

Designing for student facing learning analytics

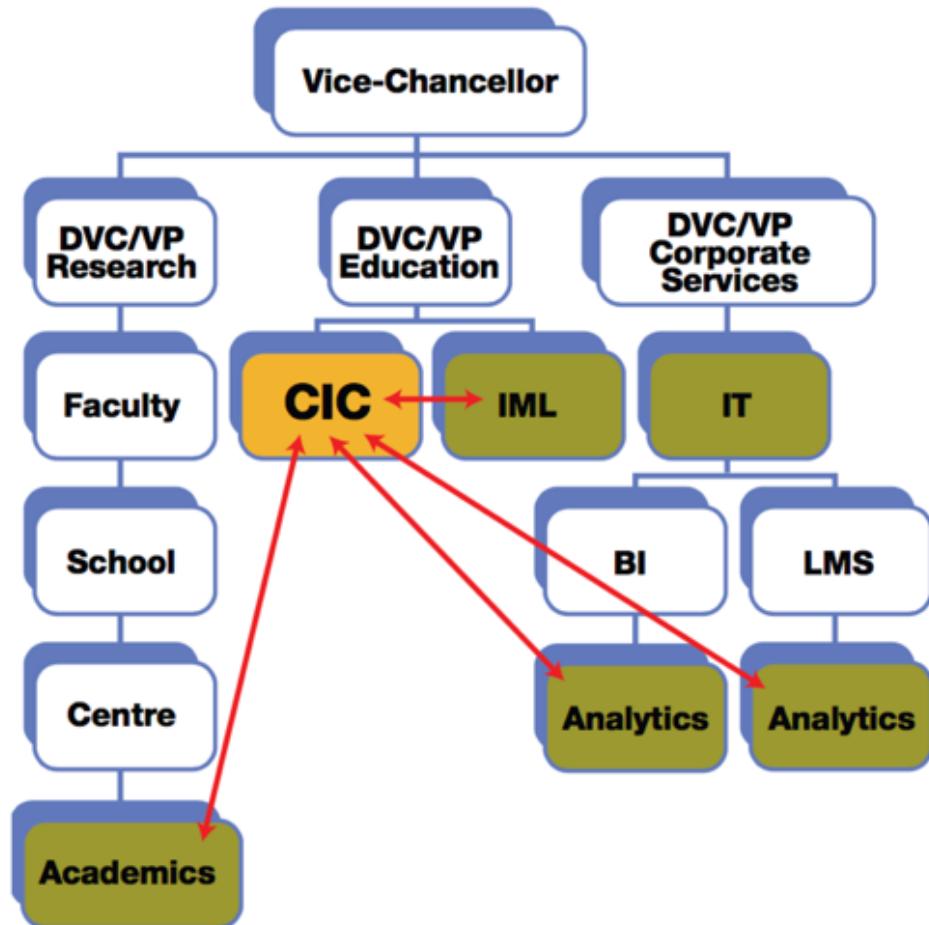
Kirsty Kitto

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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

PURDUE
UNIVERSITY

West Lafayette Academic Campus

Build Teach Student View

Fall 2008 - MA-154 - T Delw

Course Tools

- Course Content
- Who's Online
- My Tools
- My Grades

Your location: Home Page

154

Fall 2008

 Caution! You can do better in this CLASS.

 Course Information

 Daily Lessons

 Opt in and Opt out

Questions? Contact Tim Delworth, delworth@math.purdue.edu

MA 154 Course Web Page

Arnold, K. E., & Pistilli, M. D. (2012). Course signals at Purdue: Using learning analytics to increase student success. In Proceedings of the 2nd international conference on learning analytics and knowledge (pp. 267-270). ACM.

many EdTech systems offering some form of LA

The image displays three separate screenshots of educational technology platforms, each illustrating a different approach to Learning Analytics (LA) for students or parents.

