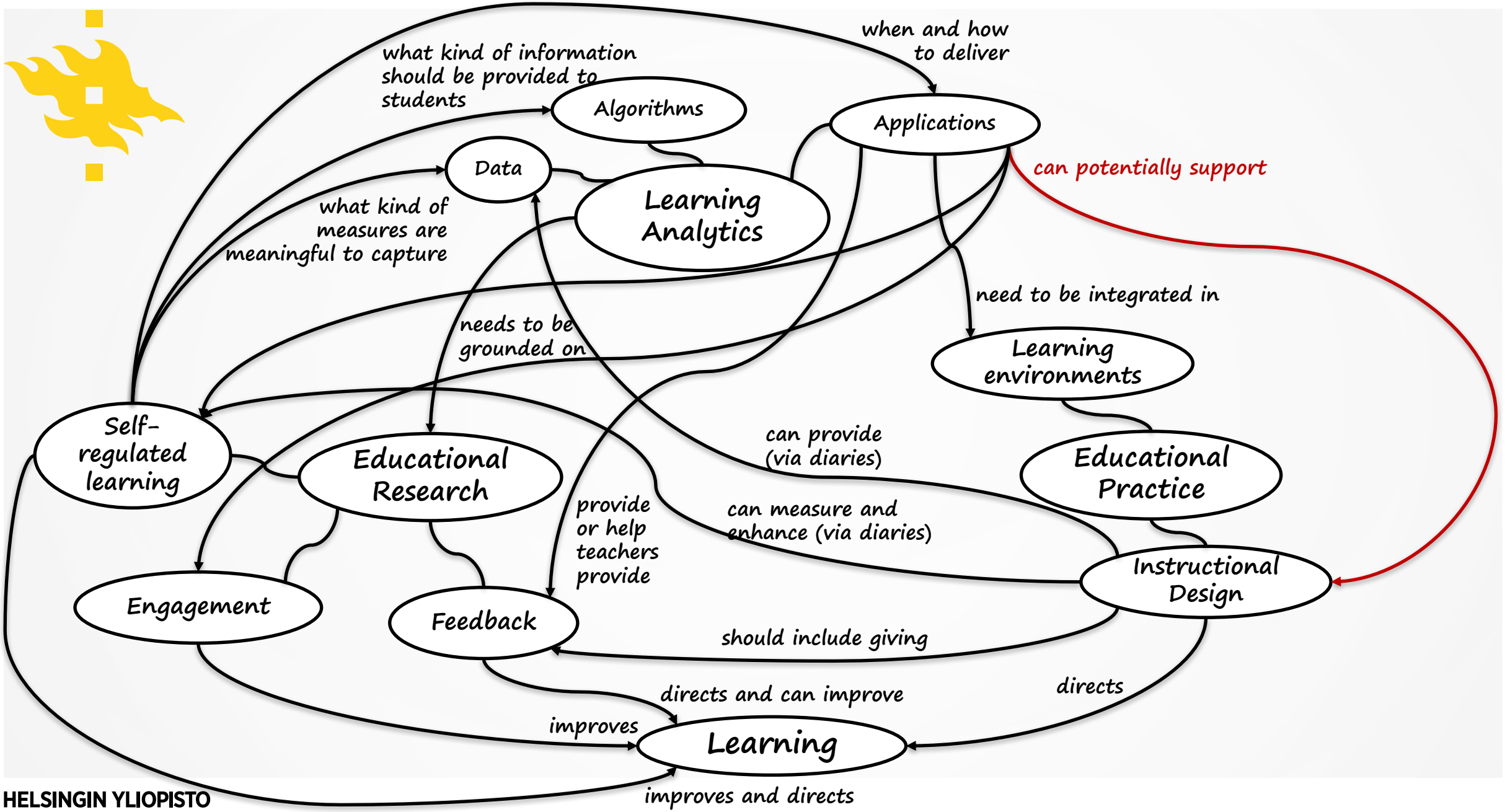
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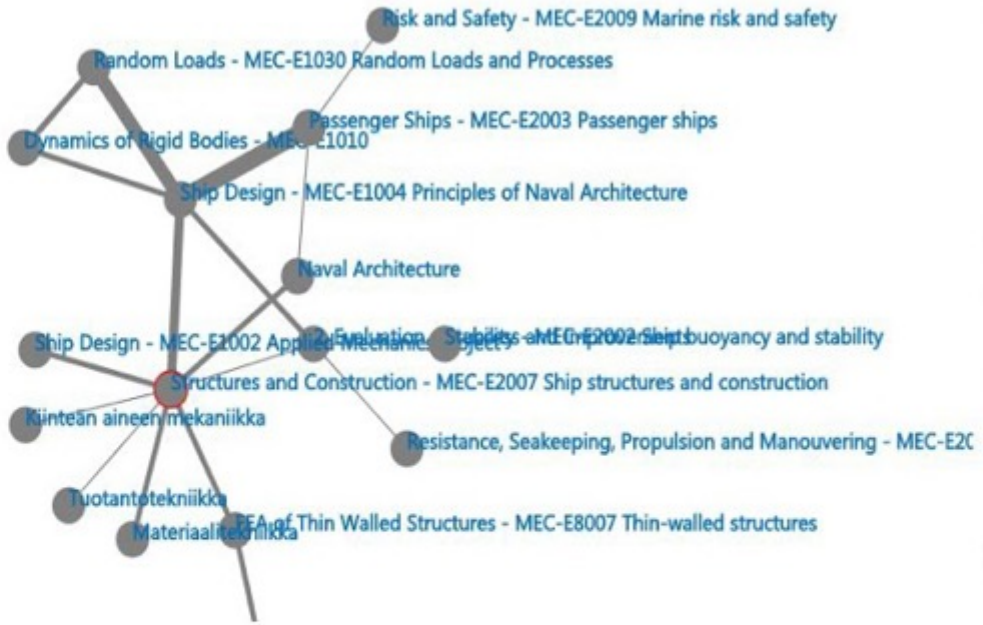
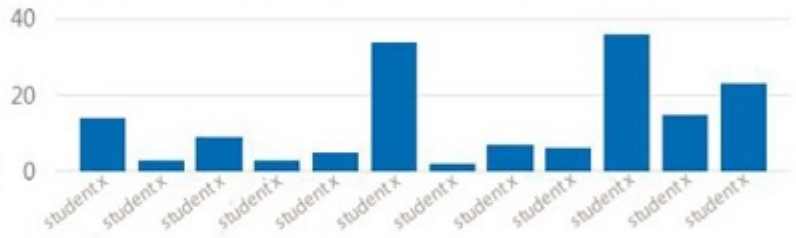
Course Relationships

