

Symposium: Towards Highly-Informative Learning Analytics
Open Universiteit, Heerlen, The Netherlands

Designing student-facing learning analytics for higher education

Dr. Ioana Jivet
12.05.2023



Zentrale eLearning-Einrichtung
Goethe-Universität Frankfurt am Main



EduTec 
Educational Technologies @ DIPF

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SEPTEMBER 2015

SUNDAY MONDAY TUESDAY WEDNESDAY

		1	2
6	7	8	9
13	14	15	16
20	21	22	23
27	28	29	30

The
TIPPING POINT

How Little Things Can
Make a Big Difference

MALCOLM
GLADWELL

KA

WINNER

Edisherashvili et al. (2022)

Photo by [Avel Chuklanov](#) on Unsplash

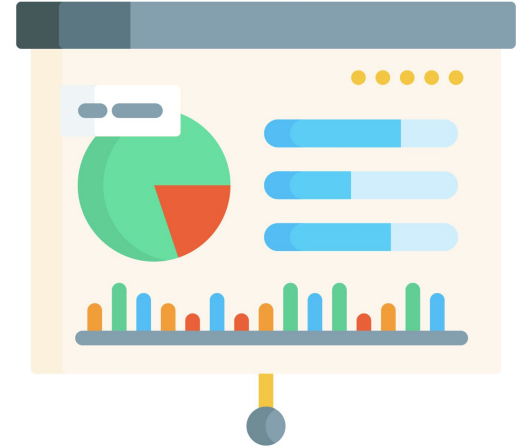
Learning analytics



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

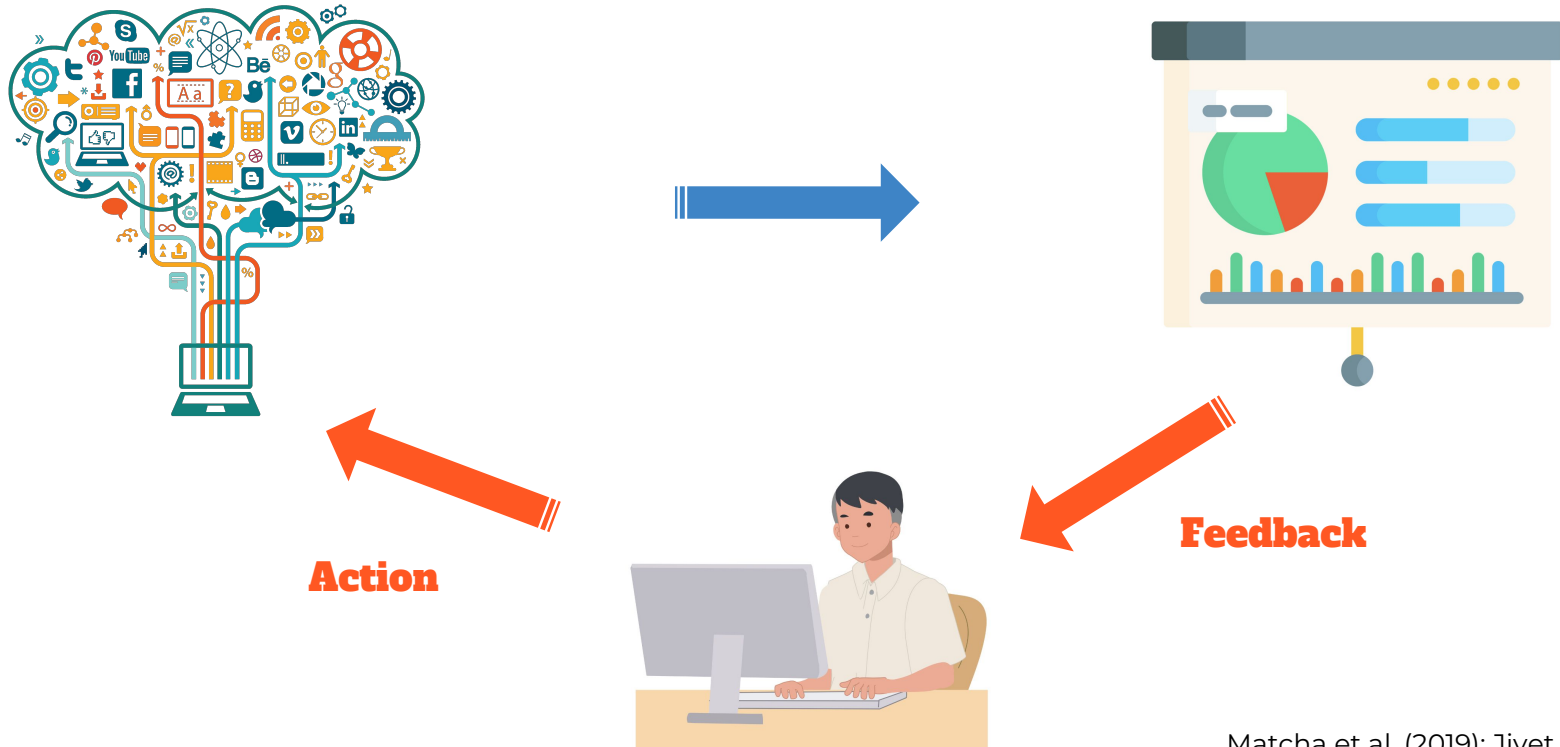
Siemens & Gasevic (2012)

Student-facing learning analytics





Student-facing learning analytics



Student-facing learning analytics



Informative



Understandable



Actionable

Student-facing learning analytics



Informative learning analytics

The impact of feedback is substantially influenced by the information content.

Wisniewski et al. (2020)

Not all types of feedback are equally effective.

Hattie & Timperley (2007)

Task level

Is the work correct?

Process level

Process to complete the task

SRL level

Self-management during learning

Self level

Praise: "Well done!"

Feedback levels according to Hattie & Timperley (2007)

Do learners see value in this feedback?

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

... what data do they **choose** to monitor?

... do their **goals** and **SRL skills** influence this choice?