- EdPlace Dashboard:** A mobile-style dashboard for a user named "Bobby". It shows a total of 197 Points. Key sections include "Worksheets to do" (with a list of tasks like "Use colors to signal a list" and "Write a number of quarters in different ways"), "Badges" (a grid of achievement icons), and "Progress" (a summary card showing 64% Overall completion with sub-tasks: 96% Bonus, 74% Experts, 78% Novice). Buttons for "See all badges" and "See all progress" are present.
- Customer Profile View:** A screenshot from a platform managing customer profiles. It shows a profile for "Kate Spade" with contact information (email: lam.a.unicorn@gmail.com, phone: 98125678) and roles (School, Student). It includes sections for "ACTIVE COURSES" (Ballet Intro, Acrobatics 1, Pilates Intro), "REVENUE (\$ THIS MONTH)" (486 DOLLARS), "CLASSES THIS MONTH" (21 CLASSES), and "REVENUE (\$ - CLASSES BY MONTH)" bar charts for March, April, and May. A sidebar lists recent activity: Attended Class (Pilates Intro, 10 May), Signed Up For Course (Pilates Intro, 10 May), Made Payment (\$200.00, 10 May), Received Email (Re: Pilates classes, 10 May), and Sent Email (Pilates classes, 10 May).
- Course Progress Overview:** A dashboard for a course titled "Essentials of Pharmacology for Health Professions". It shows a current grade of B+, 12 assignments done, 17 assignments left, and 28 days remaining. A large circular progress indicator shows 61% Complete. It lists "UPCOMING COURSE MILESTONES": Unit 7 Practice Quiz - Controlled Narcotics (May 04), Final Essay Rough Draft Due (May 19), and Job Shadow Research Assignment Paper Due (May 23). Below this, a line graph tracks "RECENT ASSIGNMENT GRADES" over time, showing a dip during Unit 8 and a rise towards the mid-term.

BUT is it any good?

where does learning happen?





View Progress

Export Course Content

+ Module

traditionally LA has focused upon providing analytics within the confines of specific systems built by vendors...
(e.g. LMSs, eBooks, SIS)