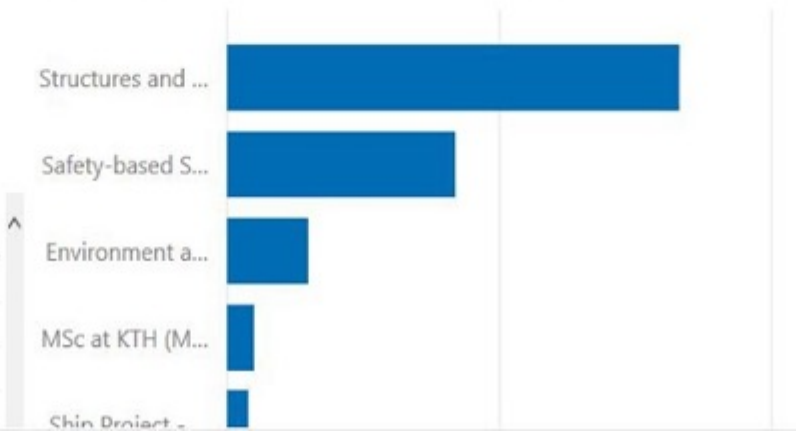


Count of Relations by Week

Count of Relations by Student

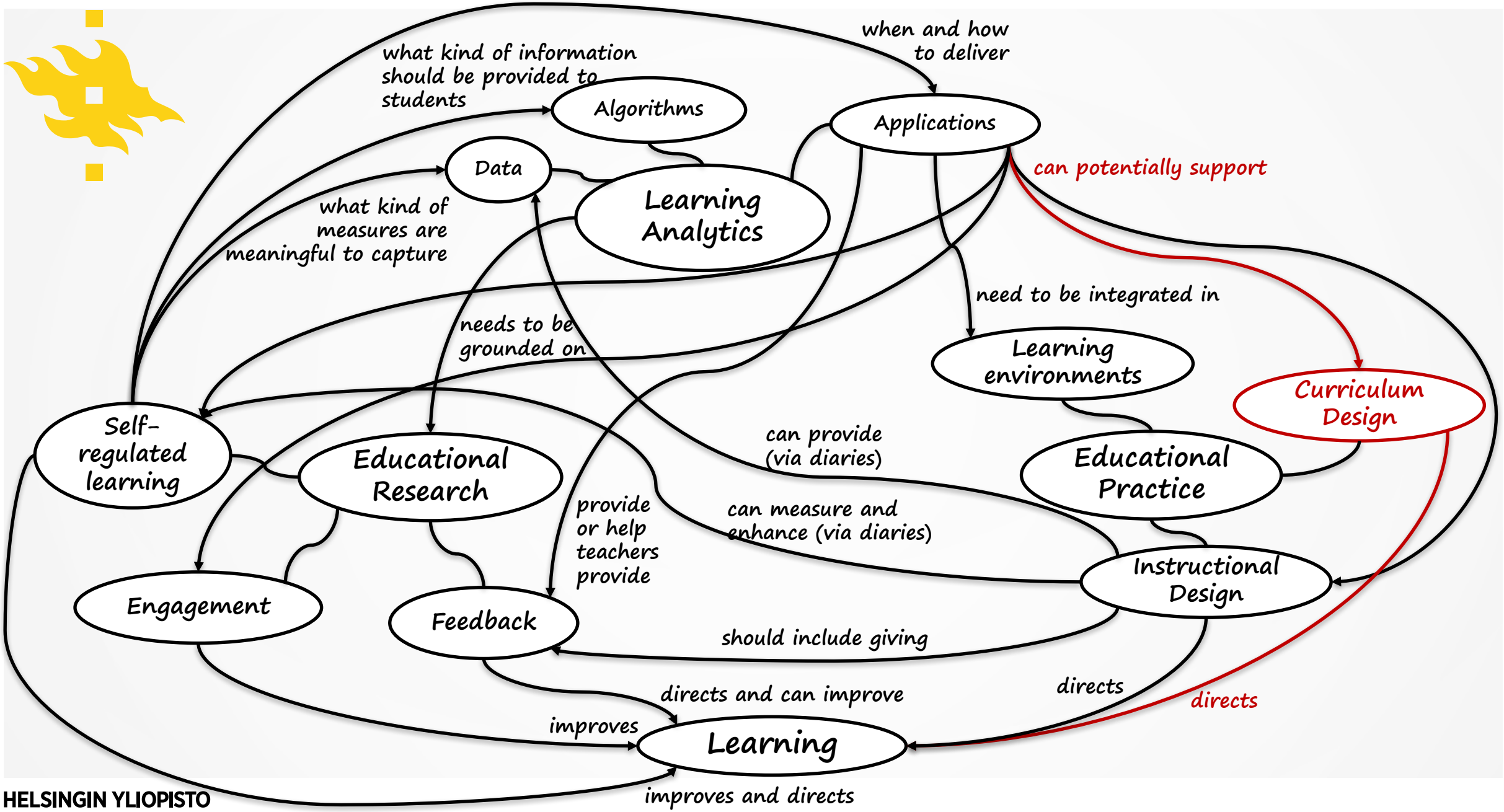


Count of Relations by Discipline



Topic Relations With Explanations

Relation	Explanation
Final project report - 11. Fracture and ...	Final design
Final project report - 12. Reliability and...	Summary and reflection to the final report
Hauras ja sitkeä murtuma - 3.Material ...	Buckling, fatigue, ultimate and elastic loading. What is the relationship between material selecti...
