Designing for student facing learning analytics

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what is UTS:CIC?

Connected Intelligence Centre

- UTS innovation lab specialising in Learning Analytics
- provides in house data science consultancy
- academics teach data science and perform research
- trains PhDs in Learning Analytics

what is learning analytics? (LA)

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.

SoLAR definition
example: course signals at Purdue

many EdTech systems offering some form of LA

BUT is it any good?
where does learning happen?
tradi"onally LA has focused upon providing analytics within the confines of specific systems built by vendors… (e.g. LMSs, eBooks, SIS)
but learning happens everywhere!
and learning occurs over a lifetime!
new data standards are emerging to help us collect and harmonise data from many spaces and places

http://mfeldstein.com/recommended-viewing-learning-analytics-webinar-on-caliper-and-xapi/
so a lot of data is coming to education! but how can we use it effectively?
careful… data must be cooked with care!

- are you capturing all of the relevant data?
- is what you are collecting even useful?
- or are you just collecting it because you can?
- and what metrics are you developing from your data?

the clicks to constructs problem

low level click steam data rarely yields significant insights

BUT a careful mapping to educational constructs can lead to far more useful outcomes

student facing LA
but what type of student facing LA are we talking about?

Are students acquiring:
content and skills?
or
learning to learn?
we should give students access to *rich* LA

*In principle this should help to promote things like:*
- learning to learn
- metacognition and reflection
- interpretation and sensemaking
- data literacy
- lifelong learning

And ethically… is it reasonable not to give students access to the data that they themselves generate?
but care is required!

what would a student do if:

- they were told by a predictive model that they were failing a subject?
- a dashboard showed them at the bottom of a leader board?
- ... at the top?
- a predictive model told them something they knew was wrong?
- a social network tool showed them as the only student who was not connected to anyone else in class? ... and they were suffering from anxiety and depression?
things can go very wrong with naïve approaches

“our combination of leaderboards, badges, and competition mechanics do not improve educational outcomes and at worst can harm motivation, satisfaction, and empowerment”

(Hanus and Fox, 2015)


Learning outcome 1: connected learning in “the wild”
the connected learning analytics toolkit
ID14-3821: ENABLING CONNECTED LEARNING VIA OPEN SOURCE ANALYTICS IN THE WILD: LEARNING ANALYTICS BEYOND THE LMS

This project is supported by the Australian Government’s office for learning and teaching

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UNIVERSITY OF SYDNEY
Abelardo Pardo

UNIVERSITY OF TEXAS (ARLINGTON)
George Siemens
some details (CLA toolkit)

1. Has a philosophy of going to the students where they are actually learning (rather than expecting them to come to us)
2. Can currently access data from: wordpress blogs, twitter, youtube, facebook, trello, github, slack
3. Stores data in xAPI format (to ensure future interoperability)
4. Only retrieves data for specific learning activities and only if students sign up
5. And gives students access to their own analytics

Question: How can we give students access to rich LA that encourages metacognition and reflection?
a “go look at it” approach tends to fail
- students don’t apply knowledge
- limited reflection
- often blindly believe LA instead of questioning it and reinterpreting
- and it can be **hard to use** without scaffolding
Learning design patterns for student facing LA
do-analyse-change-reflect

**Do:** Students are instructed to participate in some sort of activity.

**Analyse:** Students are encouraged to consider LA dashboards that have data collected during the *do* phase.

**Change:** Students encouraged to consider *changing* their behaviour as a result of the analytics that they see in the *analyse* phase.

**Reflect:** Students participate in a reflective process where they explain how they used the LA to make sense of their behaviour, and whether they decided to change as a result (and how).


does it work? … maybe

<table>
<thead>
<tr>
<th>Unit</th>
<th>Semester</th>
<th>Aim/pattern</th>
<th>Linked to assessment</th>
<th>N=</th>
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<tbody>
<tr>
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<td>S2, 2015</td>
<td>Piquing students curiosity</td>
<td>No</td>
<td>S:12</td>
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<td></td>
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<td>Examine, relabel classifier</td>
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<td>AL:6</td>
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<td>B:17</td>
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<td>IFN614 Information Programs</td>
<td>S2, 2016</td>
<td>Do-analyse-change-reflect (predict, compare)</td>
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<tr>
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<td></td>
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<td></td>
<td>B:11</td>
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for example (Trial 3)

**Do:** blogging assignment was introduced in the first week of semester

**Analyse:** In week 2 students were introduced to the CoI model (Garrison et al., 2001) and were encouraged to sign up for the CLA toolkit (optional)

- a class provided an overview of the CoI model and the CLA toolkit
- 23/40 signed up (eventually)
- Students blogged about role and activity they were aiming for

**Change:** Students encouraged to think about how they were contributing to the community using data in the CLA toolkit dashboard and to change

**Reflect:** In week 14 students were required to critically evaluate their engagement with respect to their aims in week 2 (assessed!)

final blog post prompt for Trial 3

- What role did you want to play in the community this semester? Did you achieve that?
- How many comments did you make on your peers’ posts?
- Why did you comment as much as you did; what factors influenced the volume of your contributions?
- Did you need to modify your instinctive behaviour to engage the way you wanted to, or felt you should, engage?

