The current state of using learning analytics to measure and support K-12 student engagement:
A scoping review

Melissa Bond, University of South Australia
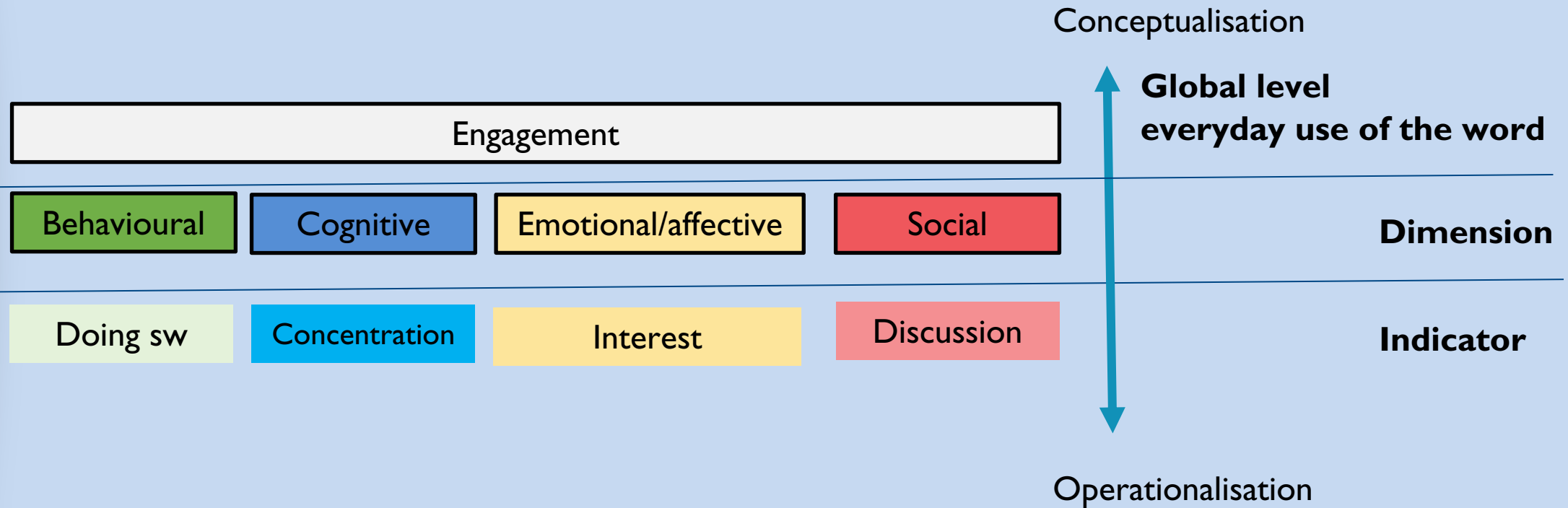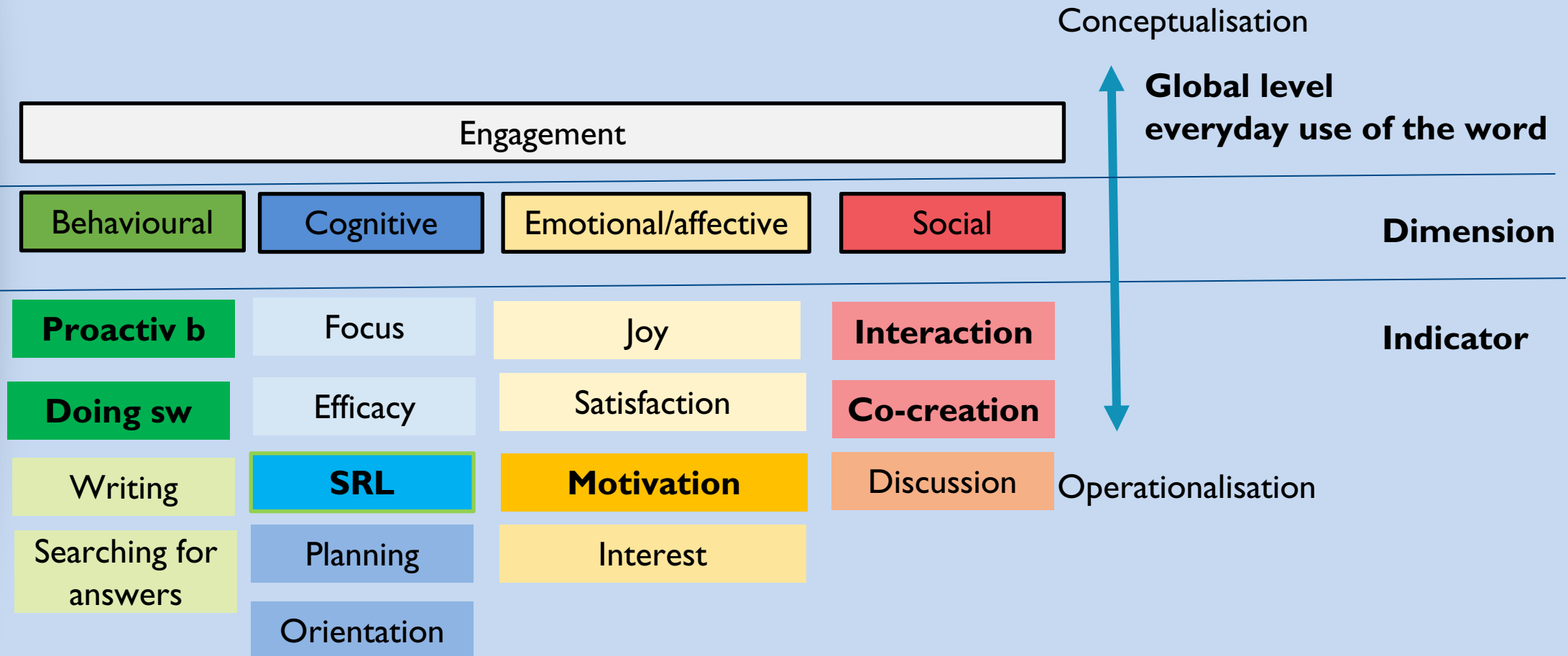Olga Viberg, KTH Royal Institute of Technology
Nina Bergdahl, Halmstad University