Marine Structures - 3.Material Selectio...	Many of the things covered here I've done in the past, but with a more rule based approach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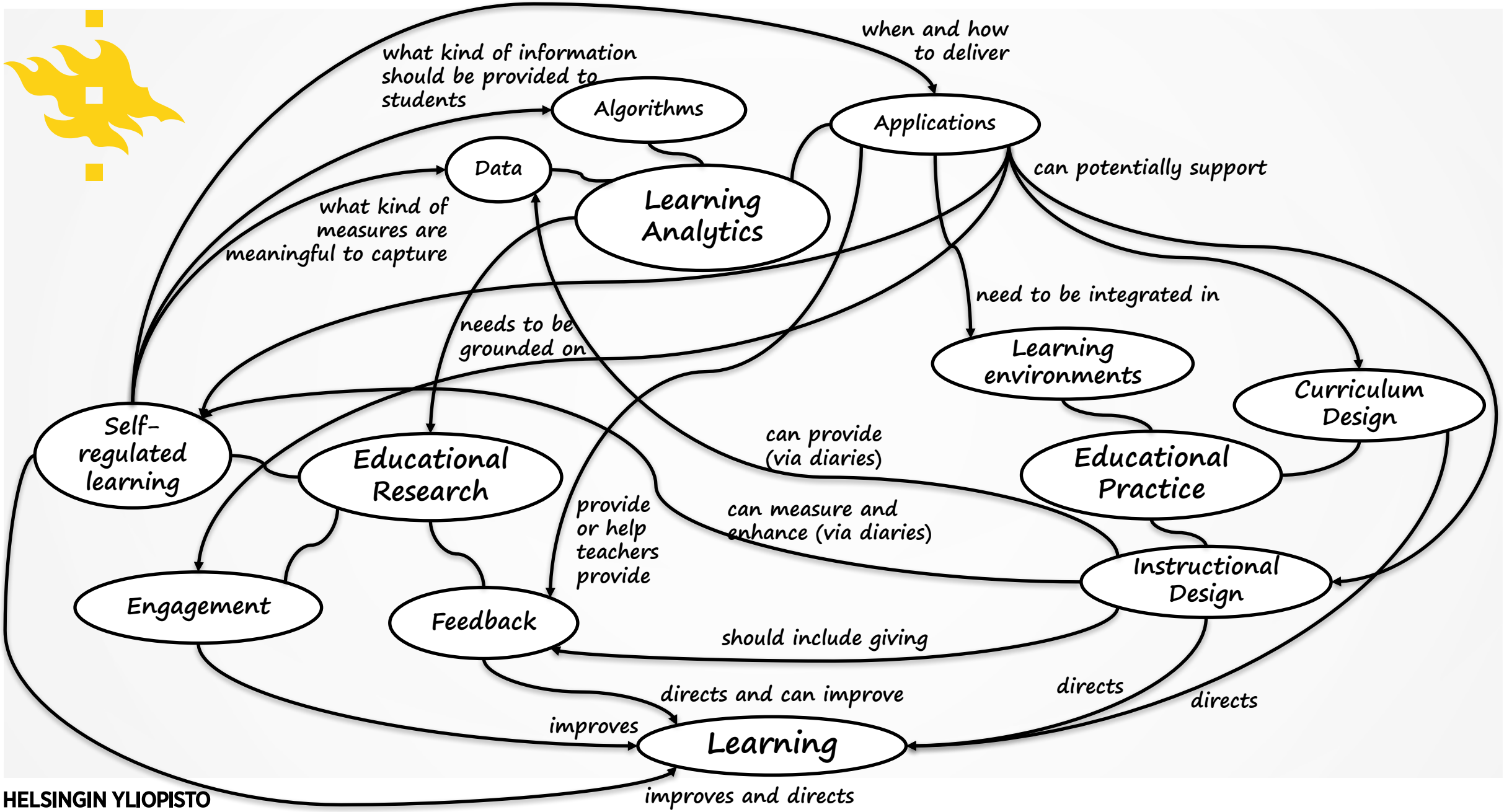
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JOIN US!

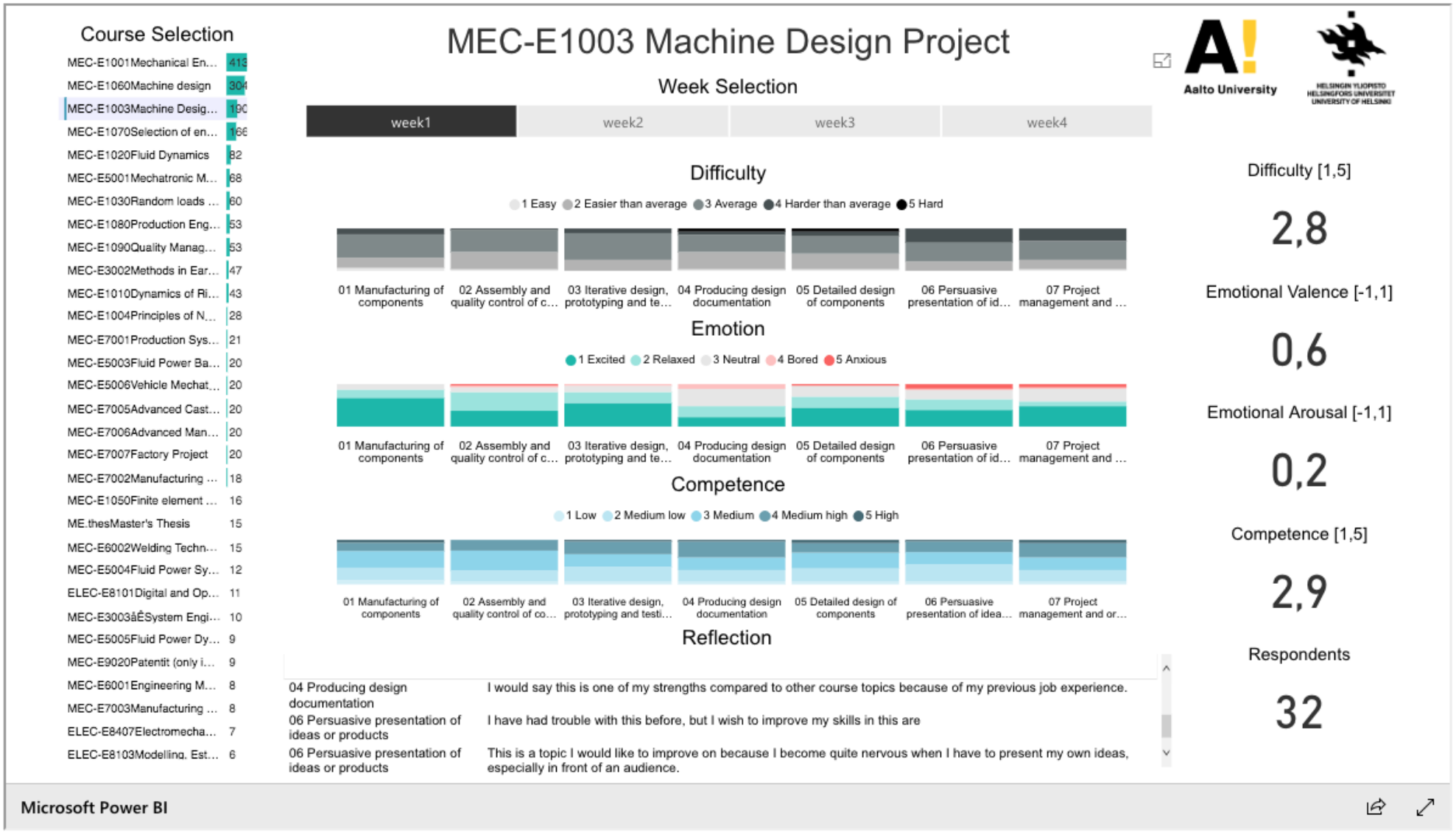
- We are open for collaboration, development partnership or just demonstrating the methodology in your institution
  - Contact me (joonas.pesonen@helsinki.fi) or Ville Kivimäki (ville.kivimaki@aalto.fi)
- Currently involved institutions
  - Aalto University (A!OLE funded development project)
  - University of Helsinki (Petri Ihantola's group at Faculty of Educational Sciences)
- Near future
  - Evaluating the methodology with randomized controlled trials
  - Building open source software to support this methodology
  - Productizing the methodolgy so that it will be easy to bring into use in any educational program