Jivet, I., Wong, J., Scheffel, M., Valle Torre, M., Specht, M., & Drachsler, H. (2021, April). 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 (pp. 416-427). *Best Paper Award*.

My learning dashboard

Learning with a MOOC can be challenging. This tool supports you to achieve your goals. Here you can (1) actively set your goal for this course and (2) select indicators to monitor your progress towards your goal.

What do you want to achieve by the end of this course?

Some examples for a goal are learning specific topics covered by the course, completing the course and getting a certificate, completing all activities in the course in a certain timeframe, dedicating 3 hours weekly to this course, etc.

Save goal

Goal input

How would you like to monitor progress towards this goal?

You can choose between three and six indicators. You can change them at the beginning of every week. Hover over each indicator to show its description.

- | | |
|--|---|
| <input type="checkbox"/> Engagement in discussions | <input type="checkbox"/> Completed course activities |
| <input type="checkbox"/> Current course grade | <input type="checkbox"/> Online presence |
| <input type="checkbox"/> Content revision | <input checked="" type="checkbox"/> Timing of starting activities |
| <input type="checkbox"/> Productivity | <input checked="" type="checkbox"/> Submitted discussion prompts |
| <input type="checkbox"/> Completed reading assignments | <input checked="" type="checkbox"/> Completed graded assignments |
| <input type="checkbox"/> Completed videos | <input type="checkbox"/> Timing of completing activities |

Save ind

The average number of days between completing an activity and the end of the course week that the activity is assigned to. This is an indicator of how close to the end of the learning week, on average, you complete the learning activities.

Select 3-6 indicators

Indicator descriptions

**Task-level:
Content progress indicators**

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

**Process-level:
Learning behaviour indicators**

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

The Views of Assessment Experts

Further Considerations on the Role of Assessment

The Usability of Assessment

Where to Start? The Assessment Cycle

My learning dashboard

🕒 My learning dashboard
10 min

My learning dashboard

Learning with a MOOC can be challenging. This tool supports you to achieve your goals. Here you can (1) actively set your goal for this course and (2) select indicators to monitor your progress towards your goal.

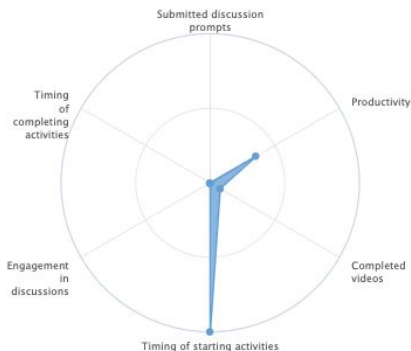
What I want to achieve by the end of the course:



finish the course on time and get a certificate

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

Hover over the points on the chart to get more information. The information shown on the chart is updated once per day.



Change goal

Change indicators

Show explanations

Open FAQ

Change settings

Show explanations

Self-regulated learning (SRL) questionnaire

Help our research and fill out the SRL questionnaire. The questionnaire assesses four self-regulated learning skills in relation to this course: time management, help-seeking, goal setting and self-evaluation and will not take more than 10 minutes.

Fill out the SRL survey



401 learners configured the dashboard

Indicator selection data:

- 12 binary variables

Goal data - Schunk (2012):

- *Learning component:* knowledge, understanding, skills, transfer
- *Performance component:* complete the course, certificate
- *Time frame*

SRL data - SOL-Q-R (Jansen et al., 2018)

- Metacognitive activities before learning
- Metacognitive activities after learning
- Time management
- Help seeking

Findings

- Learners focus on content progress indicators.
 - Easy to understand & immediately actionable
 - Paradox of choice (Schwarz, 2004)
 - Feedback literacy (Carless, 2018)
- The way learners formulate goals does not predict their monitoring choices.
 - Same choices, but different motivations, insights and interpretation

Findings

- Time management predicts use of procrastination indicators.
- Help seeking predicts monitoring engagement in discussion.

What about learners with lower time management skills
or who don't know where to seek help?

Crafting the 12 indicators
was the bigger challenge!

**Work in
progress**



Crafting the 12 indicators
was the bigger challenge!