https://eppi.ioe.ac.uk/eppi-vis/login/open?webdbid=286

@misc_nerd
@OlgaOvi
@Nina_Bergdahl
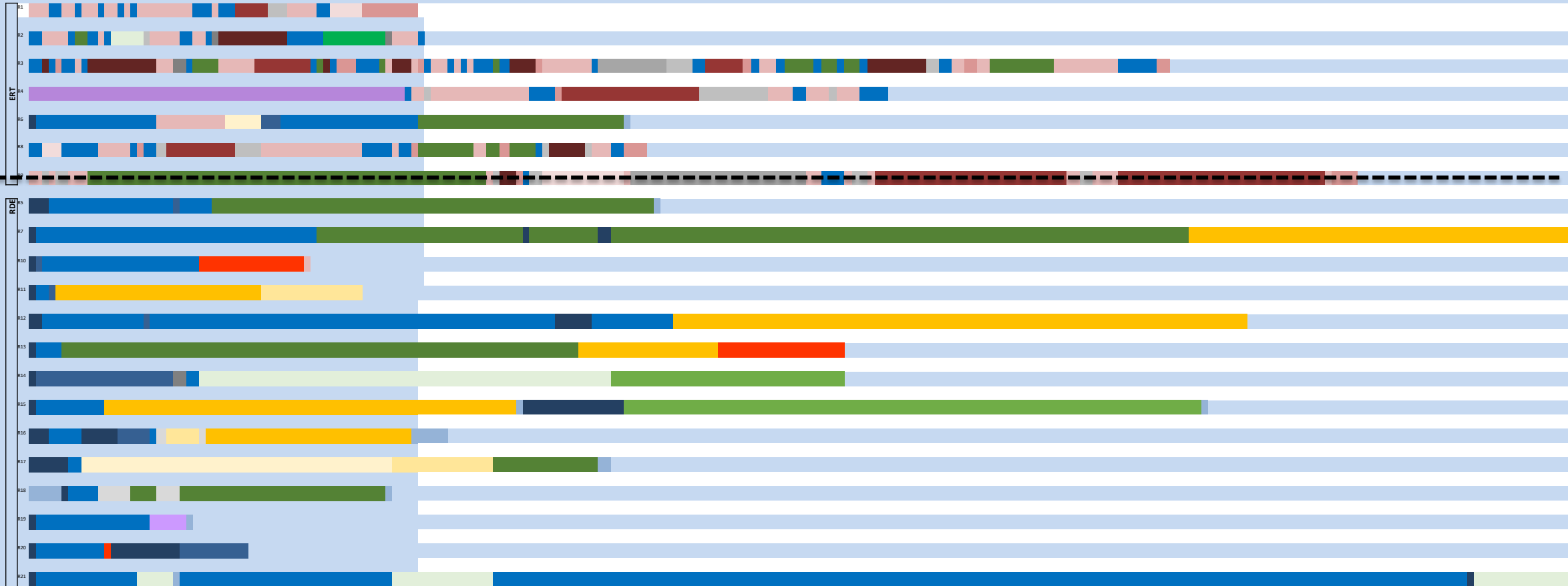
Introduction

- Engagement is significantly related to retention, grades and wellbeing.

  ➢ Complex and multi-faceted.

- K-12 is under-researched.

- LA community increasingly exploring engagement and disengagement.

  ➢ Rigor?

- Ideal time to map the state of the field and provide guidance.

Engagement

Conceptualisation

**Global level
everyday use of the word**

Engagement

Dimension

Behavioural	Cognitive	Emotional/affective	Social

Indicator

Doing sw	Concentration	Interest	Discussion

Operationalisation

Engagement
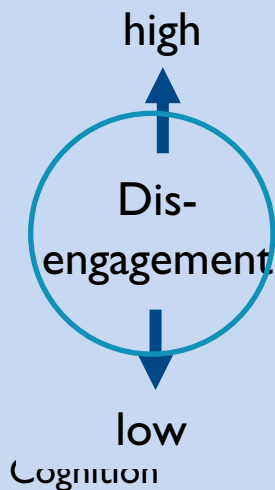
Cognition
(incl SRL)