<table>
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<tr>
<th>Score</th>
<th>Level of analysis</th>
<th>N = 11</th>
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<tbody>
<tr>
<td>1</td>
<td>Included some /all graphs with no reference or analysis</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Included some/all graphs, quantitative analysis relating activity to personality &amp;/or interest</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Included some/all graphs, quantitative analysis relating activity to personality &amp;/or interest, basic analysis on activity in relation to week 2 aim</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Included some/all graphs, referred back to week 2 aim, compared &amp; contrasted, mentioned qualitative aspects</td>
<td>3</td>
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</table>

Out of 21 who signed up, 40 total!
a very strong reflection from most recent trial?

In Week 2 I was very aspirational about the role I wanted to play; ‘I would like my profile to be professional, respectful, organised, connected and visible. I aim to be an active participant within “reflection and critical discourse that is the core dynamic of a community of inquiry”. I achieved my aim of being an active participant as I made over 75 comments on my peers’ posts, averaging over 5 per week. **However I feel I did not participate fully in all 4 phases of the cognitive presence in the Practical [sic] Inquiry Model; triggering event, exploration, integration and resolution – despite having sentence openers taped next to my computer!** Triggering events and some exploration were met by sharing an interesting article relevant to a post I had read and also asking some questions, but I felt a lot of my posts were agreeing with and complimenting upon the erudite musings of my peers. I was definitely wary of confronting differing ideas and promoting a critical discourse. **This participation in all cognitive phases needs improving** so the sentence openers will remain up! [score=4]

learning outcome 2: better writing

We should not make nanobots for multiple reasons. As you probably know in the wrong hands they can be dangerous. So to find out the rest you are going to have to read the rest of this existing article.

For one a nanobot could have a bug and start eating anything cardinal based or just not work at all. Another thing is that they may also eat the wrong substances which would only be bad in some cases. What is worse if one has a bug it could make more with the same problem. Now I know that you are wondering what I am talking about, I mean how could it make more of its problem unless it could iterate other nanobots programs. Well some scientists are trying to figure out how to make it possible for them to copy themselves. Someone might be able to be a 100.

Also they are planning to make them able to eat bacteria, and there might eat away at the intestines instead. But don’t be worried they might make it so that they will go throw the body with the rest of the food. Also they might program them to term of after a certain amount of time.

They are also planning to make small tracking devices so kids won’t get lost. I just hope they are hacker safe and they aren’t over used. I don’t want the government to know too much. I also don’t want some sick thieving me.

So as you can see there are lots of problems. There is bugs, hackers, government overuse, and falling into the wrong hands. There is good news I think we are stile al התלע fare frome getting a lot of nanobots just yet.
LA must be linked to the pedagogical purpose!

reflective writing


research writing (CARS model)

Move 1 – Establishing a research territory:
- **E** – Emphasis of a significant or important idea
- **B** – Background information and reviewing previous work

Move 2 – Establishing a niche:
- **C** – Contrasting idea, tension, disagreement or critical insight
- **Q** – Question or gap in previous knowledge

Move 3 – Occupying the niche
- **N** – Novelty and value of your research
- **S** – Summary of the authors goal, nature of the research or structure of the paper


See www.heta.io for more details
feedback – reflective writing

Prior to starting my clinical placement, I honestly had no idea what sort of challenges I would have to face in a Community Pharmacy setting. It has essentially provided me with a perspective of the expectations of a pharmacist as a health care professional. I saw my preceptor as someone who guided me to help address my weaknesses. However, I began to realise that this was only to a certain extent. The most important thing I learnt from these experiences is that I can only develop my skills if I actively contribute to the pharmacy by demonstrating initiative. This initiative was product of my inner passion and motivation to practise as a pharmacist in future.

Various encounters along my journey proved to me that every day presents with a new challenge. I initially could not comprehend just how diverse the members of the community were, particularly in regards to their health issues and understanding of their condition. I found that my clinical placement allowed me to see things from a perspective that I would never have imagined. In order to illustrate these notions, I have decided to reflect upon two major ideas.