3
CASE EXAMPLES

CASE 1: USING DYNAMIC FEEDBACK SYSTEM IN A MASTER'S PROGRAM AT AALTO UNIVERSITY

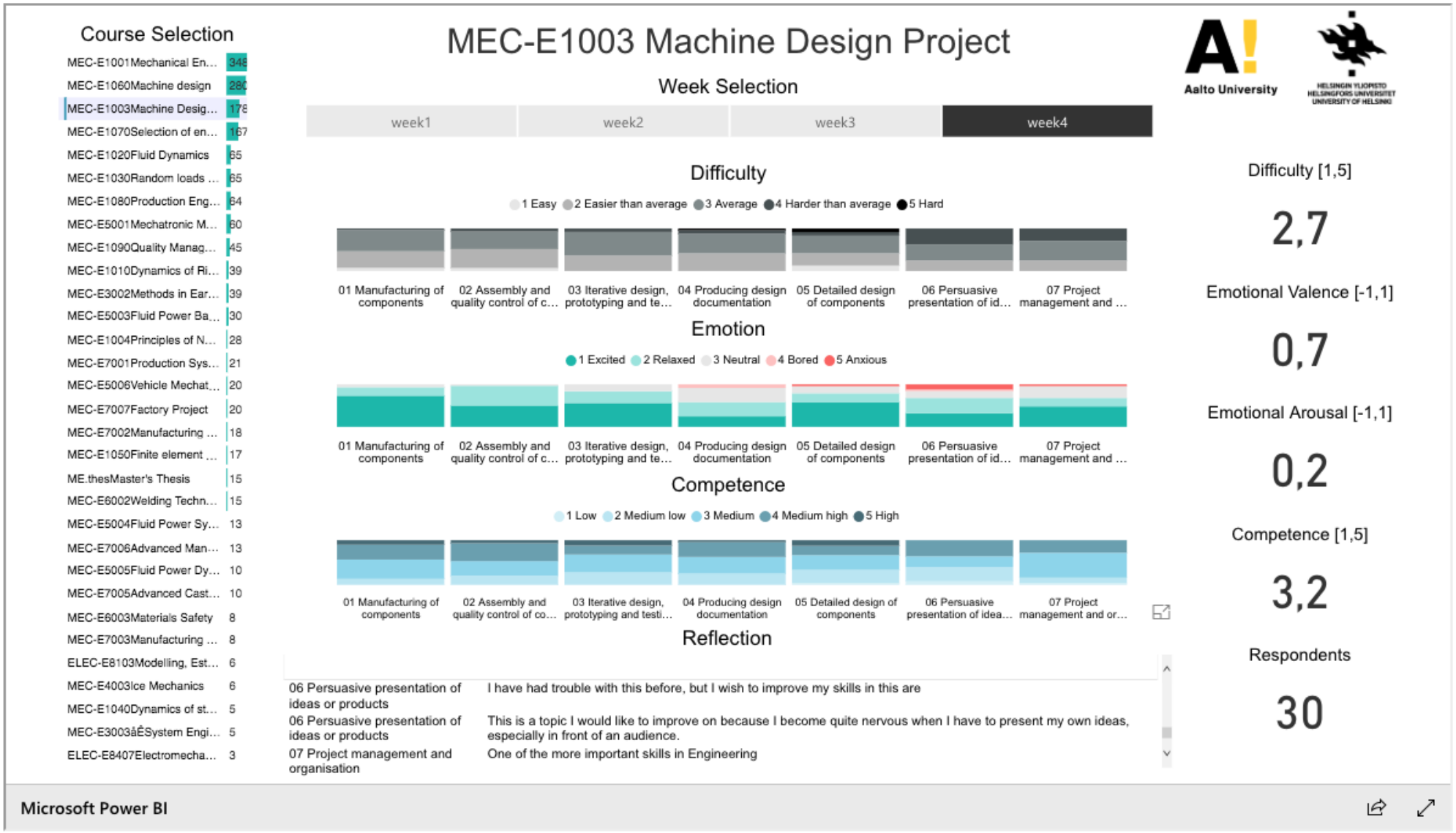
- Weekly structured learning diary as an assignment on course which all degree programme students (N~100) take
- On structured learning diaries, students reflect on their learning process (whole program, not single course) and answer items on
  - Their feeling of competence on different topics
  - Their emotions experienced during studying different topics
  - Their judgements on difficulty of different topics
  - Relationships between different topics
- Data from diaries is anonymized, aggregated and provided to students and teachers in Moodle as learning analytics dashboards