Social

Behavioural

Emotional

Break

Admin
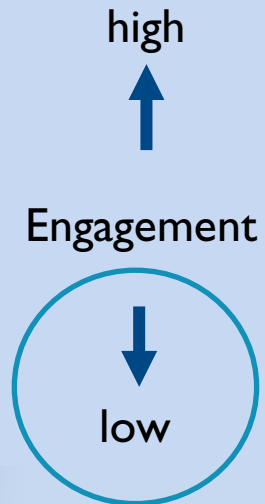
(Bergdahl & Gyllander Torkildsen, 2022)

- One or two continua?
- Same or separate
- Should be overlooked because its hard to measure?
- Difference in consequences outcomes

high

high

Engagement

Dis-
engagement

low

low

Cognition

Social

Behavioural

Emotional

Break

Admin

(incl SRL)

I we have a continua, does this intensity of engagement reflect effort, or is effort its own indicaor?
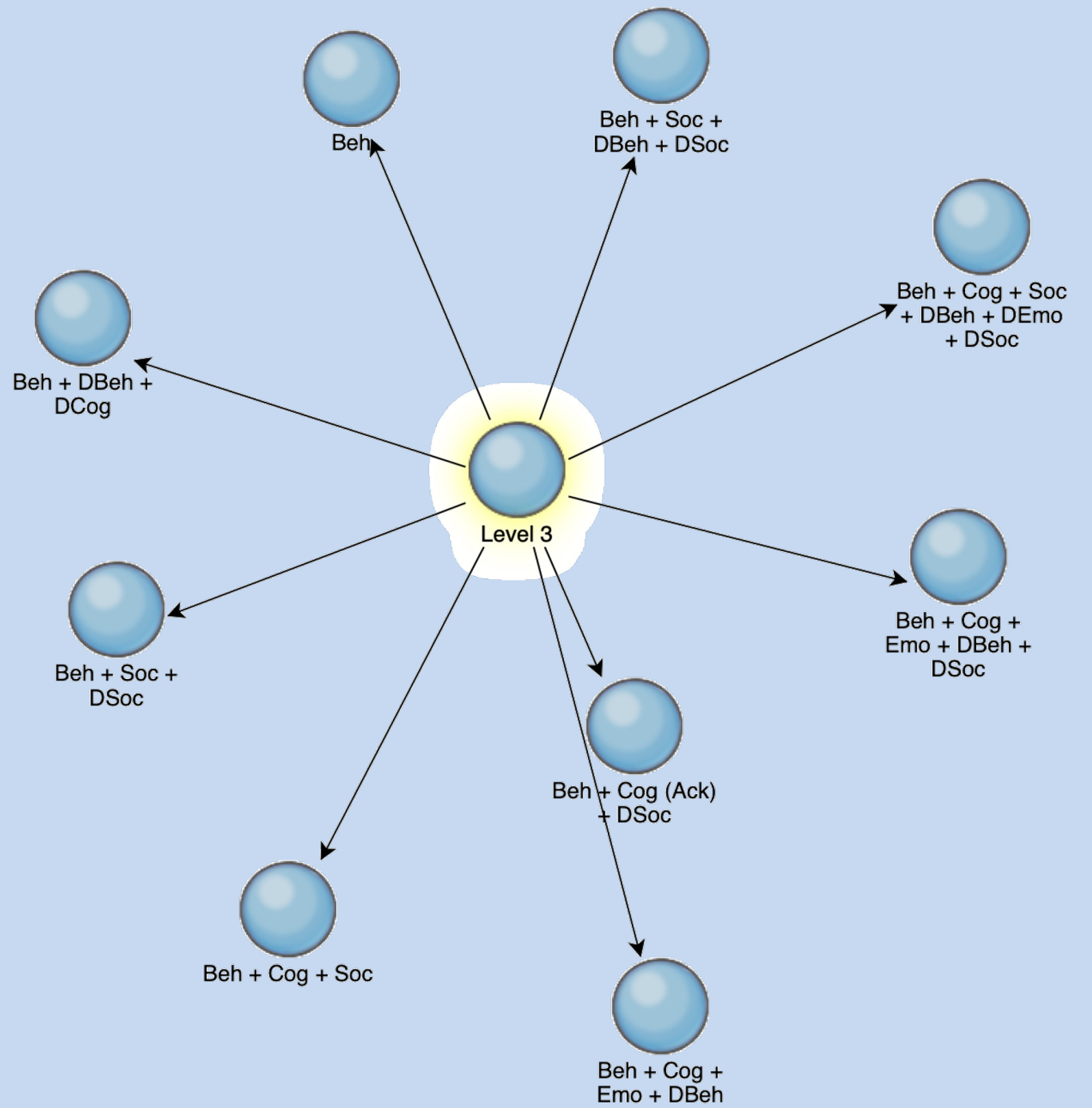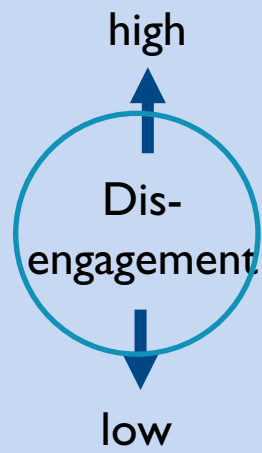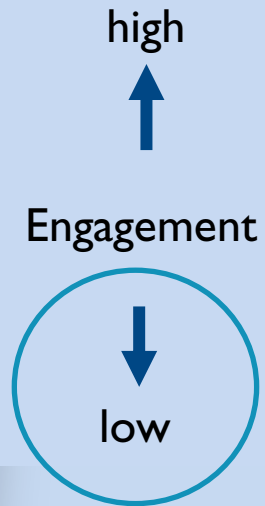If so, under which dimension does it best fit?

