Supporting students are teachers with learning analytics

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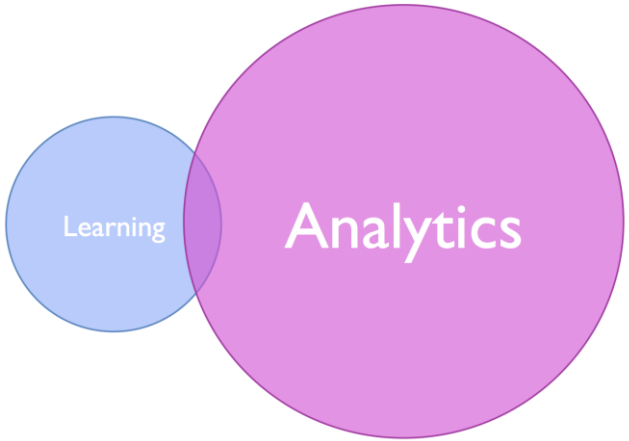
Learning analytics

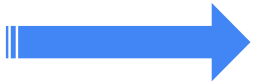
Learning analytics is …

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

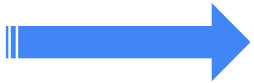
Siemens (2011)



Learning analytics dashboards



Learning analytics dashboards



Action

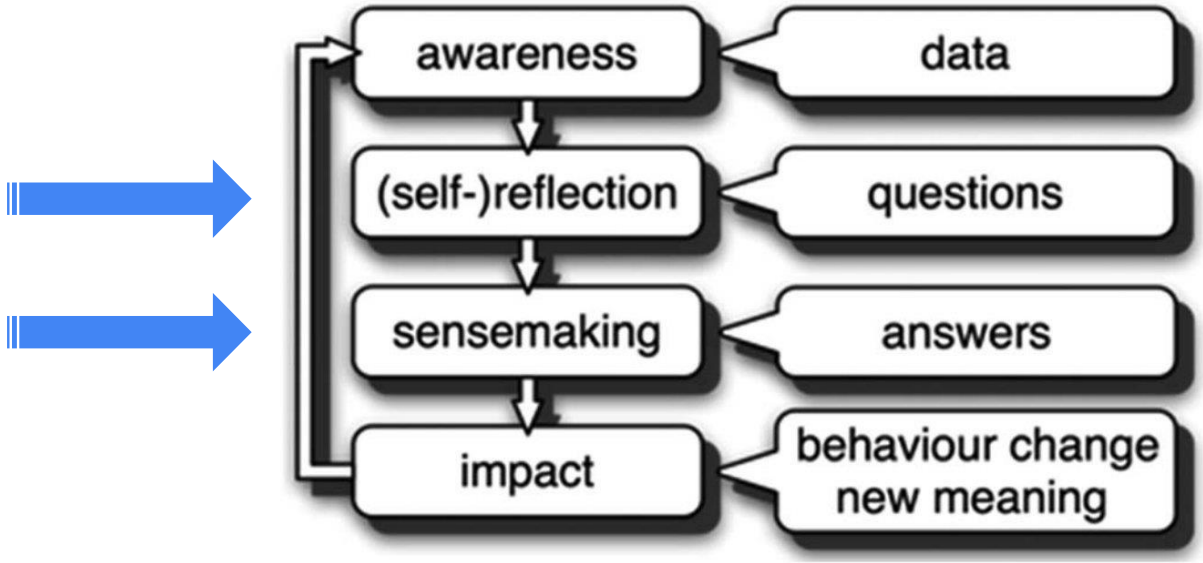
Feedback

Are dashboards effective?

Are dashboards effective?

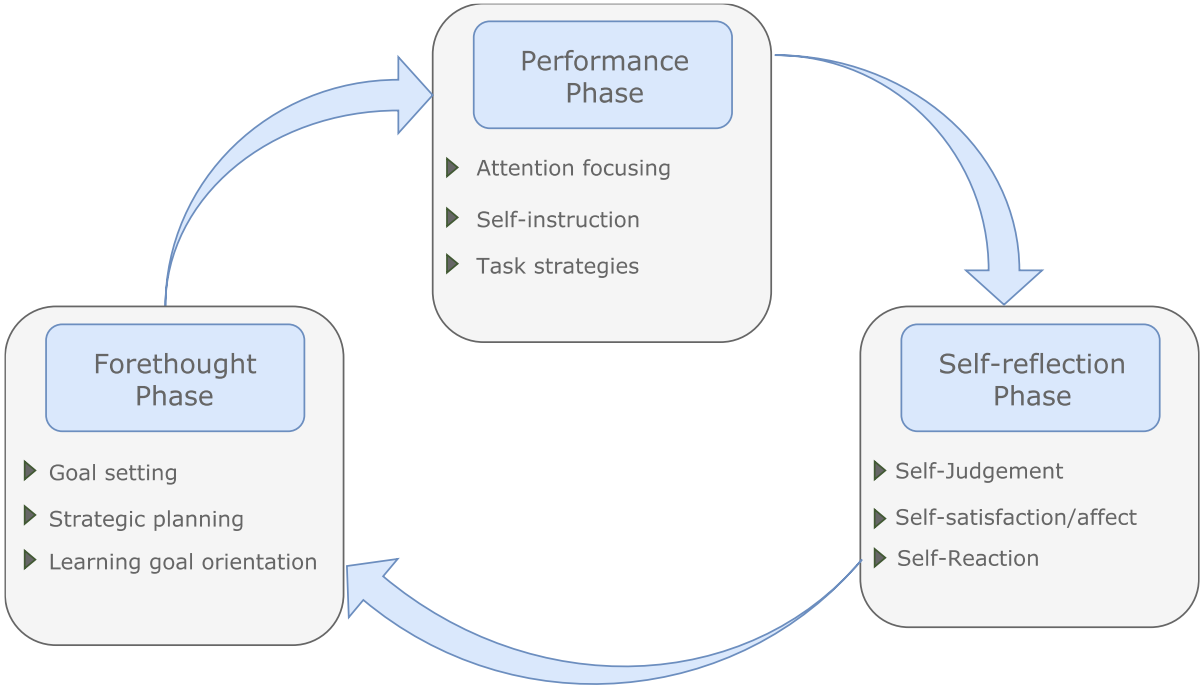
For whom are dashboards effective, why and in what context?

Making sense of learning dashboards



Learning analytics process model - Verbert, K., Duval, E., Klerkx, J., Govaerts, S., & Santos, J. L. (2013). Learning analytics dashboard applications. *American Behavioral Scientist*, *57*(10), 1500-1509.

Self-regulated learning



Adapted from Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into practice*, *41*(2), 64-70.

For whom are **dashboards** effective, **why** and **in what context**?

Self-regulated learning

Learner goals

For whom are **dashboards** effective, **why** and **in what context**?