Course Dashboard



Course Dashboard. This dashboard will be updated with real data after weekly Structured Learning Diary submission deadlines.

Course Dashboard



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Topic Relationships Dashboard

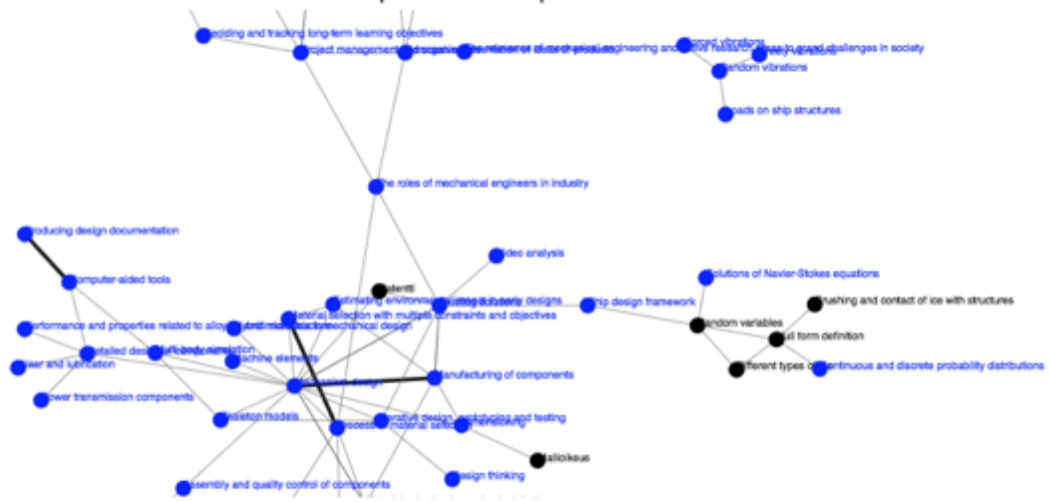
Topic Relationships

Aalto University

Week Selection

week1 | week2 | week3 | week4

Topic Relationships



Relationships

45

Relationship Explanations

"we"
[2nd week] I hope that this course will help me make more clear as to what my professional identity is. By the end of the course I wish to have that clear
[2nd week] Lecture demonstrating engineer's role in industry/society
[2nd week] My previous studies prepared me well for machining skills
After this week's first communication seminar, I learned that I am better at evaluating myself (strengths, weaknesses, goals) than I originally thought. I really enjoyed the w...
Assuming courses to be pretty similar. Update: I was completely wrong.