Are there cultural, and temporal changes to engagement (long-term)
Doing more than the bare minumin in the 1950's can mean one thing and can be a norm of indifference in a school of today
Is the bare minimum still engagement (low levels) - or is it disengagement?

(Bergdah

(Bergdahl & Gyllander Torkildsen, 2022)

Introduction

high

Engagement

low

high

Dis-engagement

low

Beh

Beh + Soc +
DBeh + DSoc

Beh + Cog + Soc
+ DBeh + DEmo
+ DSoc

Beh + DBeh +
DCog

Level 3

Beh + Soc +
DSoc

Beh + Cog +
Emo + DBeh +
DSoc

Beh + Cog (Ack)
+ DSoc

Beh + Cog + Soc

Beh + Cog +
Emo + DBeh

(Bergdahl, 2022)
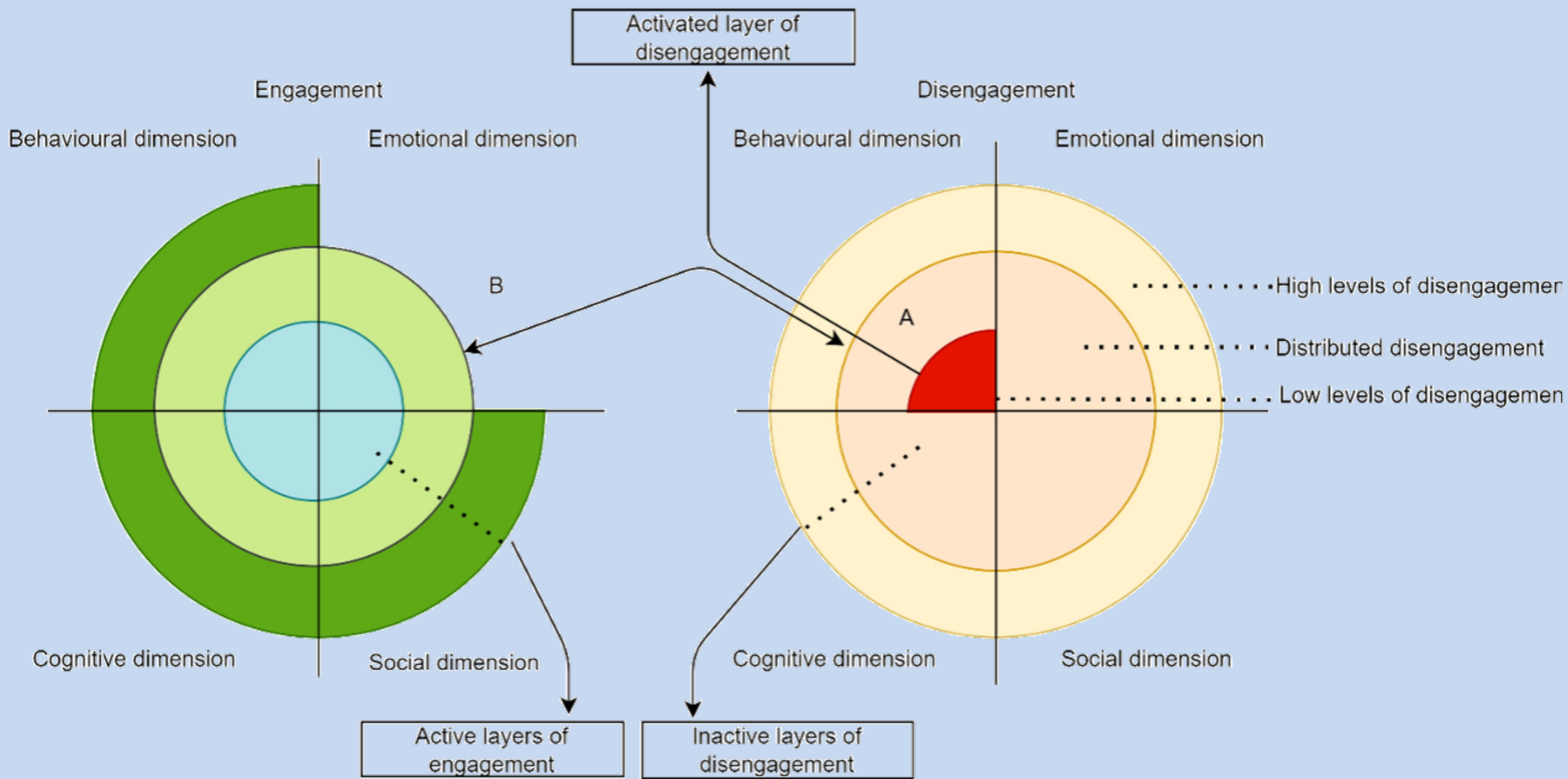
Figure 7 Model 2: Inter-dimensional influences (model viewed from above)

(Bergdahl, 2022)