1. **Design features**
2. **Meaningful data**

Self-regulated learning

Learner goals

Study 1

Design features

Study 2

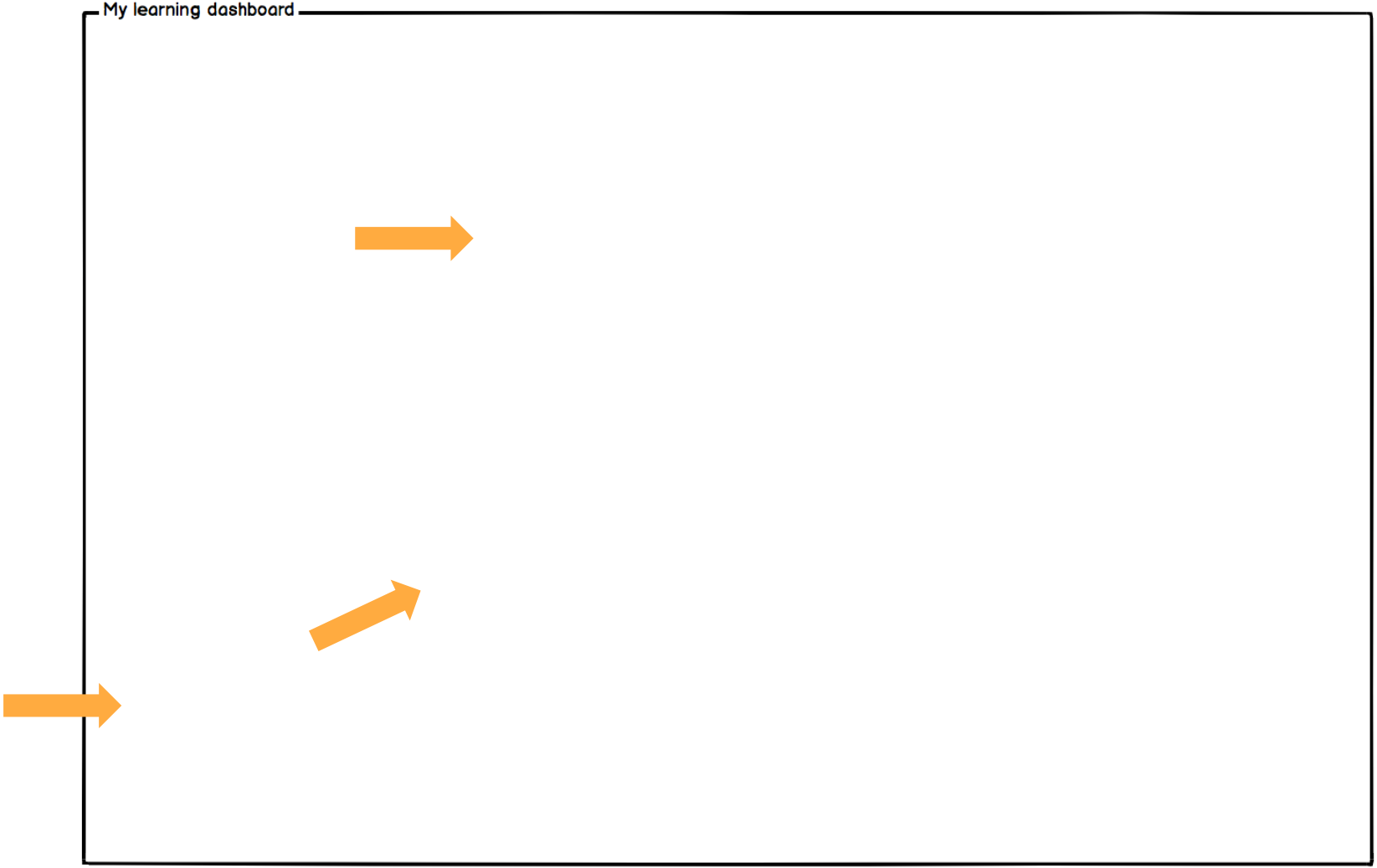
Meaningful data

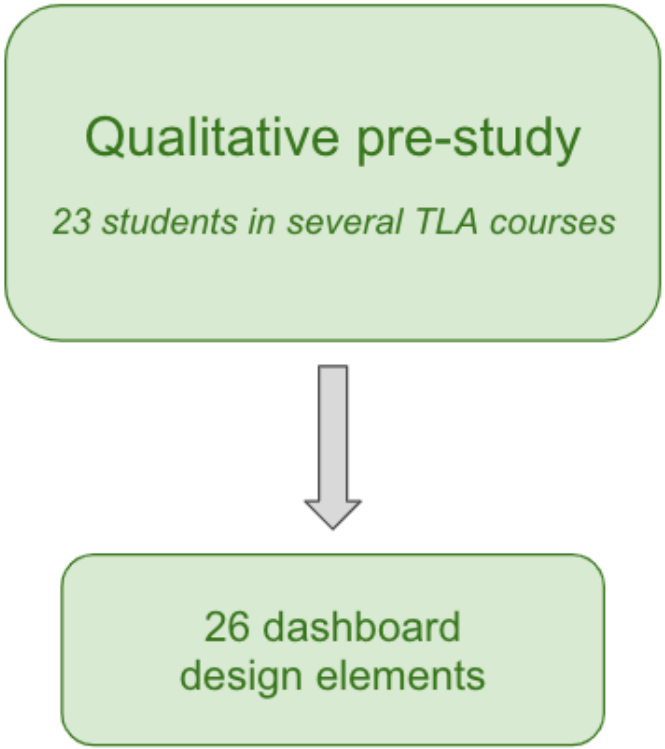
Relevant design features

What ***design features*** learners use to interpret the information on a dashboard?

Do ***goals*** and ***SRL skills*** influence these perceptions?

Jivet, I., Scheffel, M., Schmitz, M., Robbers, S., Specht, M., & Drachsler, H. (2020). From students with love: An empirical study on learner goals, self-regulated learning and sense-making of learning analytics in higher education. *The Internet and Higher Education*, *47*, 100758.


My learning dashboard


Qualitative pre-study
23 students in several TLA courses
26 dashboard
design elements

Design features

1. Transparency of the design
2. Reference frames
3. Support for action

The ***higher SRL skills***, the ***more relevant*** dashboard feature were perceived.

Learners with a ***mastery goal*** rated ***reference frames*** significantly higher.

Meaningful data

If learners have the choice to configure the data on their own dashboard…

What data do they ***choose*** to see?

Do ***goals*** and ***SRL skills*** influence this choice?

Jivet, I., Wong, J., Scheffel, M., Valle Torre, M., Specht, M., & Drachsler, H. (2021). Quantum of Choice: How learners' feedback monitoring decisions, goals and self-regulated learning skills are related. In Proceedings of LAK21: 11th International Learning Analytics and Knowledge Conference, Irvine, CA, USA. *Best Full Paper Award.*

Why is this important?