**Work in
progress**

Leiden•Delft•Erasmus
Centre for Education and Learning



**Utrecht
University**

Student-facing learning analytics

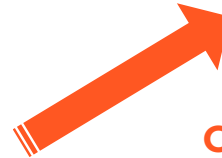


Feedback

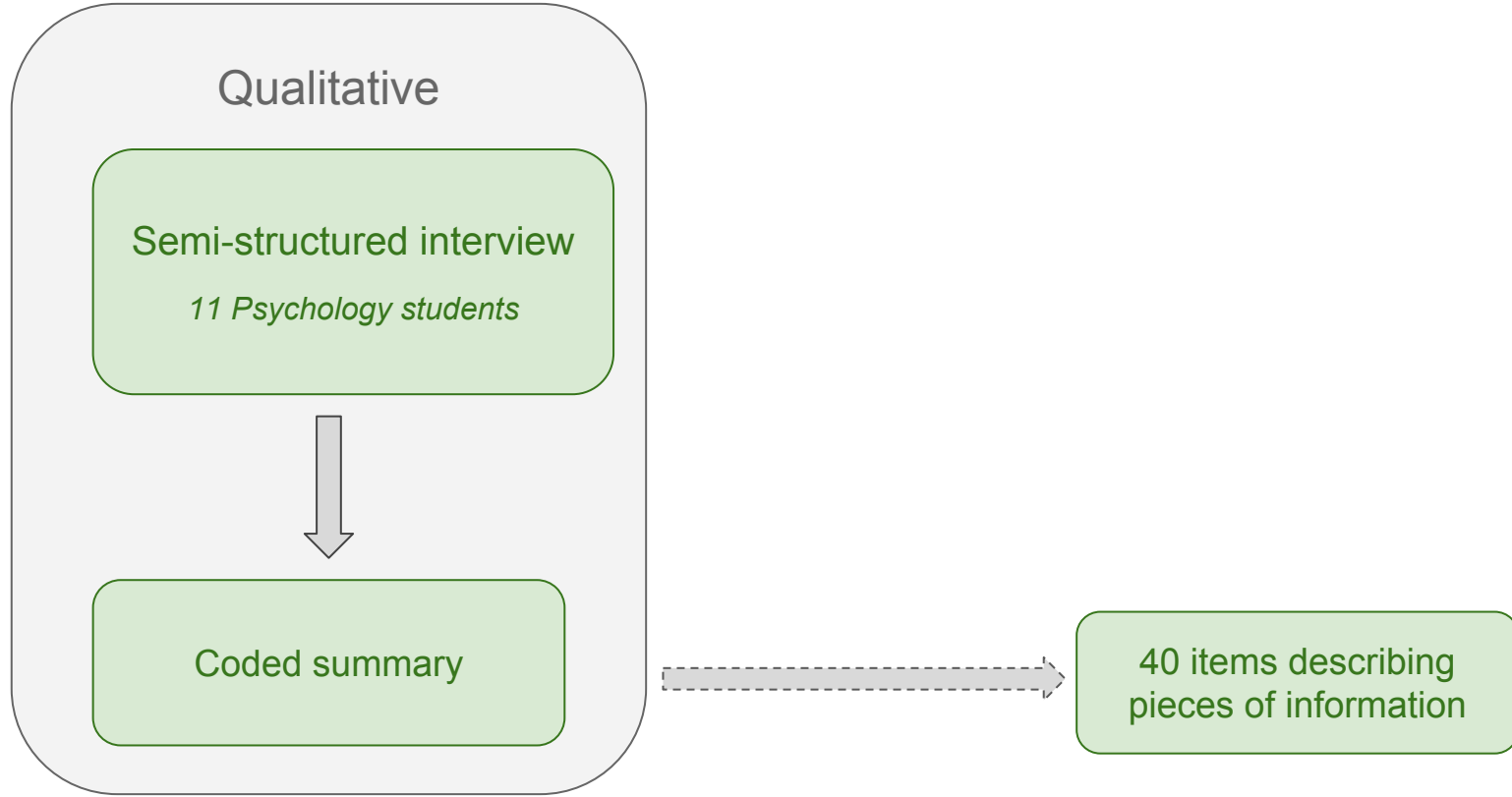


Action

Our approach for crafting indicators

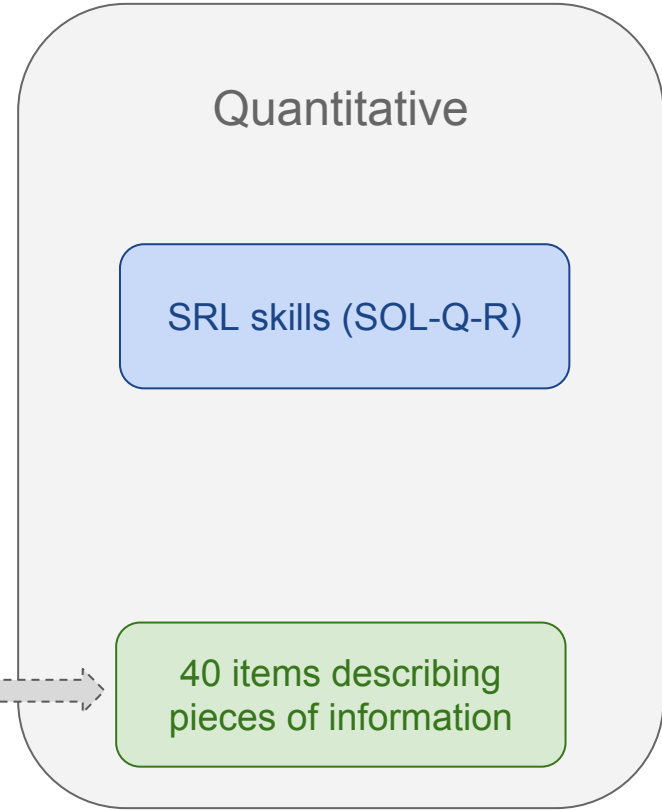
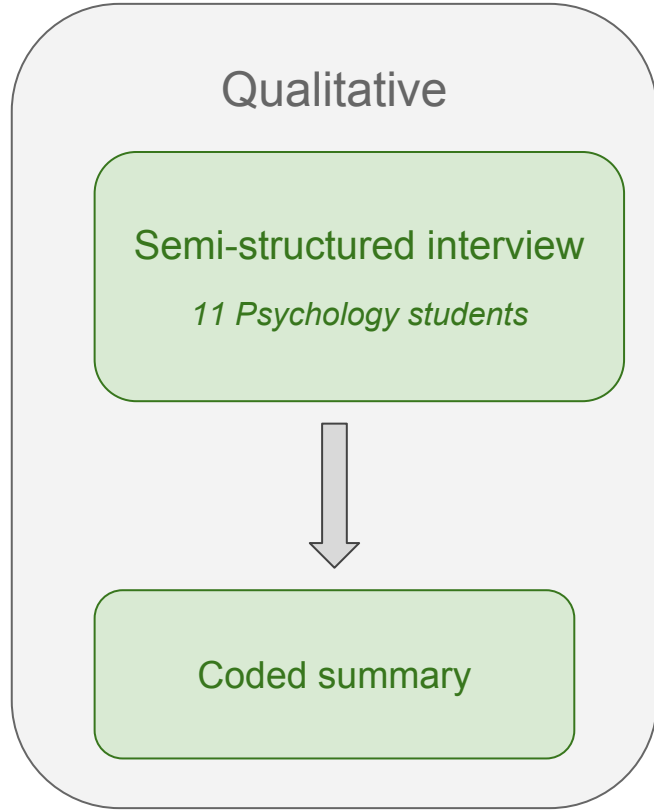