Scoping review

1. What are the study characteristics of K-12 LA research exploring student engagement?

2. How does engagement theory inform data analysis in K-12 LA research?

3. What methods and data sources have been used to examine student engagement in K-12?

4. What is the LA evidence to measure and support student engagement in K-12?
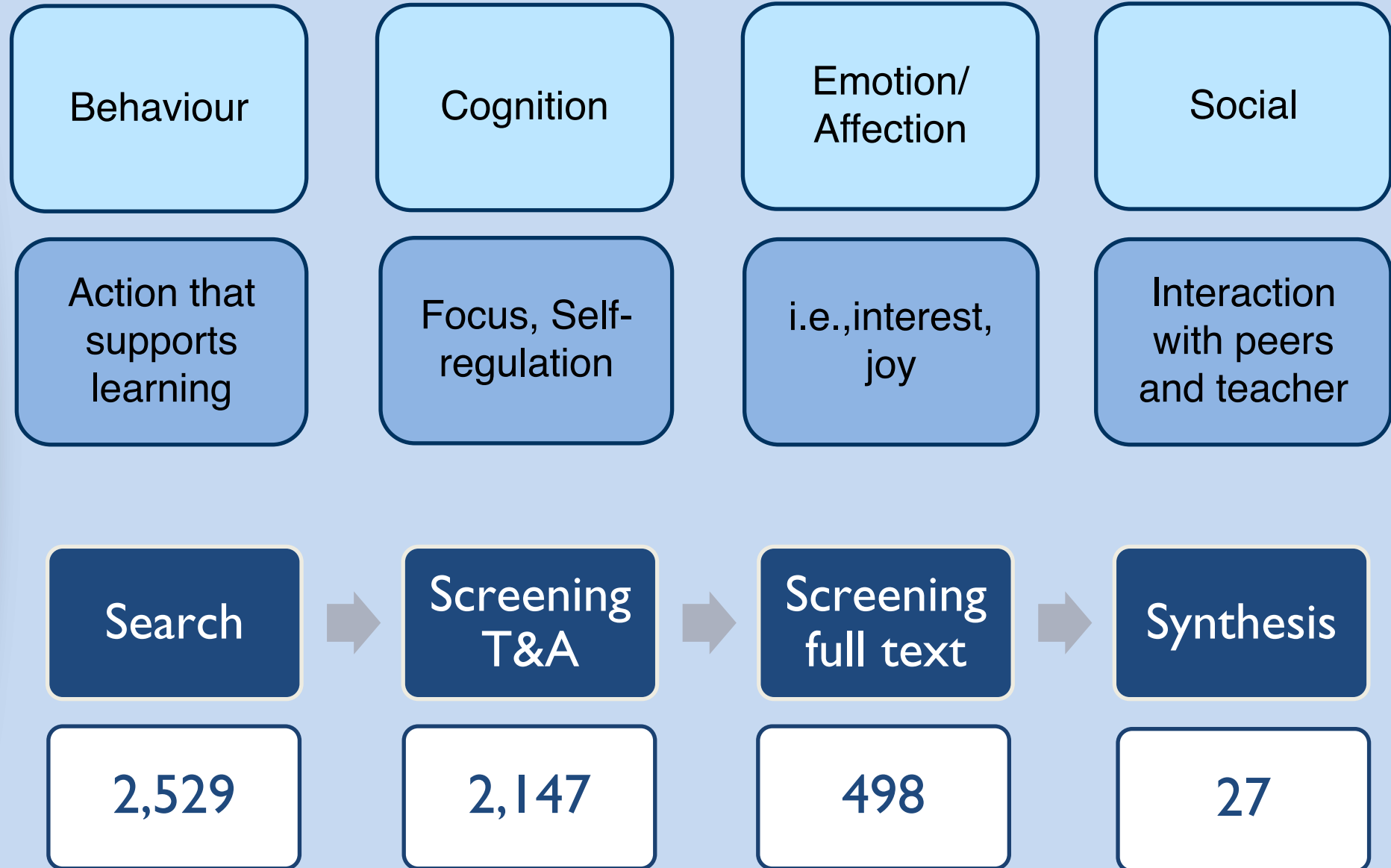
Search strategy

Web of Science, Scopus, ProQuest (including ERIC), A+ Education, SAGE

Topic	Search string elements
Engagement	"student engagement" OR "engagement" OR "disengagement" OR "learner engagement"
AND	
Learning analytics	"learning analytics"
AND	
education	universit* OR "higher education" OR postgrad* OR undergrad* OR "tertiary education" OR college* OR "K-12" OR kindergarten OR "primary school*" OR "middle school*" OR "secondary school*" OR "elementary school*" OR "middle primary" OR "upper primary" OR "senior school" OR "R-12" OR "high school*"

Inclusion Criteria

- Primary, empirical studies
- Explicitly focused on LA
- Formal educational K-12 setting
- Written in English
- Published 2011 - 2022
- Peer-reviewed journal and conference papers

Engagement Theory

Behaviour	Cognition	Emotion/ Affection	Social
Action that supports learning	Focus, Self-regulation	i.e.,interest, joy	Interaction with peers and teacher

Search → Screening T&A → Screening full text → Synthesis

Search	Screening T&A	Screening full text	Synthesis
2,529	2,147	498	27

Engagement Theory

Applying the inclusion/exclusion criteria *(studies were included based on what they reported doing).* 27 studies were then identified as K-12.