1. Task-level feedback (Matcha et al., 2019)

   Include process-level feedback

2. Limited student involvement (Dollinger & Lodge, 2018; West et al. 2020)

   Large scale field study with a customisable dashboard:
   - **goal setting**
   - **indicator selection**

3. “One-size-fits-all” designs (Teasley, 2017; Gašević et al., 2016)

   Effects of learner goals (Schunk, 2012) & SRL skills (Zimmerman, 1990) on indicators selection

My learning dashboard

This visualization reminds you of your course goal, shows you your learning behaviour and allows you to improve your study plan each week. You can adjust the indicators weekly.

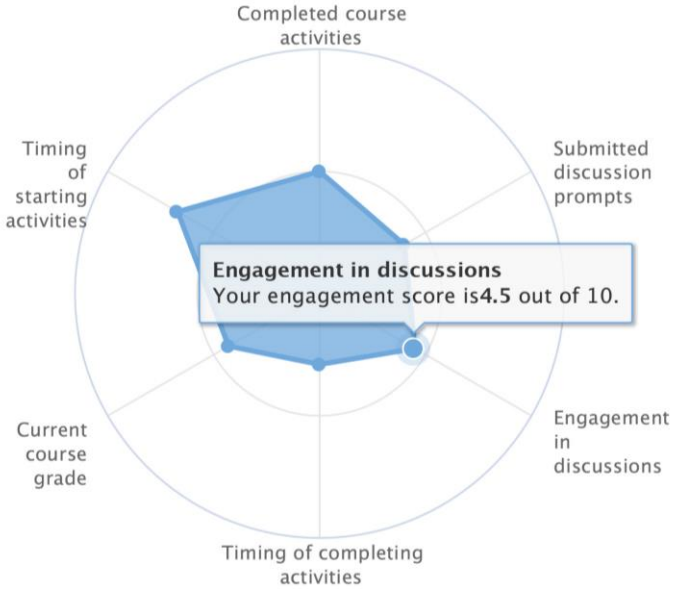
What I want to achieve by the end of the course:

I want to finish the course in three weeks and get a certificate.

Save goal

My outcomes and learning behaviour since the beginning of the course:

Hover over the points on the chart to get more information. The feedback is updated daily.



Change goal

Change indicators

Show explanations

Open FAQ

My learning dashboard

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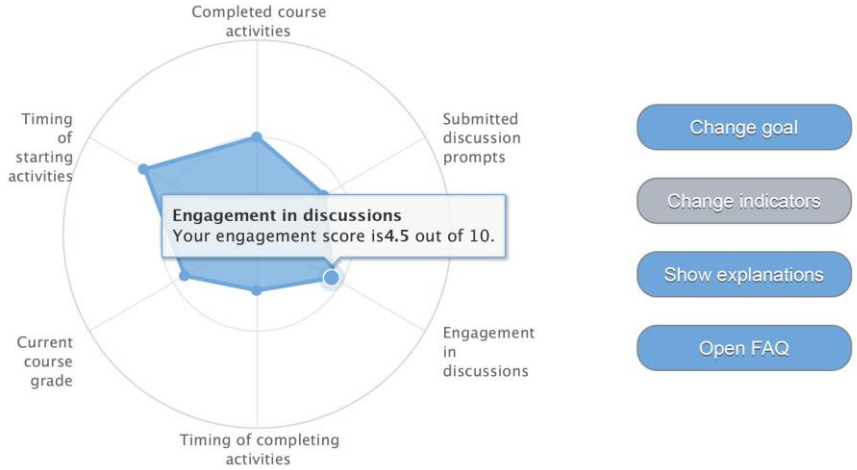


Change goal

Change indicators

Show explanations

Open FAQ

Process-level:
Learning behaviour indicators

- Content revision
- Engagement in discussions
- Productivity
- Online presence*
- Timing of starting activities
- Timing of completing activities

Task-level:
Content progress indicators

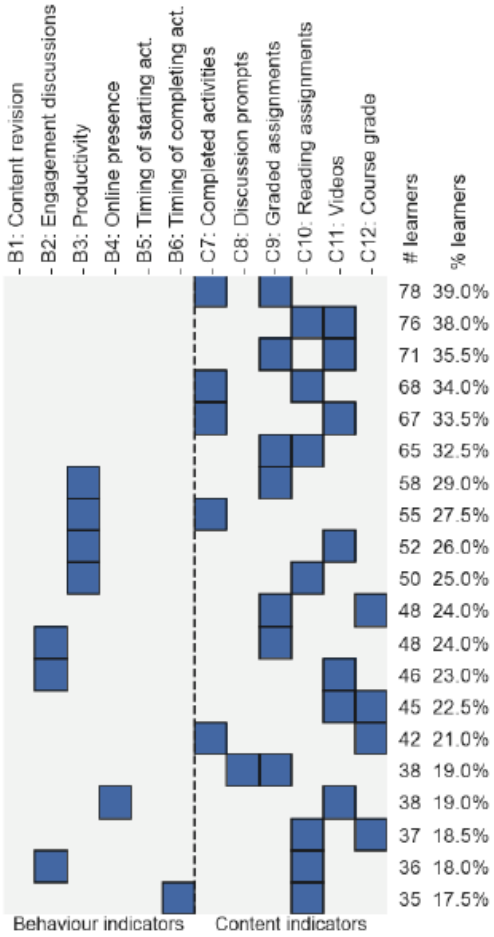
- Completed course activities
- Submitted discussion prompts
- Completed graded assignments
- Completed reading assignments
- Completed videos
- Current course grade

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

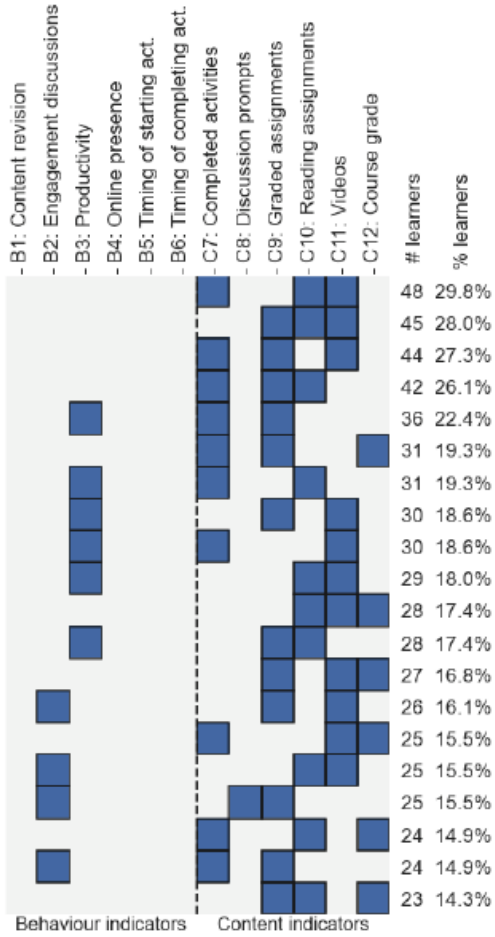
	Total (N=401)		AHE (N=200)		SDG (N=201)	
	#L	%L	#L	%L	#L	%L
3 indicators	101	25.2%	39	19.5%	62	30.8%
4 indicators	54	13.5%	22	11.0%	32	15.9%
5 indicators	69	17.2%	28	14.0%	41	20.4%
6 indicators	177	44.1%	111	55.5%	66	32.8%