Search

Settings

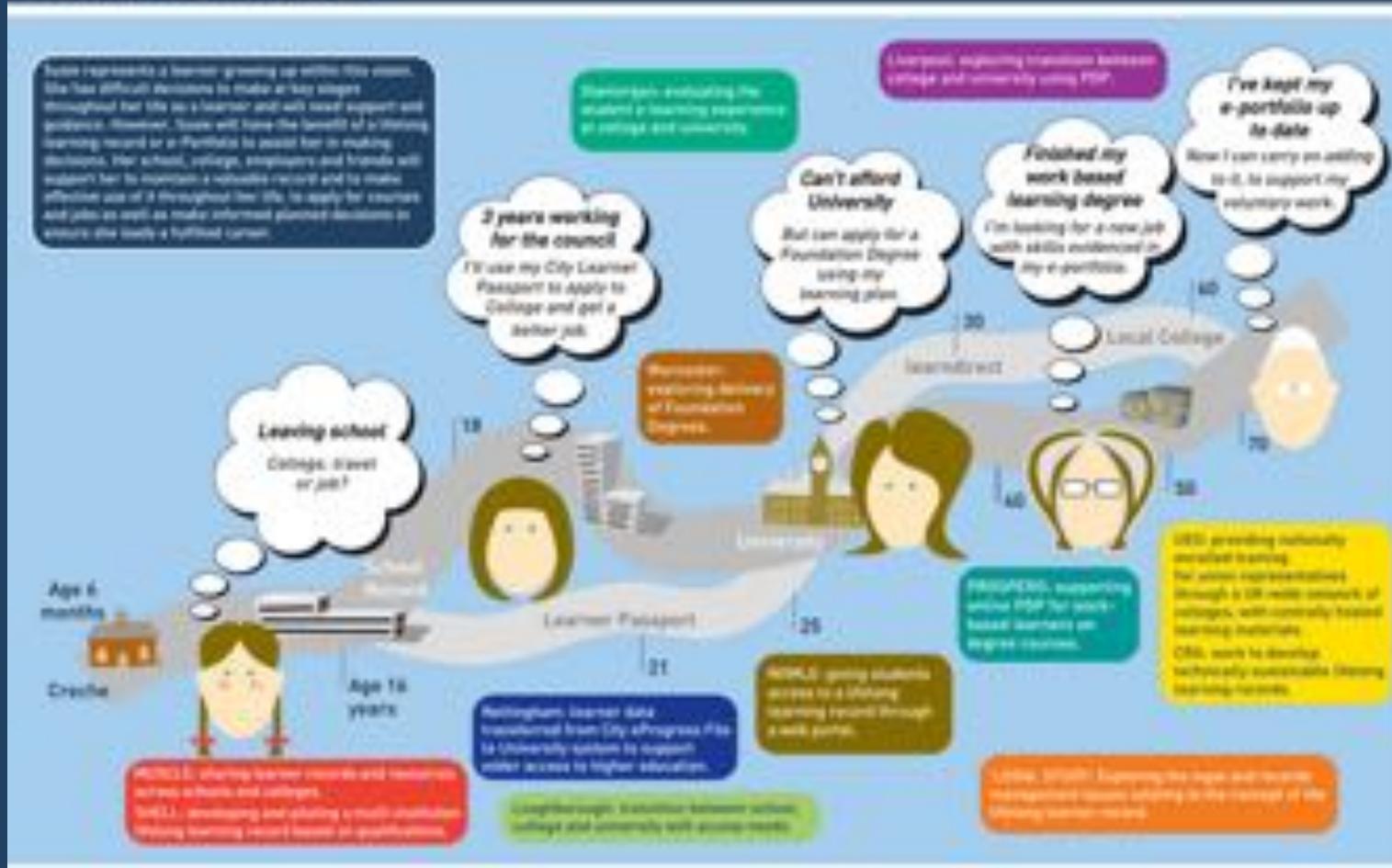
A diagram showing the structure of course modules. At the top is a box labeled 'Welcome to 36103 - Statistical Thinking for Data Science!'. Below it is a box labeled 'Module 0: Preparing for statistical thinking'. Underneath these are two boxes: 'Don't plagiarise!' and 'Resources, texts, and good online courses'. At the bottom is a box labeled 'Am I ready for statistical thinking?'. Each box has a green circular icon with a white number (1, 2, or 3) and a set of three small icons (green circle, plus sign, and three dots).



but learning happens everywhere!

Susie's journey

and learning occurs over a lifetime!



new data standards are emerging to help us collect and harmonise data from many spaces and places





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?*

Bowker, G. C. (2005). Memory practices in the sciences (Vol. 205). Cambridge, MA: Mit Press.

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



Kitto, K., Buckingham Shum, S., Gibson, A. (2018). Embracing imperfection in learning analytics. In Proceedings of the 8th International Conference on Learning Analytics and Knowledge (LAK '18). ACM, New York, NY, USA, 451-460. DOI: <https://doi.org/10.1145/3170358.3170413>



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?