LA improve learning outcomes

LA improve teaching provide learning support

LA are taken up and used widely, including deployment at scale

LA are used in an ethical way

A call for qualitative aspects in LA research

Realising the potential(s) of learning analytics

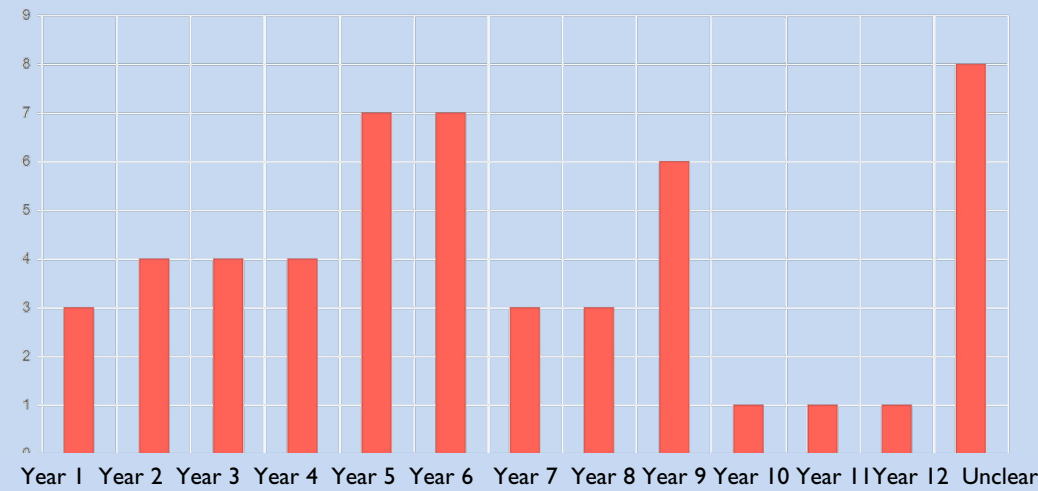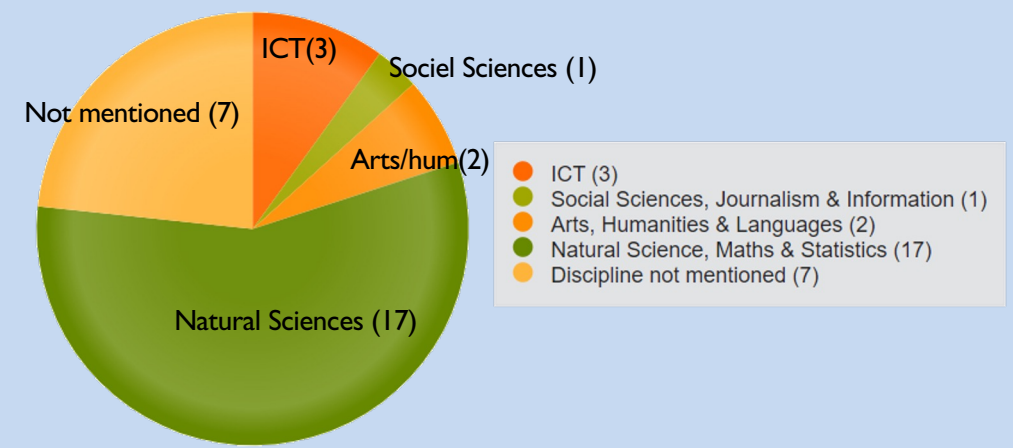| LA improve learning outcomes | LA improve teaching provide learning support | LA are taken up and used widely, including deployment at scale | LA are used in an ethical way |

1. What are the study characteristics of K-12 LA research exploring student engagement?

Countries	N
US	6
Germany	2
China	2
Australia	1
Canada	1
Finland	1
Greece	1
Hong Kong	1
Israel	1
Kenya	1
Singapore	1
Tanzania	1
Turkey	1

Pie chart:
- ICT (3)
- Social Sciences, Journalism & Information (1)
- Arts, Humanities & Languages (2)
- Natural Science, Maths & Statistics (17)
- Discipline not mentioned (7)

Labels: ICT(3), Sociel Sciences (1), Not mentioned (7), Arts/hum(2), Natural Sciences (17)

Bar chart: Year 1, Year 2, Year 3, Year 4, Year 5, Year 6, Year 7, Year 8, Year 9, Year 10, Year 11, Year 12, Unclear

2. How does engagement theory inform data analysis in K-12 LA research?

confusion
concentration ⟶ affective engagement

(rather than cognition)

Dimensions of engagement were subsumed into one:

behavioral + cognitive ⟶ behavioural

- Most commonly studies would say the explore "engagement" and the dimensions…
- Few studies specified the indicators they used.
- Of those even fewer linked their indicator to engagement
- Of those, even fewer linked the indicator to a specific dimension of engagement

Introduction

The Study

Key findings

In terms of **conceptualisation** of engagement:

Behavioural Engagement = 13
Cognitive Engagement = 8
Affective/Emotional = 9
Social = 3 (including one not well conceptualised)
All 4 dimensions = 1
ot no. of studies that did not use one of the 4
dimensions = 10
Engagement in general = 3

SRL = 4
Game engagement = 3
Motivation = 4
At risk/persistence/performance = 3
Embodied cognition = 1

Introduction

The Study

Key findings

Behavioural

Cognitive

Emotional

Social

How is engagement approached?