		Total (N=401)		AHE (N=200)		SDG (N=201)		χ^2	
		# learners	% learners	# learners	% learners	# learners	% learners	Value	p
Learning behaviour indicators									
B1	Content revision	102	25.4%	63	31.5%	39	19.4%	7.73	.005**
B2	Engagement in discussions	122	30.4%	74	37.0%	48	23.9%	8.15	.004**
B3	Productivity	189	47.1%	99	***49.5%***	90	***44.8%***	0.90	.343
B4	Online presence	109	27.2%	63	31.5%	46	22.9%	3.76	.055
B5	Timing of starting activities	69	17.2%	46	23.0%	23	11.4%	9.40	.002**
B6	Timing of completing activities	117	29.2%	62	31.0%	55	27.4%	0.64	.423
Content progress indicators									
C7	Completed course activities	251	62.6%	114	***57.0%***	137	***68.2%***	5.33	.021*
C8	Submitted discussion prompts	95	23.7%	59	29.5%	36	17.9%	7.45	.006**
C9	Completed graded assignments	248	61.8%	123	***61.5%***	125	***62.2%***	0.02	.887
C10	Completed reading assignments	231	57.6%	111	***55.5%***	120	***59.7%***	0.73	.395
C11	Completed videos	241	60.1%	122	***61.0%***	119	***59.2%***	0.14	.713
C12	Current course grade	152	37.9%	75	37.5%	77	38.3%	0.03	.867

Note: $^{***}p < .001$; $^{**}p < .01$; $^{*}p < 0.05$.



(a) 2 indicators in AHE



(b) 3 indicators in AHE

Meaningful data

Learners focus on ***content progress indicators*** (activities completed).

- Easy to understand & immediately actionable
- Paradox of choice (Schwarz, 2004)
- Feedback literacy (Carless, 2018)

Goals formulations do ***not predict*** chosen indicators.

Some SRL skills predict the selection of some indicators.

- ***Time management*** skills predict the use of ***procrastination indicators***.
- ***Help-seeking skills*** predicts monitoring ***engagement in discussion***.

Course is a significant predictor for multiple indicators.

Learner dashboard design recommendations

1. Design and evaluate dashboards as feedback tools
2. Adaptive support for less successful learners
3. Support learners in acting on the feedback