**Current practice
Needs and wants**



Resulting categories of items

- **Course related information**
 - *The criteria for passing the course*
- **Task-level**
 - *Information about how well you are progressing in the course assignments*
- **Performance-level**
 - *Information about how much you procrastinate*
- **SRL-level**
 - *Information about how accurate your grade predictions are*



Future plans

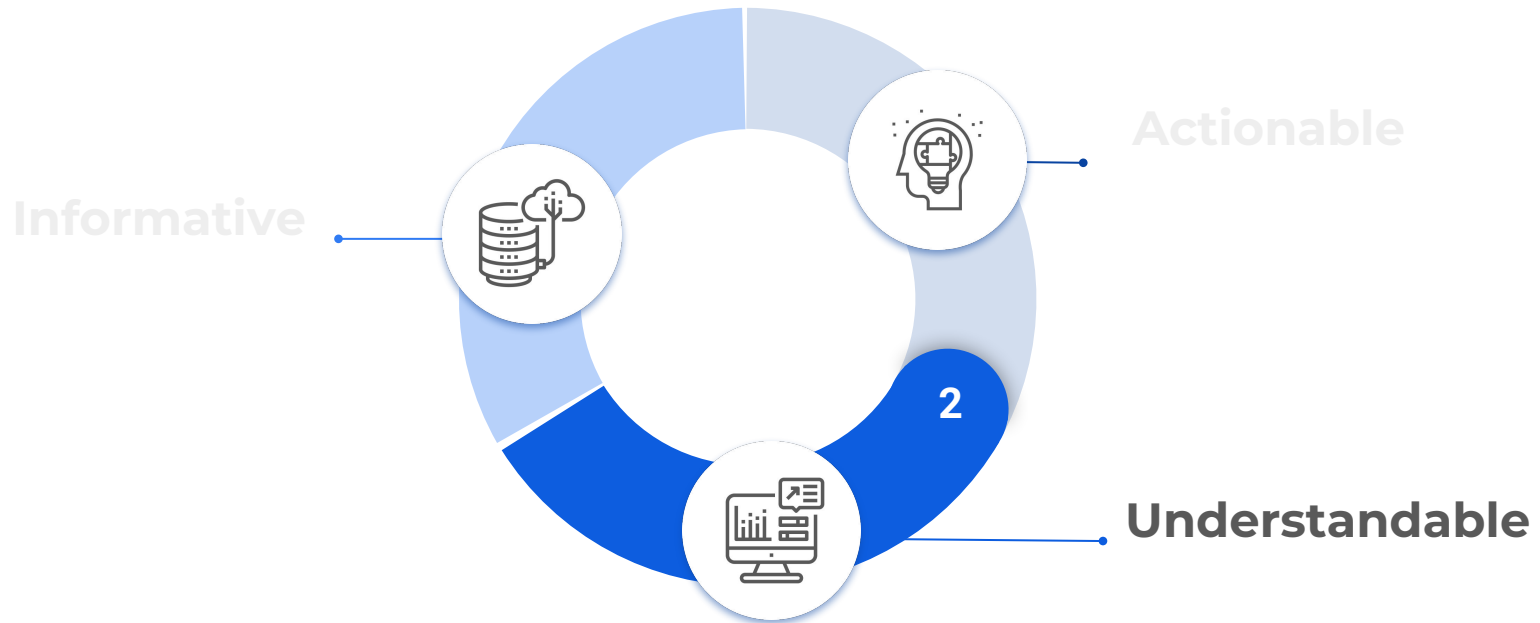
Student wants (human-centred) vs student needs (pedagogical grounding).

- How do student information needs and wants overlap?
- How can we nudge students towards more impactful information?

Collecting data in Germany, Netherlands, Spain and Norway.

- What are students' information wants?
- How do information wants differ across countries?
- How do SRL skills influence feedback wants?

Student-facing learning analytics



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

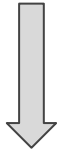
Do their **goals** and **SRL skills** influence these perceptions?

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.