Behavioural

Time on task
Attempting
Attendance
Assuming responsibility
Participation/involvement
Homework
completion/preparedness
Positive conduct
Effort
Study Habits

Cognitive

Emotional

How is engagement approached?

Behavioural

Cognitive

Critical thinking
Self-regulation
Reflection
Deep learning
Focus/concentration/attention
Fact seeking
Setting goals
Synthesis/connecting ideas
Task understanding
Preference for challenging tasks
Self-efficacy

Emotional

Emotional

Enthusiasm
Satisfaction
Pride
Excitement
Curiosity
Feeling appreciated
Joy
Positive attitude
Sees relevance
Sense of connectedness
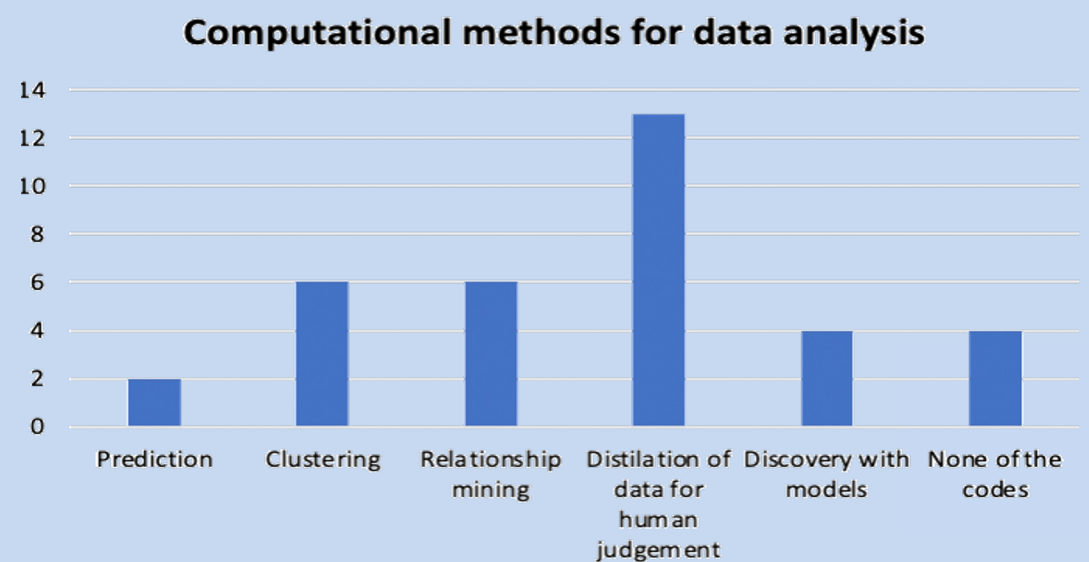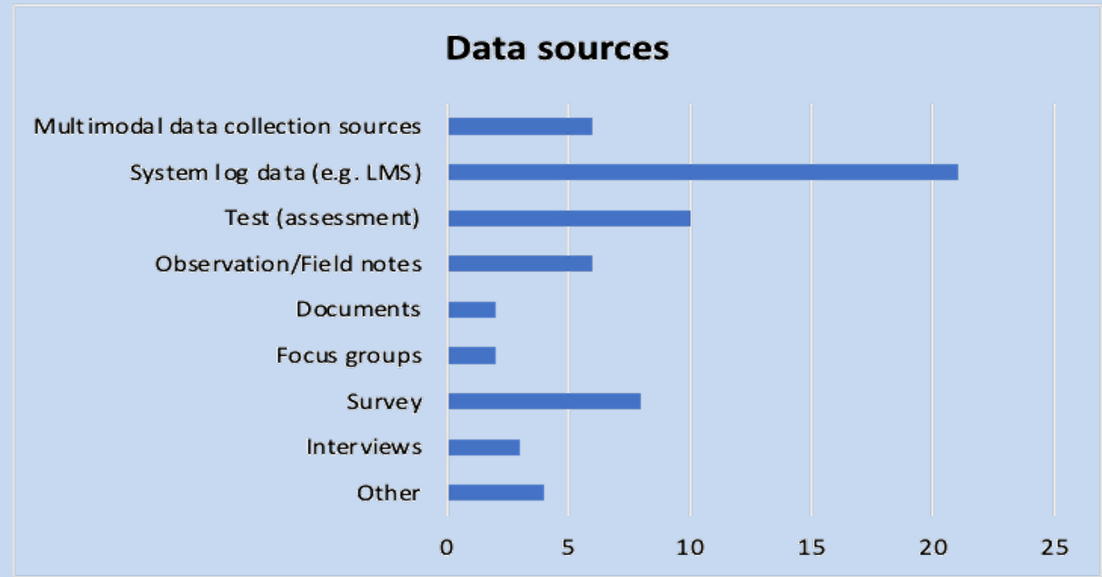Enjoyment
Confidence
Sense of wellbeing

Enjoyment
Confidence
Sense of wellbeing

Social

Collaborating and interacting
with teachers
Collaborating and interacting
with peers
Shared knowledge building
Asking for help
Caring for others
Turn taking

How is engagement approached?