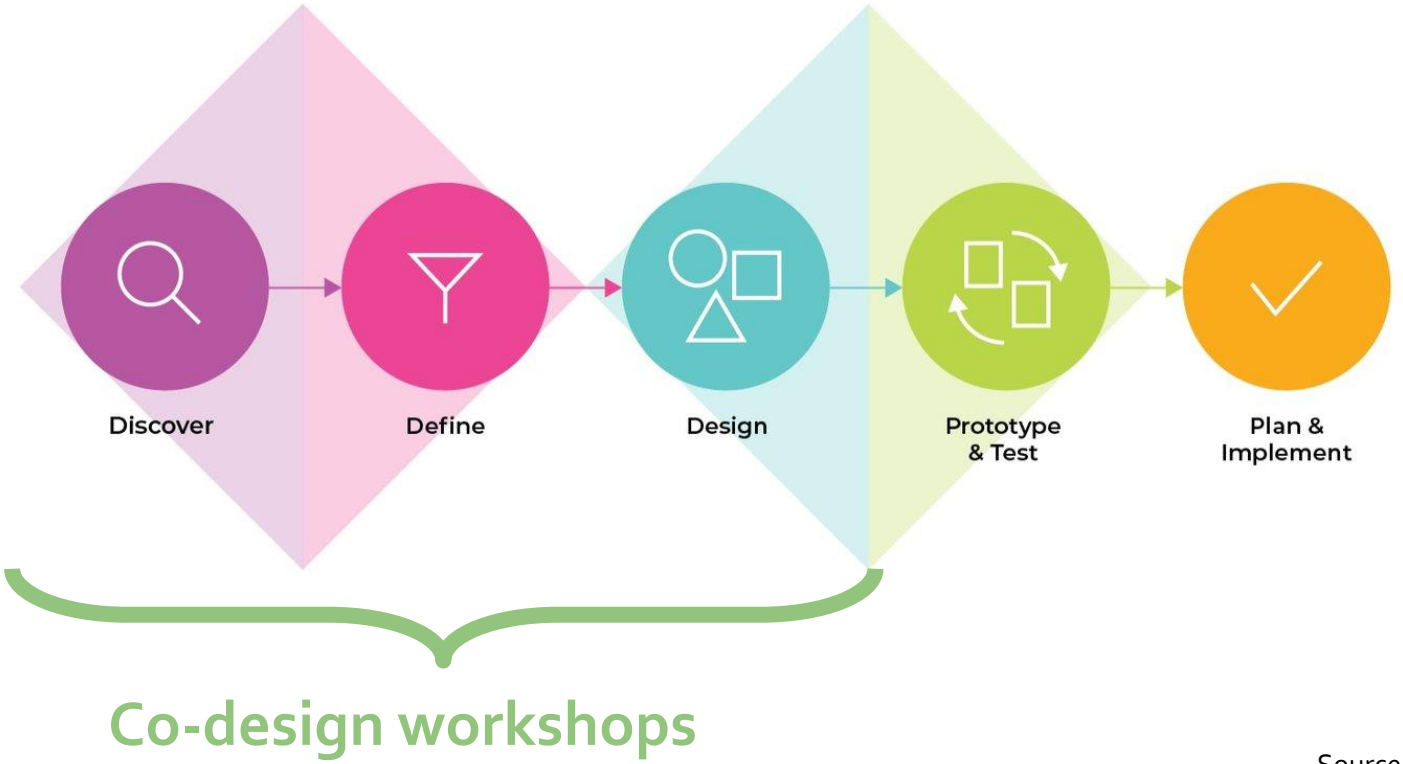
Source: https://www.loginworks.com

Human-Centred Learning Analytics

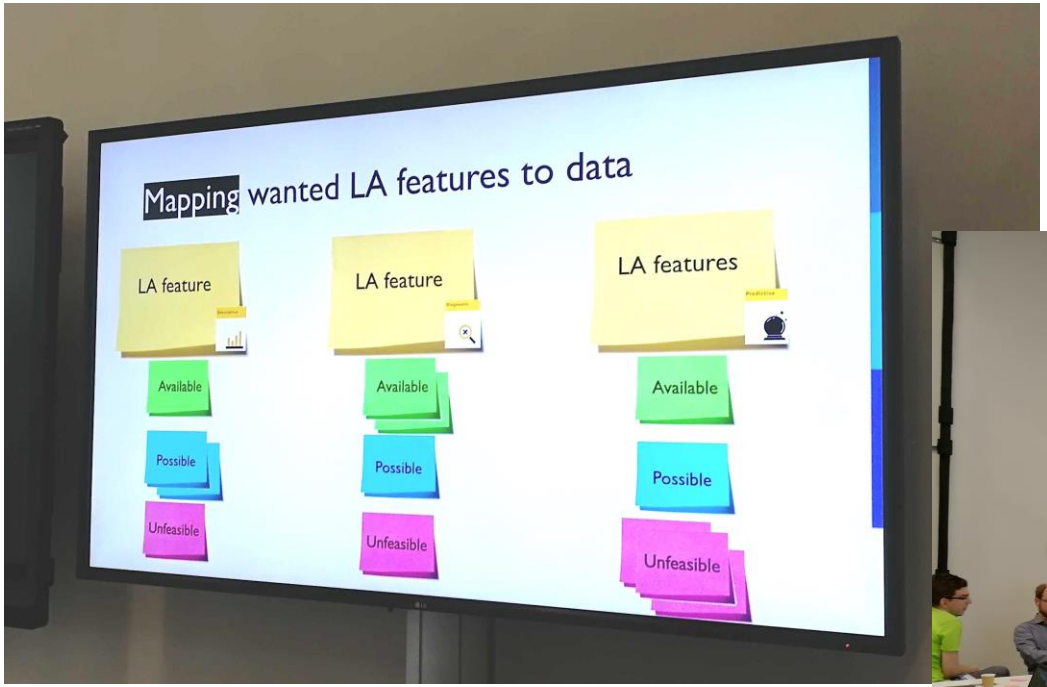
"… meanings, interaction opportunities, functions, and system attributes should be defined by the people for whom the system is intended, rather than imposed by designers or researchers."

(Buckingham Shum et al., 2019)

Human-Centred Learning Analytics

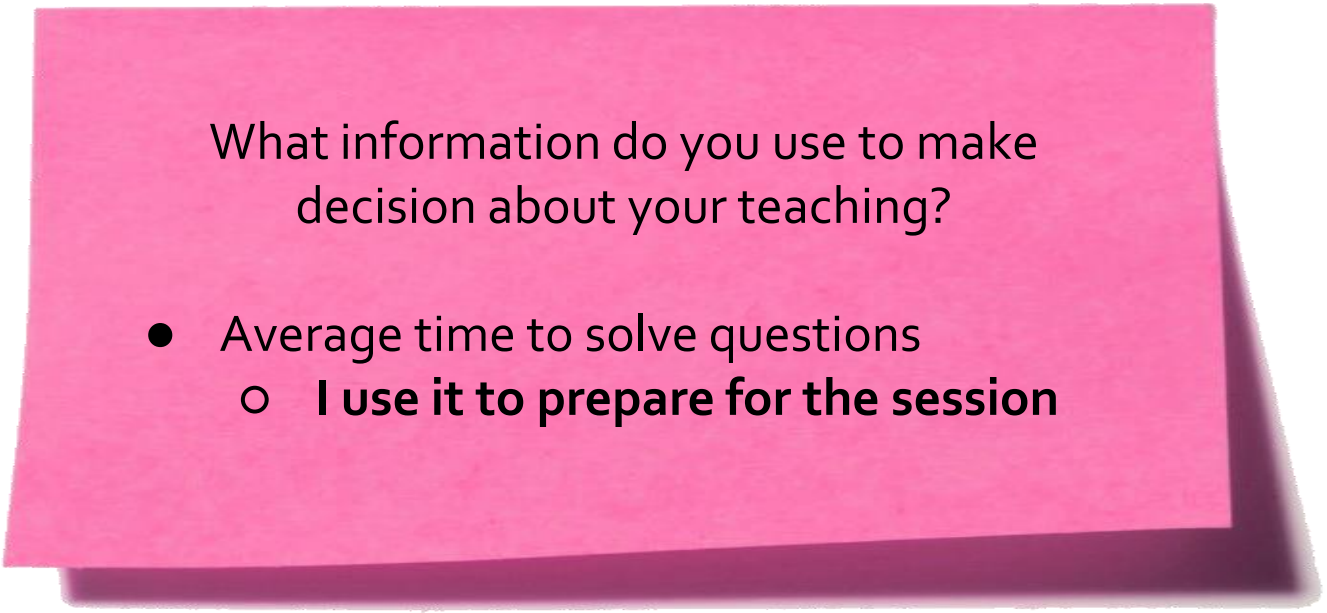


Source:
http://outwitly.com/


Mapping wanted LA features to data
LA feature
LA feature
LA features
Available
Available
Available
Possible
Possible
Possible
Unfeasible
Unfeasible
Unfeasible