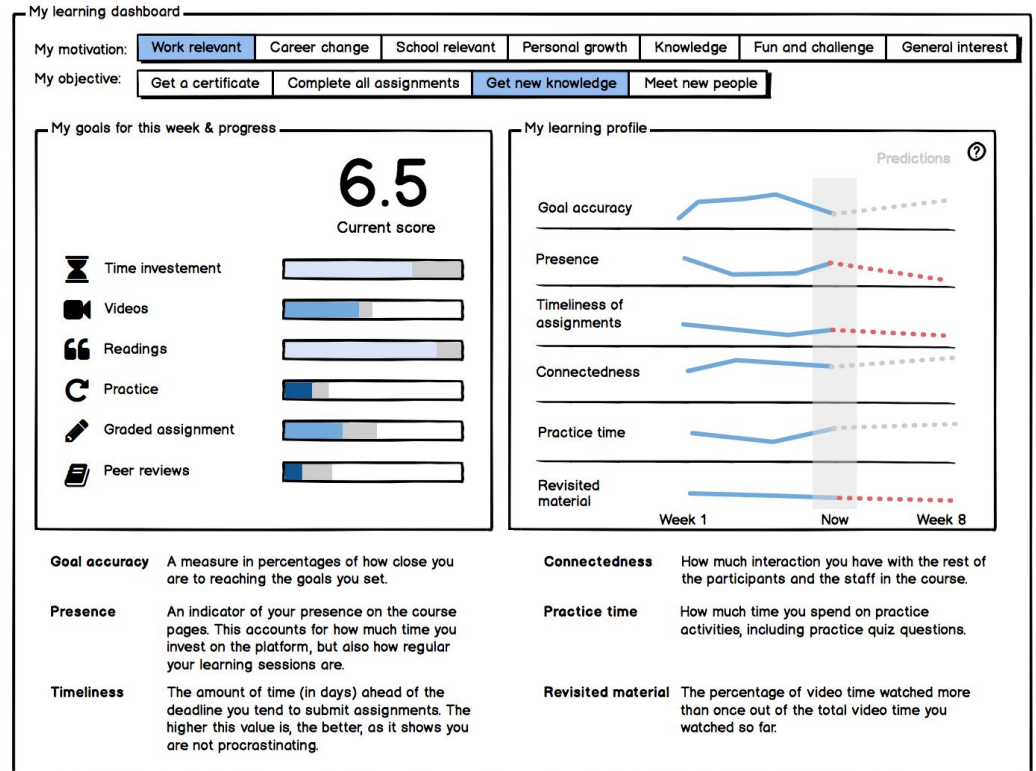
Methodology

Qualitative pre-study

23 students in several TLA courses



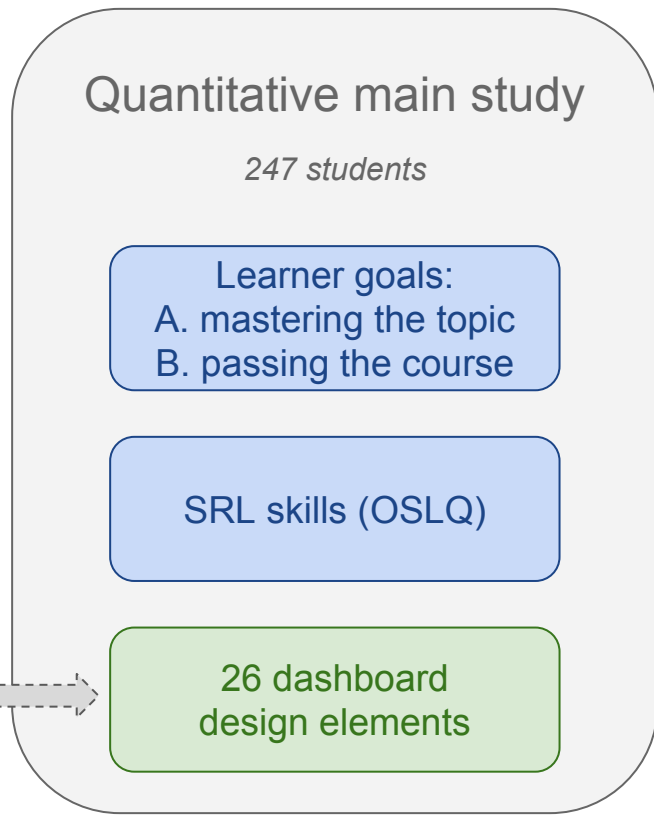
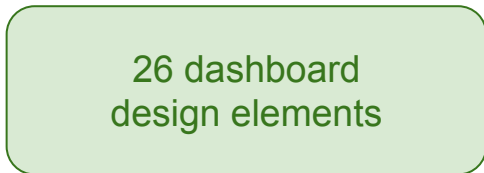
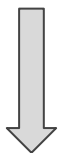
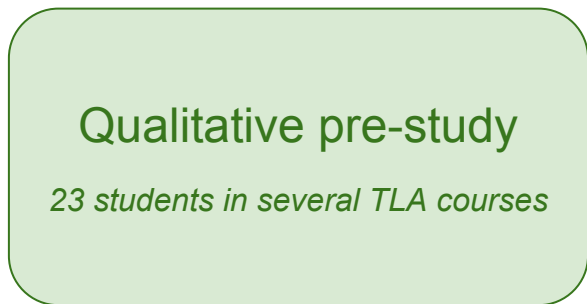
26 dashboard design elements



*“It is also interesting to see the ‘predictors’
which could act as ‘alerts’ to guide me.”*

*“It is also interesting to see the **‘predictors’**
which could act as **‘alerts’ to guide me.**”*

- "predictions of learning behaviour"
- "areas in need of improvement highlighted"



Findings - design features

1. Transparency of the design
 - explanations on how indicators are calculated
 - why the information is relevant
2. Reference frames
 - maximum possible in the course
 - past self
 - peers
3. Support for action
 - topic and learning activities recommendation
 - suggestion for improving learning behaviour

Findings

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

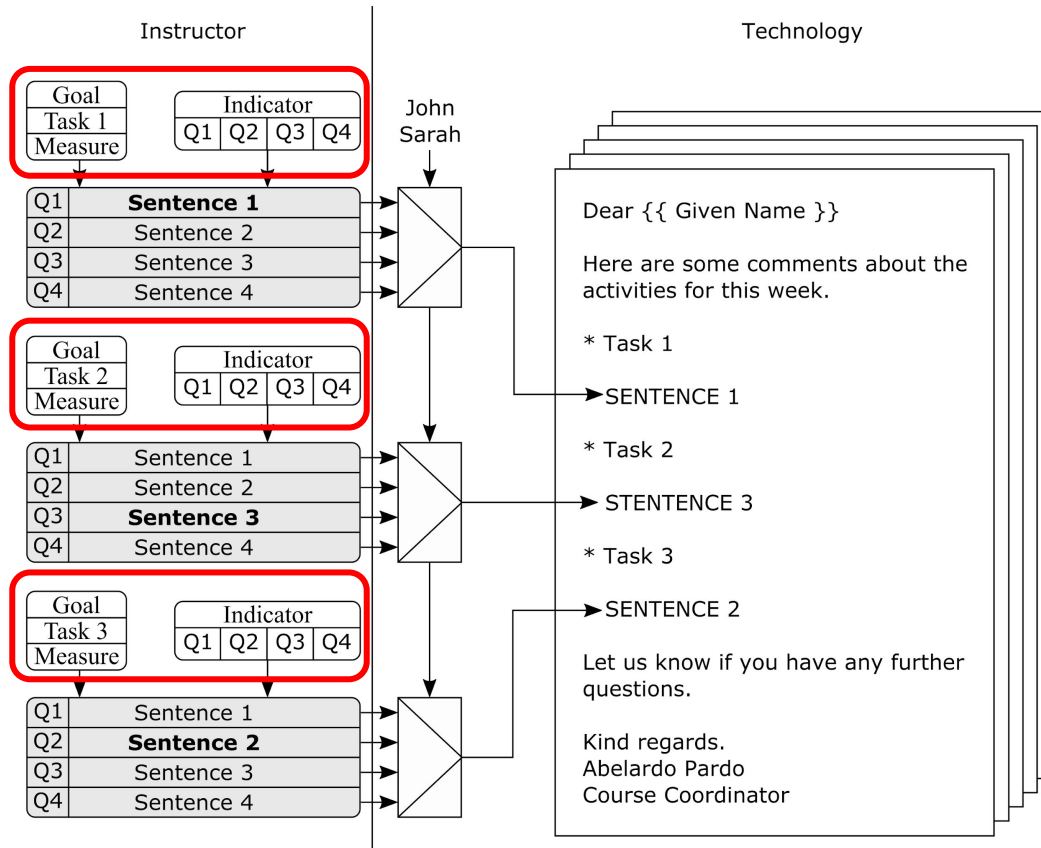
Learners with a **mastery goal** rated **reference frames** significantly higher.