3. What methods and data sources have been used to examine student engagement in K-12?

Data sources

Data source	Value
Multimodal data collection sources	6
System log data (e.g. LMS)	21
Test (assessment)	10
Observation/Field notes	6
Documents	2
Focus groups	2
Survey	8
Interviews	3
Other	4

Computational methods for data analysis

Method	Value
Prediction	2
Clustering	6
Relationship mining	6
Distilation of data for human judgement	13
Discovery with models	4
None of the codes	4

4. What is the LA evidence to measure and support student engagement in K-12?

Introduction

The Study

Key findings
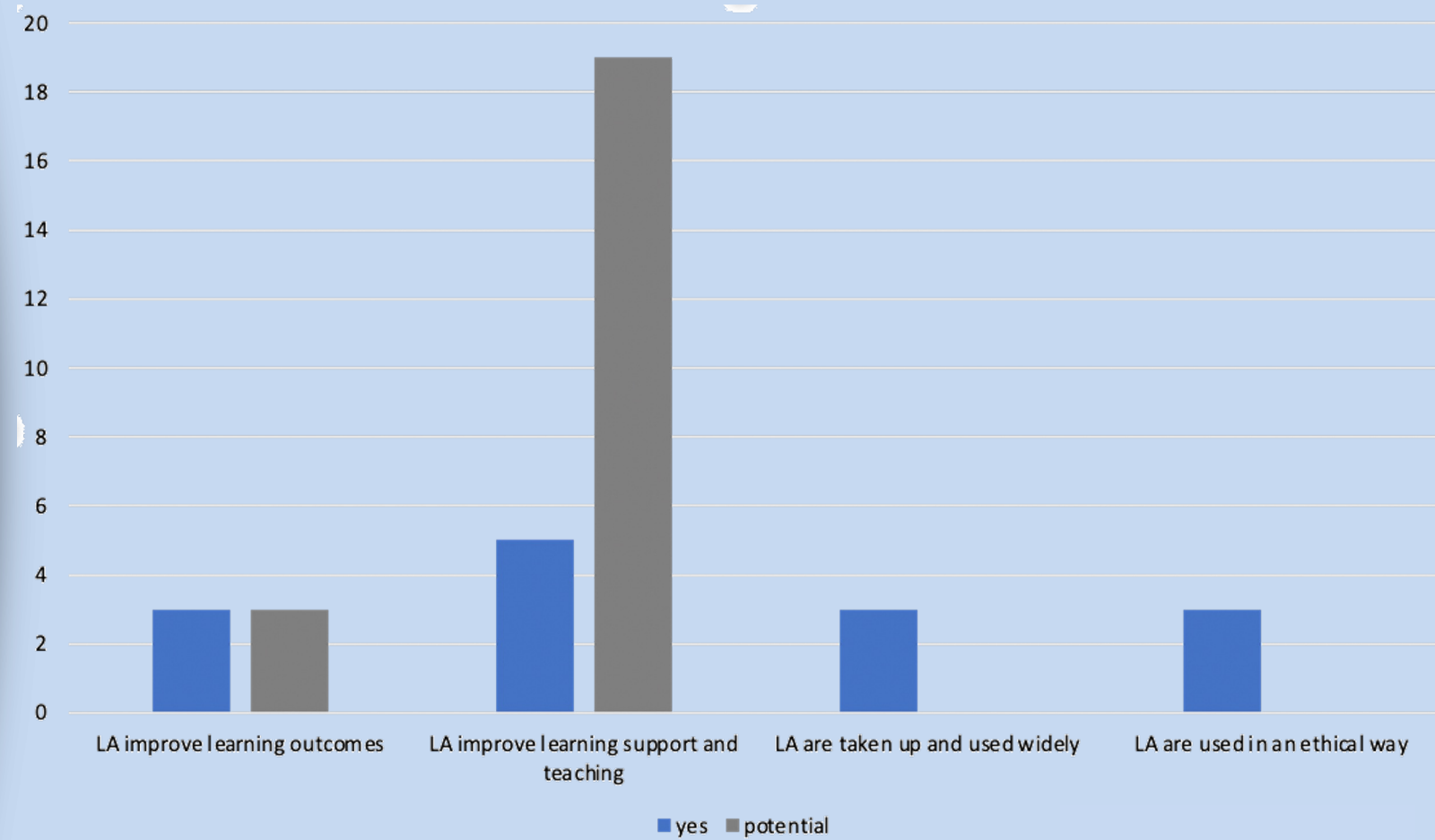
Rebecca Ferguson and Doug Clow. 2017. Where is the evidence? In *Proceedings of the Seventh International Learning Analytics & Knowledge Conference*. ACM, New York, NY, USA, 56–65. https://doi.org/10.1145/3027385.3027396.

Introduction

The Study

Key findings

Conclusion

This is a scoping review – as research is still emerging
1. Disparate in adopting previous research/theory
2. Disparate in communicating a solid connection to transparency of indicators

Introduction

The Study

Key findings

Conclusion

Recommendations

1. There are links to theory to support the conceptualisation of engagement,

2. The measures are linked to theory,

3. The terminology is consistent, and

4. Indicators are clearly linked to the engagement dimension explored.

Thank you

Questions?

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