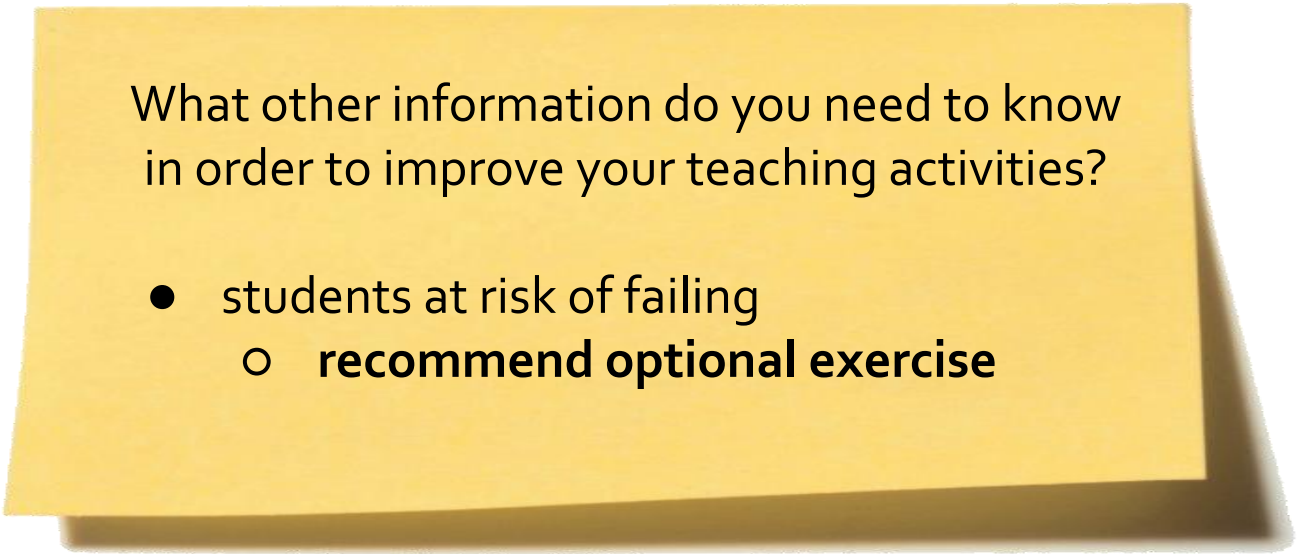
Workshop activities

1. Define the context and ***gaps***



Workshop activities

1. Define the context and ***gaps***
2. Identify needed ***information***



Workshop activities

1. Define the context and ***gaps***
2. Identify needed ***information***
3. Map LA features to ***data sources***

Workshop activities

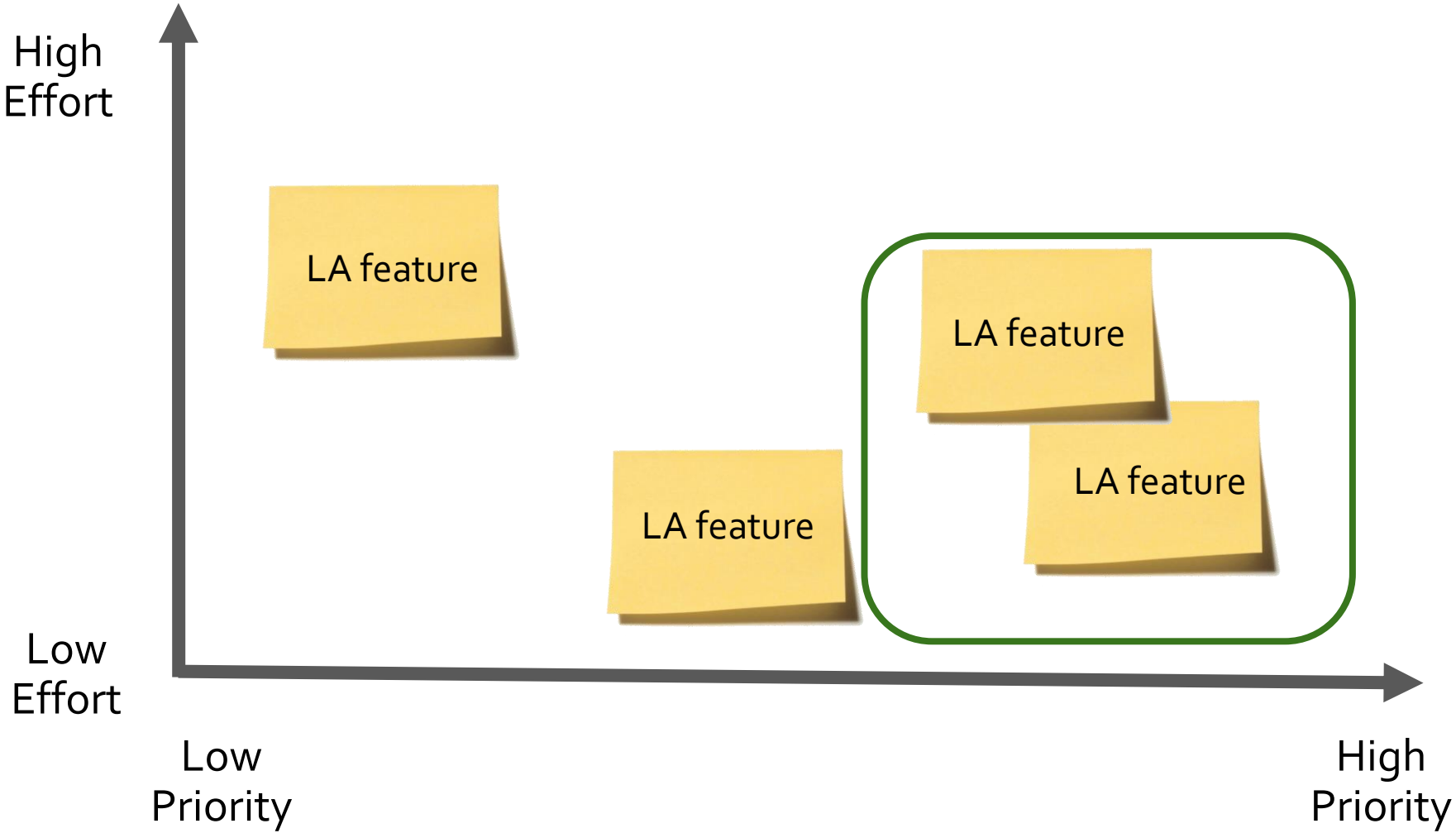
1. Define the context and ***gaps***
2. Identify needed ***information***
3. Map LA features to ***data sources***
4. Add an ***interface***

Workshop activities

1. Define the context and ***gaps***
2. Identify needed ***information***
3. Map LA features to ***data sources***
4. Add an ***interface***
5. Plan ***implementation***

How critical and useful is this feature?

How much effort is it required to implement this feature?


High Effort
LA feature
LA feature
LA feature
LA feature
Low Effort
Low Priority
High Priority

Workshop activities

1. Define the context and ***information gaps***
2. Identify ***information*** needs
3. Map LA features to ***data sources***
4. Add an ***interface***
5. Prioritise ***implementation***
6. Plan ***evaluation***