**Work in
progress**

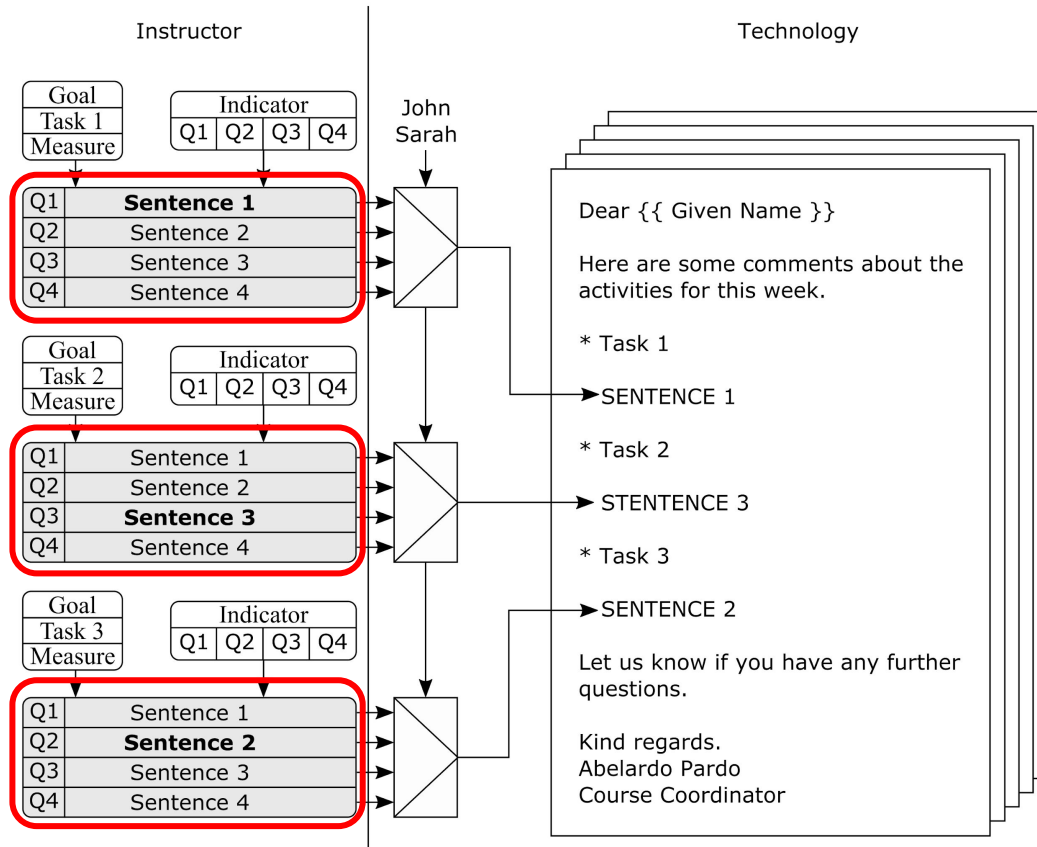
Are dashboards the best way
to deliver information to students?