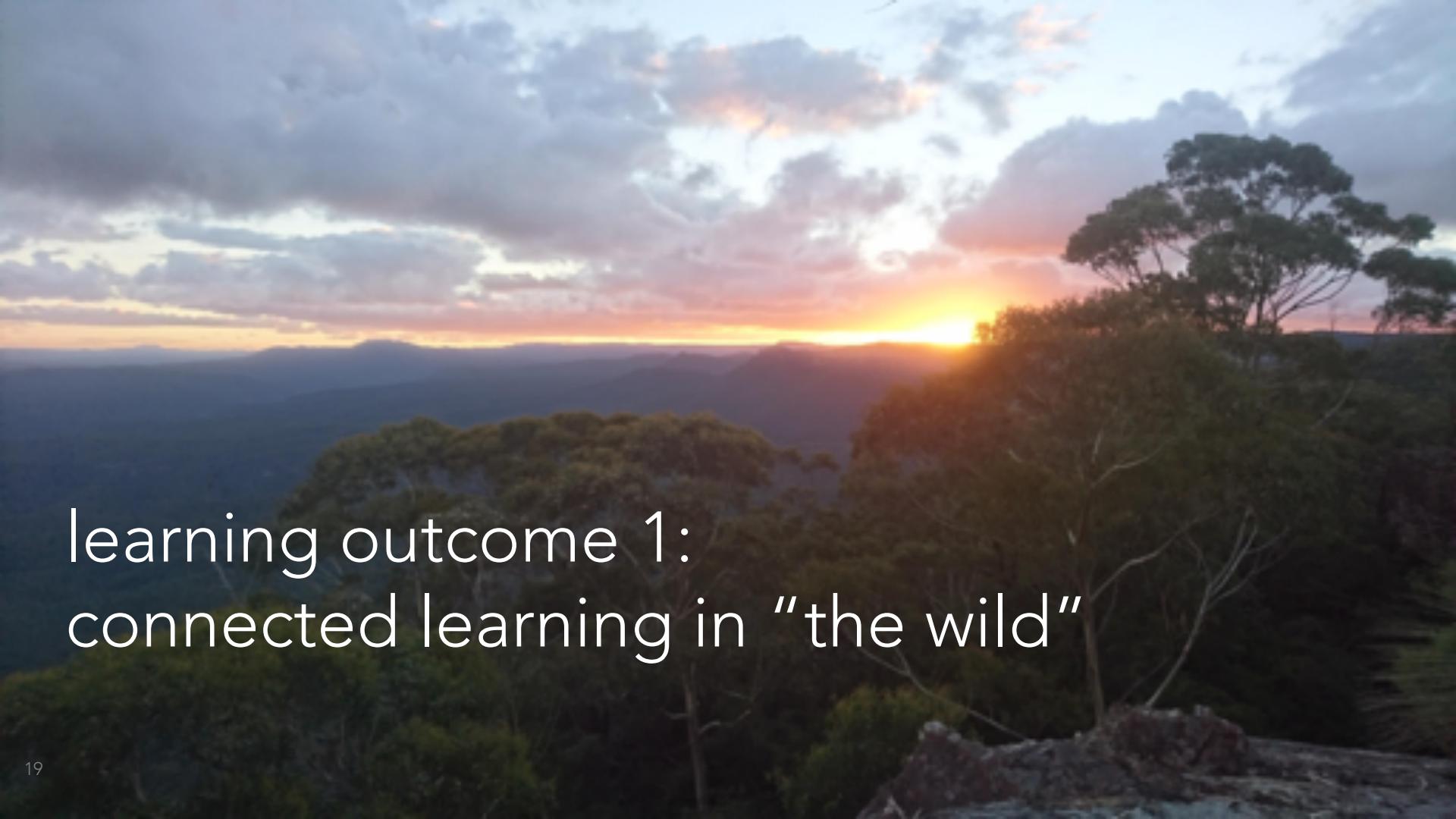
things can go very wrong with naïve approaches

Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study of intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education*, 8, 152–161.

Khan, I., & Pardo, A. (2016). Data2U: Scalable real time student feedback in active learning environments. In Proceedings of the international conference on learning analytics and knowledge (pp. 249–253). Edinburgh, Scotland: ACM.