Bridging Learning Analytics and Learning Design

Marcel Schmitz
Zuyd Hogeschool
fola2.com

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HIKOF-DL

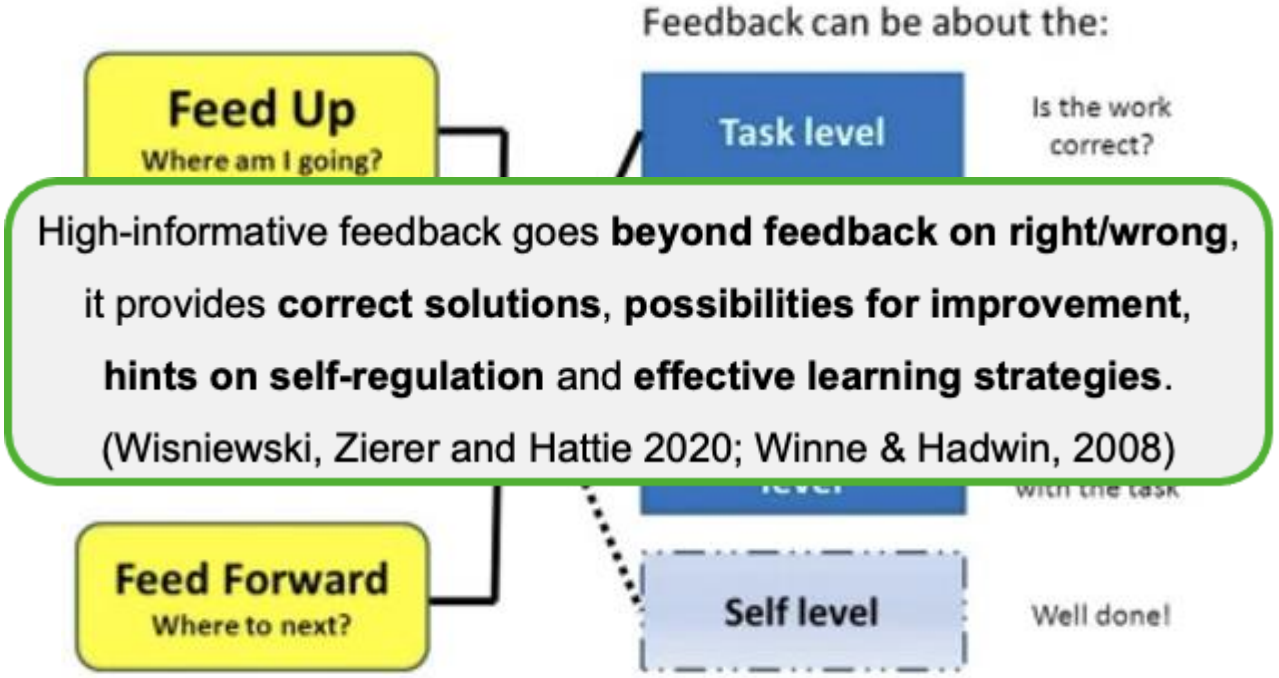
Highly Informative and Competence-based Feedback for Digital Learning

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

Project goals

- Currently, almost all students learn digitally and from home.
- Feedback is an important factor for learning effectively.
- Online courses often still lack individual feedback for learners.
- HIKOF-DL: delivers highly informative and competence-based feedback with the help of digital learning data and AI.
- Established open source software solutions (**KAT-HS & OnTask**) are combined and applied.

Highly informative feedback



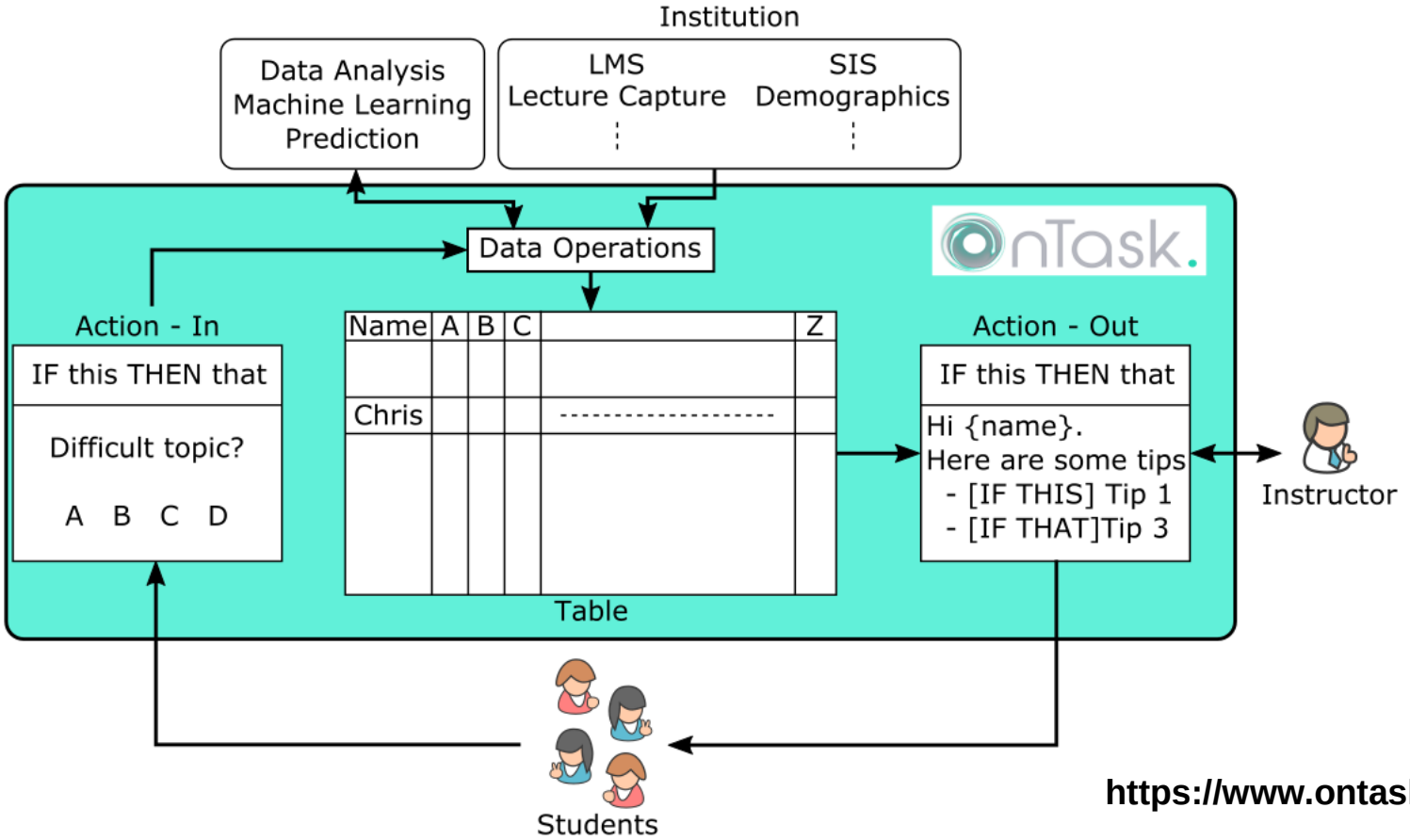
Hattie, J., & Timperley, H. (2007). The power of feedback. Review of educational research, 77(1), 81-112.