Effective patient communication was a skill I had significantly developed during my clinical placement. A specific example was when I dispensed rosuvastatin for a patient. It was one of the first weeks of clinical placement and by this time I had become quite efficient at the dispensing process. A female patient came in...
feedback – research writing

<table>
<thead>
<tr>
<th>Analytical Report</th>
<th>Feedback</th>
<th>Resources</th>
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</thead>
<tbody>
<tr>
<td><strong>Move 1: Establishing a research territory</strong></td>
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**ABSTRACT:**
It is now widely accepted that timely, actionable feedback is essential for effective learning. In response to this, data science is now impacting the education sector, with a growing number of commercial products and research prototypes providing “learning dashboards”, aiming to provide real-time progress indicators. From a human-centred computing perspective, the end-user’s interpretation of these visualisations is a critical challenge to design for, with empirical evidence already showing that ‘usable’ visualisations are not necessarily effective from a learning perspective. Since an educator’s interpretation of visualised data is essentially the construction of a narrative about student progress, we draw on the growing body of work on Data Storytelling (DS) as the inspiration for a set of enhancements that could be applied to data visualisations to improve their communicative power. We present a pilot study that explores the effectiveness of these DS elements based on educators’ responses to paper prototypes. The dual purpose is understanding

Thank you for submitting your draft to AcaWriter. Quality writing comes from revision. Research shows that writing drafts and revising your text helps improve the quality of your writing.

Remember AcaWriter is a machine – so it may not highlight all your moves correctly and could give you incorrect feedback. So, don’t be afraid to disagree with the feedback, if you believe you have included all three moves in the correct order.

It seems you have stated how your research fills the gap and/or solves the research problem [Move 3 – Occupying the niche (S or N sentences)] before you have indicated the gap and/or explained your research problem [Move 2 Establishing a nice (C or Q sentences)]. It is more effective to indicate the gap and explain the research problem before you state your solution and aim of your study. AcaWriter suggests putting Move 3 – Occupying the niche (S or N sentences) after Move 2 Establishing a nice (C or Q sentences).
learning outcome 3: data literacy for a lifetime of learning
elaboration: writing analytics

Move 1: Establishing a research territory

- Emphasis of a significant or an important idea
- Background information and reviewing previous work

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active learning squared (AL$^2$)

the student trains the classifier...

...while it is training the student...

cognitive presence

“extent to which the participants in any particular configuration of a community of inquiry are able to construct meaning through sustained communication.”

Triggering

↓

Exploration

↓

Integration

↓

Resolution


https://plus.google.com/u/0/+StefanPSchmid/posts/4wrUbFzFwpJ
current state of the art uses machine learning to classify discussion forum text using this construct.

but contextuality...

- training data sets are rarely shared in education
- and cohorts change – a lot!
- the CoI report uses (not very) accurate Machine Learning
- it is not robust in new learning scenarios
- need to be able to rapidly train classifiers for new cohorts

- does this provide a new teachable moment?
Community of Inquiry Classification

Want to learn about your participation within your learning community?

When you start this activity, you will see one of your posts. We have used machine learning to categorise your cognitive presence according the Community of Inquiry model.

However, our machine learning tool is still learning and it could be wrong. We would like you to:

1. Think about how your post was classified
2. Choose what category you believe your post belongs to
3. If you like, you may highlight text from your post that you used in making your decision, or add remarks to the text-box about what helped you come to your conclusion
4. You can view your history below

What is Cognitive Presence?

Cognitive presence has four phases: Triggering, Exploration, Integration, and Resolution.

Triggering Phase initiates discussion about a particular issue/topic for inquiry.
Exploration Phase posts explore the issue at hand by exchanging knowledge between members of the community.
Integration Phase interactions build upon the ideas shared and explored in the Exploration phase and begin to construct understanding or a solution about a topic or issue.
Resolution Phase are messages in a discussion that test the solutions or understanding developed in the Integration phase.

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Community of Inquiry Classification

Was classified as: Triggering

Here's a free definition for your buzzword bingo card

**Conspicuous:** an approach to defining the levels at which an institution collects in a given content area. It's about the depth of collecting and there are standard indicators, which you can read about in this IFLA guide to collection development policies. Conspicuous is also an approach that can be taken to collection development policy writing, where the policy sets out the target level of depth in particular areas of collecting. It's not used much in Australian libraries any more, and is a bit out of fashion internationally (though used by some research libraries still).
cognitive dissonance provides a teachable moment... and other closely related fields have used similar methods already!

in summary

- learning happens everywhere!
- student facing learning analytics opens up new pedagogical possibilities
- but to do this we need to start from the learning!
- …and then work back to the learning analytics required to help achieve the outcomes we want
Questions?