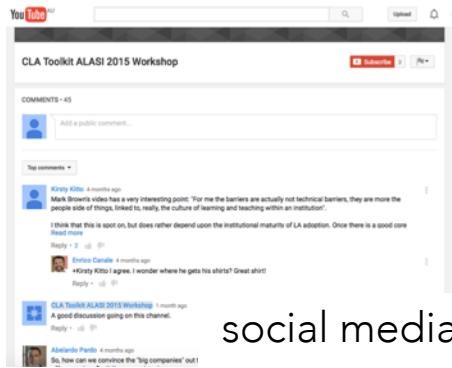
“our combination of leaderboards, badges, and competition mechanics do not improve educational outcomes and at worst can harm motivation, satisfaction, and empowerment”

(Hanus and Fox, 2015)

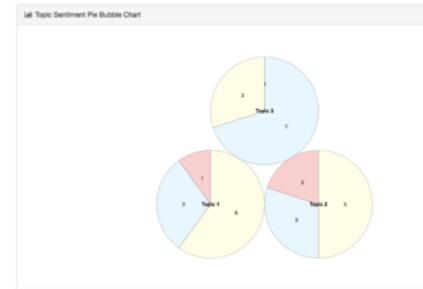
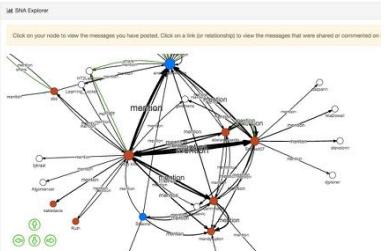
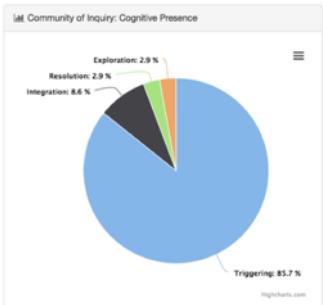
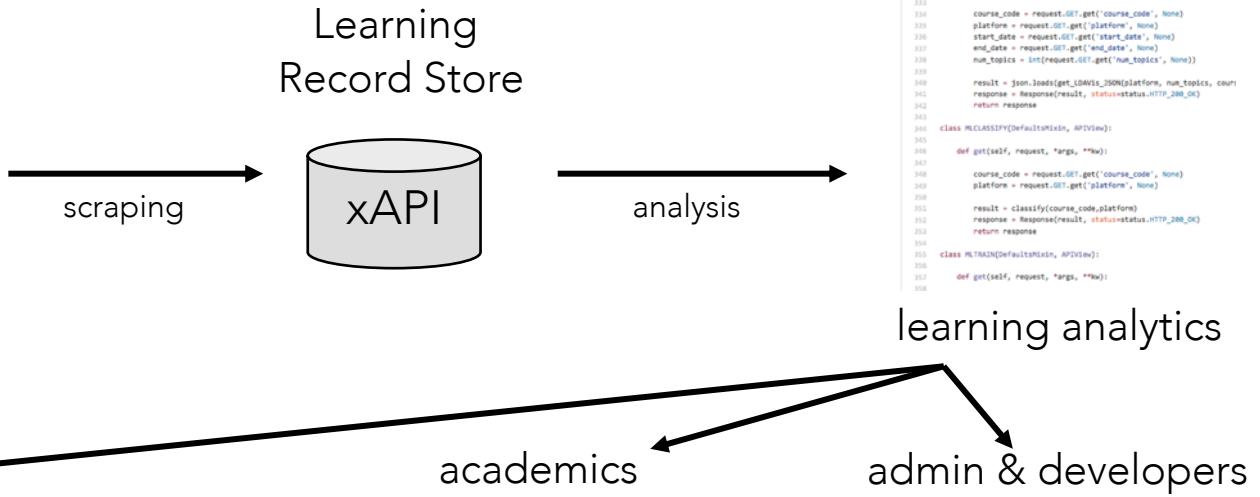
A scenic sunset over a mountain range. In the foreground, there's a rocky outcrop and a large, leafy tree. The middle ground shows a dense forest covering a hillside. In the background, several mountain peaks are visible under a sky filled with dramatic, colorful clouds ranging from deep blues to bright yellows and oranges where the sun is setting.

learning outcome 1:
connected learning in “the wild”

the connected learning analytics toolkit



social media



Learning Locker

You are still in your trial period which ends on Sat, May 23, 2015 10:00 AM. At that point you need to have entered a credit card to access your account. You can do this at any time here.