Personalisation at Scale

Pardo, A., Jovanovic, J., Dawson, S., Gašević, D., & Mirriahi, N. (2019). Using Learning Analytics to Scale the Provision of Personalised Feedback. *British Journal of Educational Technology*, *50*(1), 128–138. https://doi.org/10.1111/bjet.12592

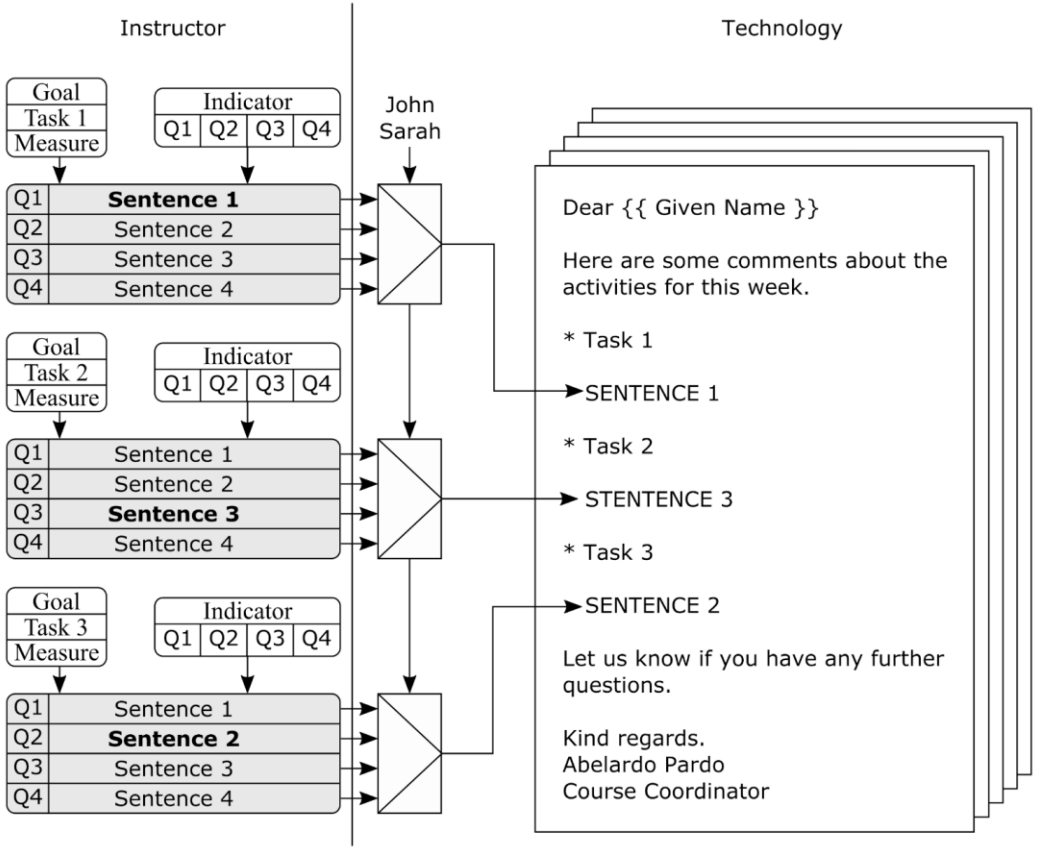
Image by Eak K. from Pixabay.

OnTask system

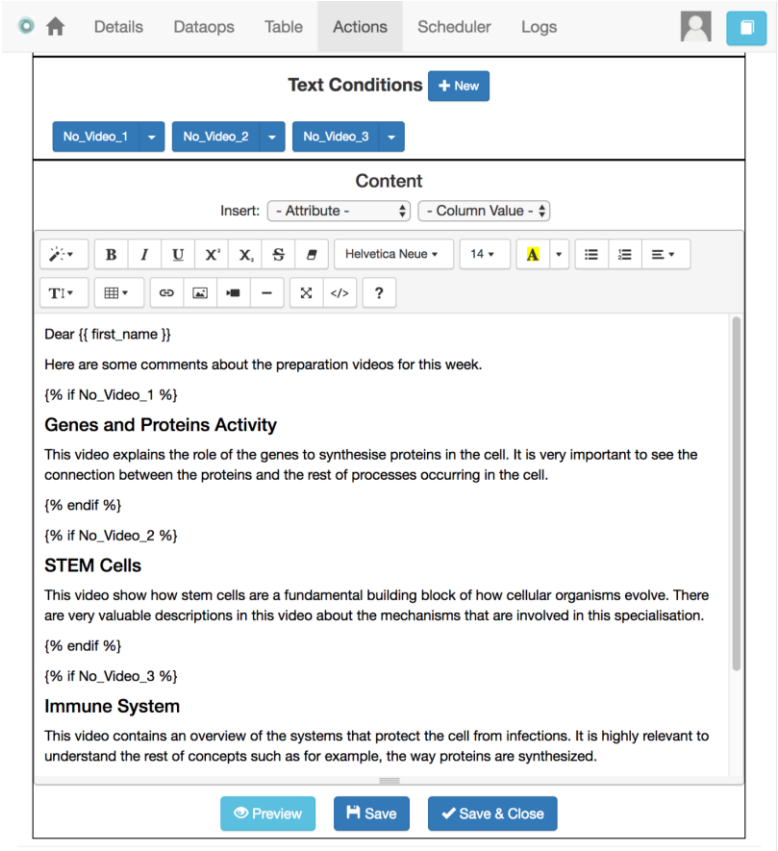


https://www.ontasklearning.org/

OnTask system



OnTask system



Hi [redacted]

Here are some comments and feedback about your lecture preparation in ELEC1601 during Week 2.

Activity VIDEO: Encoding in base 2, 8 and 16

- Make sure you review again the whole content explained in the video of the activity. You could use a piece of paper and try to replicate the developments that are explained in the video.
- Give another round to the questions next to the video in this activity until you answer all of them correctly at the first attempt and without looking at the solutions.

VIDEO: Review of natural and integer number encoding

- Make sure you review again the whole content explained in the video in the activity. Encoding naturals is a procedure that you will be using very frequently in the following weeks.

VIDEO: Encoding Integers

- Review again the 2s complement encoding explained in the video in the activity. Repeat the procedure until you are able to do it very fast.
- You should give it another try to the questions next to the video in this activity. Try to work in the encoding until you have no incorrect answers in a full round.

Read about the floating point representation

- Good work with the questions in the section. You may take some of them and create variations (change number of bits for example) to make sure you fully understand the concepts.
- You should give it another try to the questions about range, accuracy and precision in section 2.7.2.
- Good work with the questions in section 2.7.3.

Sequence of problems about information encoding

- Good work with the exercises in the sequence. You may want to review it in a few days, or perhaps before the midterm.

Regards

Ongoing work

Preparing the software & adaptation (April - August)

- Installing and testing the software in Moodle

Pilot study (Oct – Feb)

- Experiment with control group
- Winter semester 21/22
- Review of effectiveness & generation of data
- Sample size: ca. 650 students

Main study (Oct – Feb 22)

- Compute indicators and create ruules based on pilot study data
- Evaluate effectiveness of personalised feedback

Towards the future of learning analytics

1. Explore interactive and customisable dashboard
2. Assist the development of feedback literacy and data literacy
3. Crafting meaningful indicators to describe learning

Thank you!

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