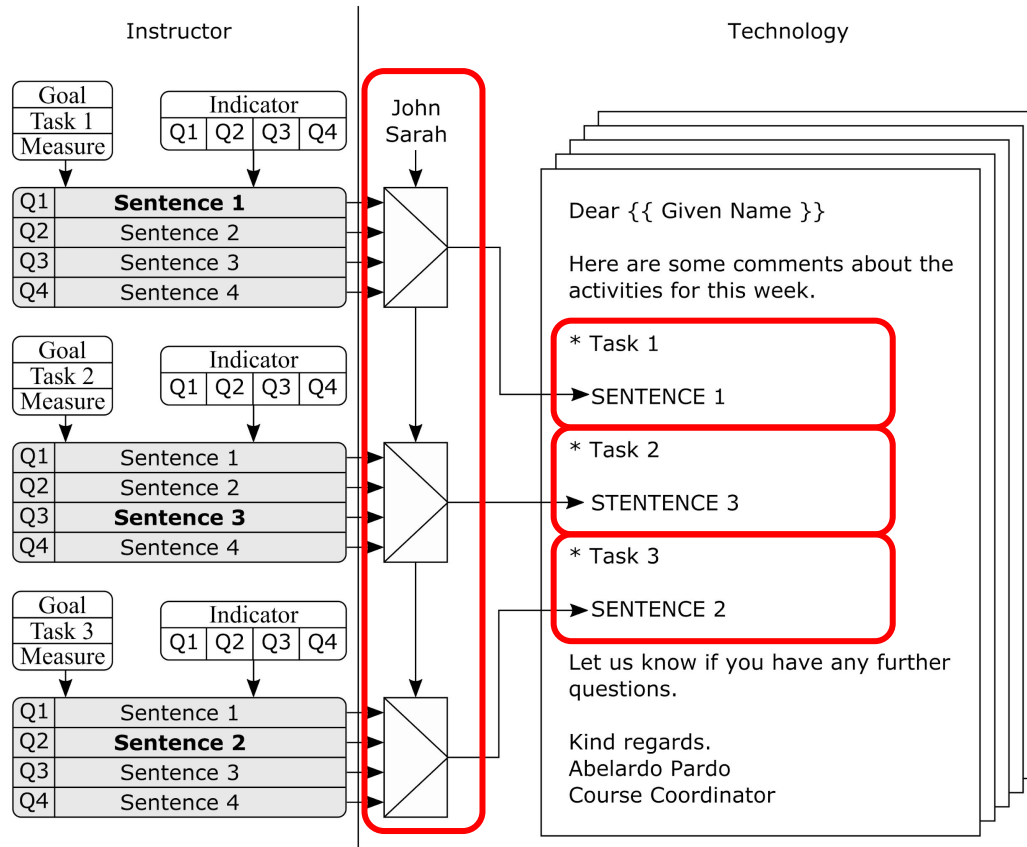
Rule-based template for feedback-text



Rule-based template for feedback-text



Rule-based template for feedback-text



Text-based feedback for concept map tasks

Indicators:

- Number of nodes
- Number of edges
- Similarity to solution
- Content mastery

Hallo XY,

Nachfolgend erhalten Sie Feedback zur Aufgabe 5: Unterrichtsmethoden aus der Vorlesung BW-A/Sb1 – Einführung in Unterricht sowie Beratung und Diagnostik.

Bei dieser Aufgabe war das Ziel, Vorlesungsinhalte zum Thema 5 "Unterrichtsgestaltung" in Form einer Concept Map darzustellen und die konstruierte Concept Map schriftlich zu beschreiben.

Inhalt:

Ihre Concept Map enthält **9** Konzepte. Sie haben **11** Pfeile verwendet, um diese Konzepte zu verbinden. Ihre Lösung entspricht zu **71** % der Ziel-Concept-Map. Sie haben damit gezeigt, dass Sie **in der Lage sind** Unterrichtsmethoden zu klassifizieren, voneinander abzugrenzen und miteinander in Zusammenhang zu bringen. Ihre Lösung ist gleich bzw. besser als die von **67** % der Studierenden, die in diesem Semester diese Aufgabe bearbeitet haben.

Der beschreibende Text zu Ihrer Konzeptstruktur erwähnt **9** Konzepte (**100** %), die auch in Ihrer Concept Map dargestellt sind. Sie haben damit gezeigt, dass Sie **in der Lage sind** Unterrichtsmethoden zu identifizieren und zu erläutern.

Insgesamt ist ihre Abgabe daher inhaltlich als **angemessen** einzustufen. In diesem Semester haben **80** % Ihrer Mitstudierenden Aufgabe 5 inhaltlich angemessen bearbeitet.

Eye-tracking study with a mock-up

Meine Abgabe und mein personalisiertes Feedback

INHALTSORIENTIERTES FEEDBACK

Anzahl der Konzepte	14 von 14
Anzahl der Verbindungen	15 von 13
Anzahl der richtig beschrifteten Verbindungen	11 von 13
Übereinstimmung mit der Musterlösung	73 %

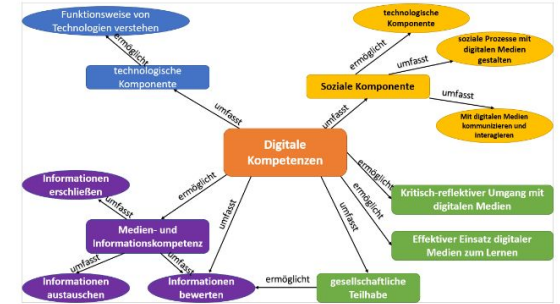
Die Bewertung Ihrer Kompetenzen in LE 3: Digitale Medienkompetenzen von SuS basiert auf der Zuordnung der Konzepte zu den jeweiligen Hierarchieebenen mithilfe von Farben und Verbindungslinien und deren Beschriftungen.

Funktionen von digitalen Kompetenzen	Ausreichend
Technologische Komponente	Mangelhaft
Soziale Komponente	Ausreichend
Medien- und Informationskompetenzen	Hervorragend

Zusammenfassung: Sie haben noch einige Schwierigkeiten, digitale Kompetenzen zu klassifizieren, voneinander abzugrenzen und miteinander in Zusammenhang zu bringen. Der Entwicklungsbedarf ist bei technologischer Komponente und Funktionen von digitalen Kompetenzen am höchsten.

● Hervorragend | ● Ausreichend | ● Mangelhaft | ● Ungenügend

MEINE ABGABE



UMSETZUNGSORIENTIERTES FEEDBACK

	Eigene Aktivität	Durchschnitt Ihrer Mitstudierenden	Mitstudierende mit korrekter Lösung
Bearbeitungs-Sessions	7	10	8
Zeit investiert total	2,5 Stunden	3,1 Stunden	2,3 Stunden
Ergebnis kontrolliert	3-mal	3-mal	3-mal

IM VERGLEICH ZUR MUSTERLÖSUNG

EINE FEHLENDE VERBINDUNG MIT BESCHRIFTUNG

- von "Technologische Komponente" zu "Geräte und Anwendungen bedienen"
→ richtig: "Technologische Komponente" umfasst "Geräte und Anwendungen bedienen".