LRS List

| Title | Description | User # | Created | Action |
|-----------------|-------------|--------|---------------------|--------|
| Karen's LRS | | 1 | 2015-05-09 11:00:00 | |
| Mandy's LRS | | 1 | 2015-05-12 23:02:18 | |
| James's LRS | | 1 | 2015-05-12 23:02:36 | |
| Alexander's LRS | | 1 | 2015-05-11 23:03:00 | |
| Shane's LRS | | 1 | 2015-05-11 23:03:49 | |
| Graeme's LRS | | 1 | 2015-05-11 23:04:23 | |
| Zain's LRS | | 1 | 2015-05-11 23:04:49 | |
| Geoff's LRS | | 1 | 2015-05-11 23:05:00 | |
| Simon's LRS | | 1 | 2015-05-11 23:05:36 | |
| Anneke's LRS | | 1 | 2015-05-11 23:32:10 | |

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

QUEENSLAND UNIVERSITY OF TECHNOLOGY:

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UNIVERSITY OF SOUTH AUSTRALIA

Shane Dawson, Dragan Gašević (Uni of Edinburgh)

UNIVERSITY OF TECHNOLOGY SYDNEY

Simon Buckingham Shum (and now Kirsty Kitto!)

UNIVERSITY OF SYDNEY

Abelardo Pardo

UNIVERSITY OF TEXAS (ARLINGTON)

George Siemens



Queensland University
of Technology

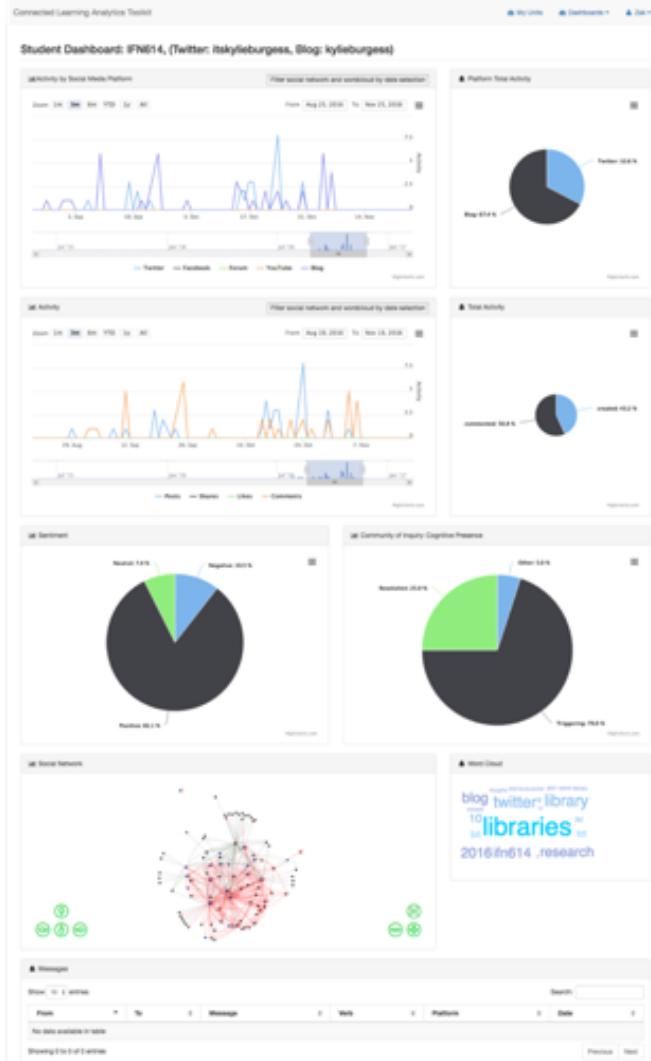


University of
South Australia



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?

