Using learning analytics to measure 21st century skills

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@dgagevic

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Melbourne, VIC, Australia
High emphasis on 21$^{st}$ century skills

Problem solving, self-regulated learning, communication, etc.
Challenge

How to develop and measure 21 century skills?
Challenge

Current approaches to assessment

Follow sound psychometric principles
Challenge

Current approaches to assessment

Performed in highly sanitized conditions
Challenge

Current approaches to assessment

Use of static measurement approaches outside authentic contexts
Challenge

Current approaches to assessment

Measurement as a collection of isolated skills or indicators
Today’s talk

Learning analytics offers promising approaches for developmental assessment
Key message

Analytics must be aligned with what we already know about learning and education
Learning environment

Educators

Student Information Systems

Learners
Data in education not new, but...

Real-time insights and longitudinal nature
Data in education not new, but...

AI and machine learning techniques are used
Topics in learning analytics 1/4

Prediction and description of outcomes and processes
Topics in learning analytics 2/4

Learning strategies and 21\textsuperscript{st} century skills
Adaptive learning support and personalized feedback at scale
Topics in learning analytics 4/4

Ethics, privacy, and policy
Challenges

Validity – Progression
Challenges

Validity – Progression
Unified theory of construct validity

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<th>Construct validity</th>
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### Unified theory of construct validity

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Content
Do counts of clicks count for learning?
Substantive

Can we trust some of measures?

Time on task

Can we trust some of measures?

Network centrality

Consequential

How can we act based on the count of logins?

Consequential

Dashboards can be harmful

Challenges

Validity – Progression
Does increase in number of clicks mean learning progression?
Negative predictors of outcomes

Student-content (counts)
Student-teacher (time)

Increase in activity ≠ increase in learning

Critical dimensions

Communities of inquiries

Communities of inquires

<table>
<thead>
<tr>
<th>Presence</th>
<th>Categories</th>
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<tr>
<td>Cognitive</td>
<td>Triggering event</td>
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<td>Exploration</td>
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Communities of inquires

Collaborative problem solving

Progression in communities of inquires

Cognitive:
Integration

Social:
Salutation, Humor

Topic 1, Topic 2, ...
... Topic N

Re: A constructivist, social introduction to the field
by [Name] - Friday, 5 October 2018, 7:23 PM

Hi [Name],

I am glad you picked up on the student data here. It was interesting to hear about the experience with Aberdeen and how it was left to the end.

My thought would be to have this aspect of the data included from the start. At least the intended output could be designed at the same time as the results for admin and faculty.

I can see why sharing the data with a student would need to be proven to be accurate and useful so perhaps a bit of reticence and face saving could be at work here.

It ties in a little with my interest in engagement and building learning community. The info provided to students should be an accurate reflection of their integration but also provide meaningful direction for expansion of their learning and learning horizons (in an ideal world).
AI to automate coding of messages

Cognitive presence, social presence, and topics

AI to automate coding of messages

Explains the properties of constructs measured
AI to automate coding of messages

Coding in multiple languages

AI to automate coding of messages

Supervised and unsupervised approaches

Does this still lead to counting?
Epistemic frames as theory for progression assessment
Progression in communities of inquiries

Cognitive: Integration

Social: Salutation, Agreement

Re: A constructivist, social introduction to the field
by [Redacted] - Friday, 5 October 2018, 7:23 PM

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Progression in communities of inquires

Cognitive: Integration

Social: Salutation, Agreement

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Progression in communities of inquiries

Cognitive: Exploration

Social: Asking question, Salutation

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Progression in communities of inquiries

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**Social:** Asking question, Salutation

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Tracking progression

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In their 2018 study, Ferreira, R., Kovanović, V., Gašević, D., & Rolim, V. explored the use of combined network and text analytics to track the progression of student discourse in online discussions. Their work was presented in the proceedings of the 19th International Conference on Artificial Intelligence in Education (pp. 111-126).
Tracking progression

Progression measurement

Self-regulated learning, learning strategy, time management, L2 tutor-student alignment, information problem solving
LEARNING ANALYTICS – CHALLENGES – DIRECTION – FINAL REMARKS
Just because it is easy to access, it does not mean it is useful
Stop the game of low hanging fruit and start measuring what matters
Quality of learning designs drives quality of learning analytics
Totally agree with @dgasevic that assessment community must accept measures of lower psychometric quality. I would add that learning analytics community should improve modeling error and uncertainty #etcps17
Prospects for AI to generate effective feedback for learning

Learning analytics for developmental assessment
Using learning analytics to measure 21st century skills

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