DREI ÜBERFLÜSSIGE VERBINDUNGEN

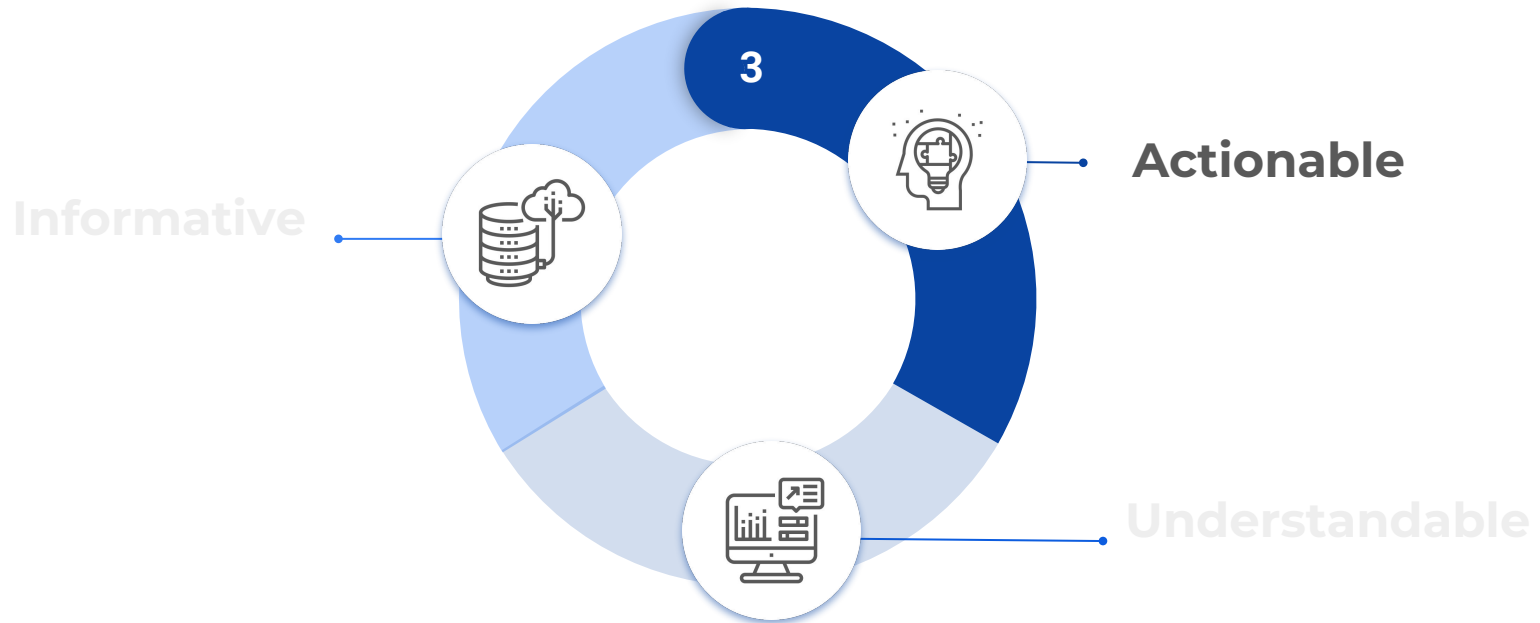
- "Soziale Komponente" ermöglicht "Geräte und Anwendungen bedienen".
- "Digitale Medienkompetenzen" umfasst "Informationen bewerten".
- "Gesellschaftliche Teilhabe" ermöglicht "Informationen bewerten".

ZWEI FALSCH BESCHRIFTETE VERBINDUNGEN

- "Technologische Komponente" ermöglicht "Funktionsweise von Technologien verstehen".
→ richtig: "Technologische Komponente" umfasst "Funktionsweise von Technologien verstehen".
- "Digitale Medienkompetenzen" umfasst "Gesellschaftliche Teilhabe".
→ richtig: "Digitale Medienkompetenzen" ermöglicht "Gesellschaftliche Teilhabe".



Student-facing learning analytics



**Work in
progress**

Exploring further student reflection and action



» Wie gehen Sie mit diesem Feedback um? «

Ein Feedback ist am effektivsten, wenn Sie sich die Zeit nehmen darüber nachzudenken, um daraus konkrete Erkenntnisse zu ziehen. Das unten stehende Eingabefeld sollte Sie dabei unterstützen.

Wir wollen Sie dabei unterstützen Ihr Lernverhalten zu optimieren, um dadurch einen besseren Lernfortschritt zu erreichen. Bitte denken Sie aktiv über das erhaltene Feedback nach und überlegen Sie sich gut:

- WAS wollen Sie an Ihrem Lernverhalten verändern,
- WARUM wollen Sie es verändern und
- WIE wollen Sie es verändern.

Im unteren Eingabefeld "*Was würden Sie an Ihrem Lernverhalten verändern wollen?*" können Sie diese Ziele festlegen und diese im Laufe des Semesters reflektieren.

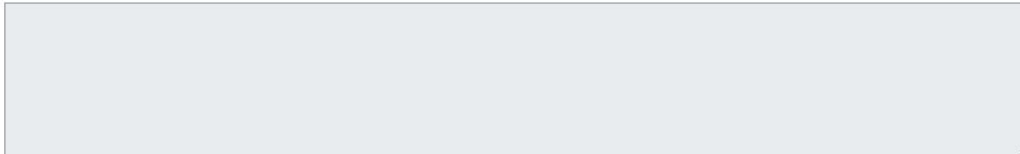
Formulieren Sie hierbei bitte Ihre Ziele in vollständigen Sätzen (gehen Sie dabei auf folgende Aspekte ein: WAS, WARUM, WIE) und klicken Sie auf Hinzufügen um diese festzuhalten. Hierbei ist die Eingabe mehrerer Ziele möglich.

Sie können diese Beispiele zur Orientierung nutzen:

- Ich versuche künftig, die Lernmaterialien nach dem Ergebnis des Selbsttests zur Wiederholung anzuschauen, um mein Verständnis zu verbessern.
- Ich möchte die Lerninhalte tiefgründig durchdenken und mir Beispiele überlegen sowie mit meinem Vorwissen vernetzen, sodass ich vertieftes Wissen generiere.

TextareaList_Id_10_1 Was würden Sie an Ihrem Lernverhalten verändern wollen?

Sie haben noch keine Ziele formuliert.

A large, empty rectangular text area with a light blue background and a thin border, intended for the user to enter their learning goals.

Future directions for research

- What are student intentions following receiving feedback?
- How does feedback content shape student intentions?
- How can we scaffold the reflection process for novice learners in real-time?

Student-facing learning analytics



Informative



Understandable



Actionable

Student needs
(pedagogical grounding)



Student wants
(human-centred design)

Technically possible
(data, algorithms and infrastructure)

Thank you!

Ioana Jivet



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