CAUTION

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).

Kitto, K., Lupton, M., Davis, K., Waters, Z. (2017). Designing for Student Facing Learning Analytics, Australasian Journal of Educational Technology, 33(5), 152-168.

Kitto, K., Lupton, M., Davis, K., Waters, Z. (2016). Incorporating student-facing learning analytics into pedagogical practice. In S. Barker, S. Dawson, A. Pardo, & C. Colvin (Eds.), Show Me The Learning. Proceedings ASCILITE 2016 Adelaide, pp. 338-347.

does it work? ... maybe

| Unit | Semester | Aim/pattern | Linked to assessment | N= |
|------------------------------------|----------|---|----------------------|--------------|
| IFN614 Information Programs | S2, 2015 | Piquing students curiosity Examine, relabel classifier | No | S:12 AL:6 |
| IAB260 Social Technologies | S1, 2016 | Do-analyse-change-reflect | Yes | S:23 B:17 |
| IFN614 Information Programs | S2, 2016 | Do-analyse-change-reflect (predict, compare) | Yes | S:21 B:11 |



IFN614 Information Programs

UNIT SITE

Need help?

Ask your peers: tweet with the hashtag #ifn614

Important question? Tweet the teaching team: @ifn614

Personal question? Email the teaching team: out.ifn614@gmail.com

Latest posts from the teaching team blog

How to export your blog's content and put it somewhere else

How to export your blog's content and import it into your personal blog or you

Author: Kate

Posted: November 23, 2016, 8:36 am

Good luck and a reminder

Just a quick note to remind you that your assignment all needs to be finalised by 11.59pm Sunday

Author: Kate

Posted: November 4, 2016, 9:21 am

Get questions about the CLA Toolkit?

A few of you have mentioned you are having difficulties with the CLA Toolkit. If that's you:

psia

Author: Kate

Posted: October 30, 2016, 10:01 am

That's that (quite) all folks!

It's Week 13 already and that means it's time for a host of lasts our last Twitter chat, tonight

IFN614 Information Programs

UNIT SITE

Latest tweets from the teaching team

Latest #ifn614 tweets

Tweets by [@ifn614](#)

QUIT IFN614 @ifn614

New post: How to export your blog's content and put it somewhere else [2016.informationprograms.info/how-to-ex-#ifn614](#)

Hmm, an empty timeline. That's weird.

Check for Tweets

Tweets by [@ifn614](#)

QUIT IFN614 @ifn614

Guy, I have an A3 reflection submission without a name on it. If it's yours, please get in touch asap. XD

11:59pm Sunday

Check for Tweets

Tweets by [@ifn614](#)

QUIT IFN614 @ifn614

New post: Good luck and a reminder [2016.informationprograms.info/good-luck-and-a-reminder](#)

10:01am

Check for Tweets

Twitter chat tips

Here's everything you need to know to participate in our Twitter chats this semester:

On this page:

- What is a Twitter chat?
- Prepare for your first Twitter chat
- Use a Twitter chat monitoring tool
- Things to do in advance of the chat
- Things to do right before the Twitter chat
- Things to do during the chat
- Things to do before you log off
- Things to do after the Twitter chat

What is a Twitter chat?

Not sure what a Twitter chat is? This definition from the Buffer blog explains it all:

A Twitter chat is where a group of Twitter users meet at a pre-determined time to discuss a certain topic, using a designated hashtag (#) for each tweet contributed. A host or moderator will pose questions (staggered with Q1, Q2, etc.) and prompt responses from participants (using A1, A2, etc.) and encourage interaction among the group. Chats typically last an hour. Imagine a business networking event—but without a dress code and with a keyboard instead of a bar. The same social customs apply.