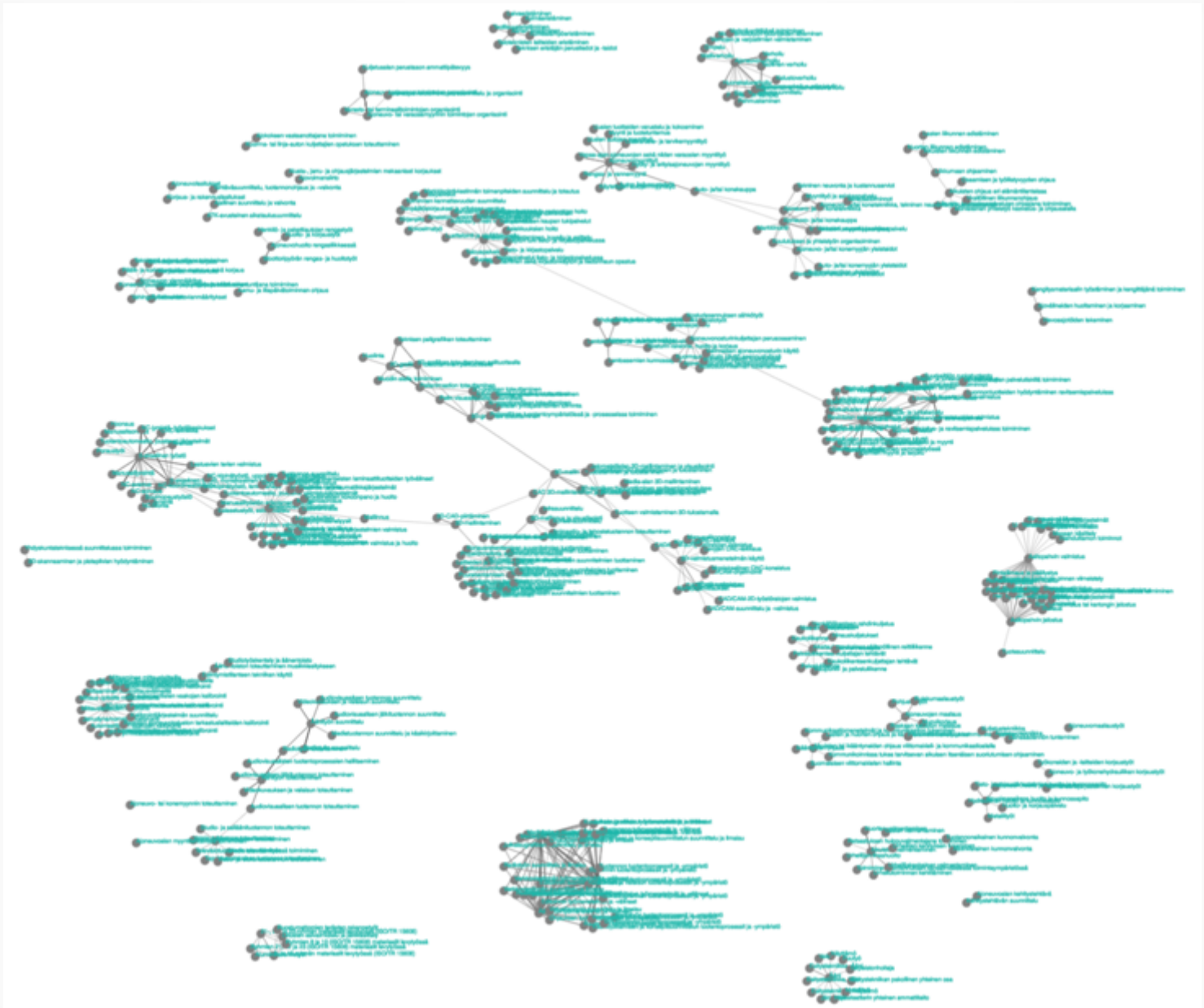
Respondents

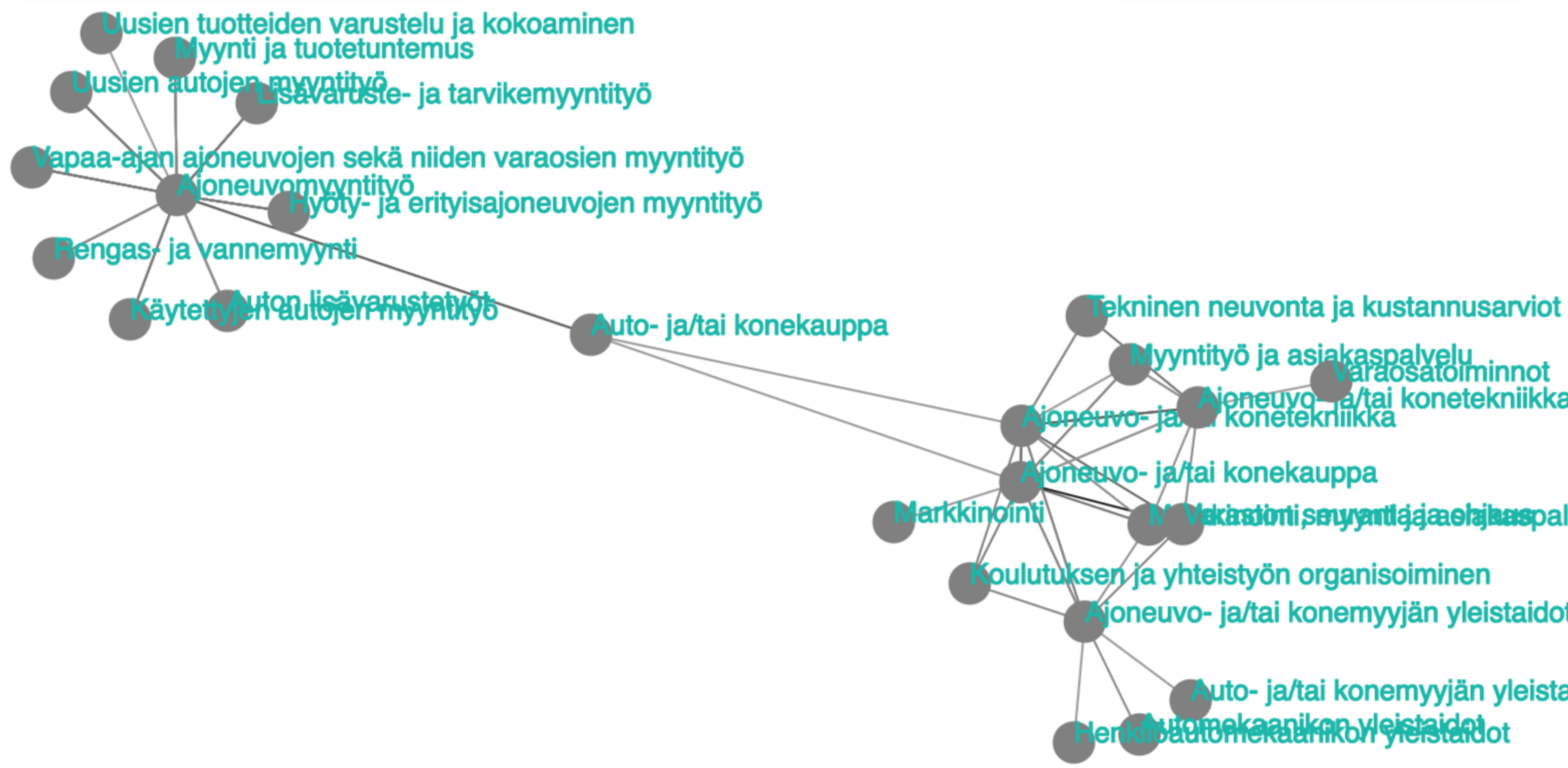
27

Microsoft Power BI

CASE 2: USING ARTIFICIAL INTELLIGENCE WITH CURRICULUM DATA TO IDENTIFY CONNECTIONS

- An exploratory project with Finnish National Agency for Education (Opetushallitus)
- Every curricula in Finnish vocational education analysed with LSA (Latent Semantic Analysis)
- Similarity measure between study modules produced
- Can be visualised as a network of study modules




Uusien tuotteiden varustelu ja kokoaminen
Myynti ja tuotetuntemus
Uusien autojen myyntityö
Lisävaruste- ja tarvikemyyntityö
Vapaa-ajan ajoneuvojen sekä niiden varaosien myyntityö
Ajoneuvomyyntityö
Hyöty- ja erityisajoneuvojen myyntityö
Rengas- ja vannemyynti
Käytettyjen autojen myyntityö
Auto- ja/tai konekauppa
Tekninen neuvonta ja kustannusarviot
Myyntityö ja asiakaspalvelu
Ajoneuvo- ja/tai konetekniikka
Ajoneuvo- ja/tai konekauppa
Markkinointi
Koulutuksen ja yhteistyön organisoiminen
Ajoneuvo- ja/tai konemyyjän yleistaidot
Auto- ja/tai konemyyjän yleista
Henkilöautomekaanikon yleistaidot

THANK YOU!

Contact for collaboration:

joonas.pesonen@helsinki.fi
Joonas Pesonen, Educational Data Scientist @ LinkedIn