Recent Posts

- How to export your blog's content and put it somewhere else
- Good luck and a reminder
- Get questions about the CLA Toolkit?
- That's that (quite) all folks!
- Return of Assignment 2

Recent Comments

- Service review: QUT Library Reference Service - 'Ask a Librarian' feature shown on Week 3 Reference
- Kate on Assignment 2 & 3: EDI and grant application
- All on Assignment 2 & 3: EDI and grant application

for example (Trial 3)

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

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

- a class provided an overview of the Col 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?

| Score | Level of analysis | N = 11 |
|-------|--|--------|
| 1 | Included some /all graphs with no reference or analysis | 1 |
| 2 | Included some/all graphs, quantitative analysis relating activity to personality &/or interest | 2 |
| 3 | Included some/all graphs, quantitative analysis relating activity to personality &/or interest, basic analysis on activity in relation to week 2 aim | 5 |
| 4 | Included some/all graphs, referred back to week 2 aim, compared & contrasted, mentioned qualitative aspects | 3 |

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 carbon 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 really bad 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 problems unless it could rewrite other nanobots programs. Well some scientists are trying to figure out how to make it possible for them to copy themselves. So one might be able to become 100.

Also they are planning to make them able to kill bacteria, and there they might eat away at the intestines instead. But don't be worried they might make it so that they will go through the body with the rest of the food. Also they might program them to turn off 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 sicker tracking me.

So as you can see there are lots of problems. There are bugs, hackers, government overviews, and falling into the wrong hands. There is good news I think we are still far from getting a lot of nanobots just yet.

LA must be linked to the pedagogical purpose!

reflective writing

| Depth | Intention | | | | | |
|-----------|-----------------|--------------------------------------|--------------------------------------|---|--|---|
| | Integration | | | What impact on my goals/inspirations? | What other ideas could I use to change myself? | How do others address these challenges? |
| | Internalisation | | What do these feelings say about me? | How is this a problem that challenges me? | Why do I need to change? | How can I change? |
| | Interpretation | What does it mean for me? | Why do I feel this way? | | | |
| | Impression | What do I notice about my situation? | | | | |
| Thoughts | | Feelings | Challenge | Self critique | Potential solution | Learning opportunity |
| CONTEXT | | | CHALLENGE | | CHANGE | |
| Narrative | | | | | | |

Gibson, A., Aitken, A., Sándor, Á., Buckingham Shum, S., Tsingos-Lucas, C., & Knight, S. (2017, March). Reflective writing analytics for actionable feedback. In Proceedings of the Seventh International Learning Analytics & Knowledge Conference (pp. 153-162).

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

Abel, S., Kitto, K., Knight, S., Buckingham Shum, S. (2018). Designing personalised, automated feedback to develop students' research writing skills. In Proceedings ASCILITE 2018. In Press.

See www.heta.io for more details

feedback – reflective writing

Key

Get Feedback Save Export to PDF Key

Words associated with strong feelings
 Expressions indicating belief, learning, or knowledge.
 Expressions indicating self critique
 ◇ One or more keywords missing
 ↗ Sentence too long, might disengage the reader. Try breaking it into smaller sentences
 ■ Initial thoughts and feelings about a significant experience.
 ● The challenge of new surprising or unfamiliar ideas, problems or learning experiences.
 ▲ Deeper reflection, personally applied.
 ▲ How new knowledge can lead to a change

Auto feedback:

Feedback (Reflective)

■● 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 personally saw it as a journey which exposed my strengths and weaknesses. ■ 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 a 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

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feedback – research writing

Analytical Report

Feedback

Resources

Move 1: Establishing a research territory

- E Emphasis of a significant or an 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 author's goal or nature of the research, or structure of the paper

E B 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. E C 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. S We present a pilot study that explores the effectiveness of these DS elements based on educators' responses to paper prototypes. S The dual purpose is understanding

Analytical Report

Feedback

Resources

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

Analytical Report

Feedback

Resources

Move 1: Establishing a research territory

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

Analytical Report

Feedback

Resources

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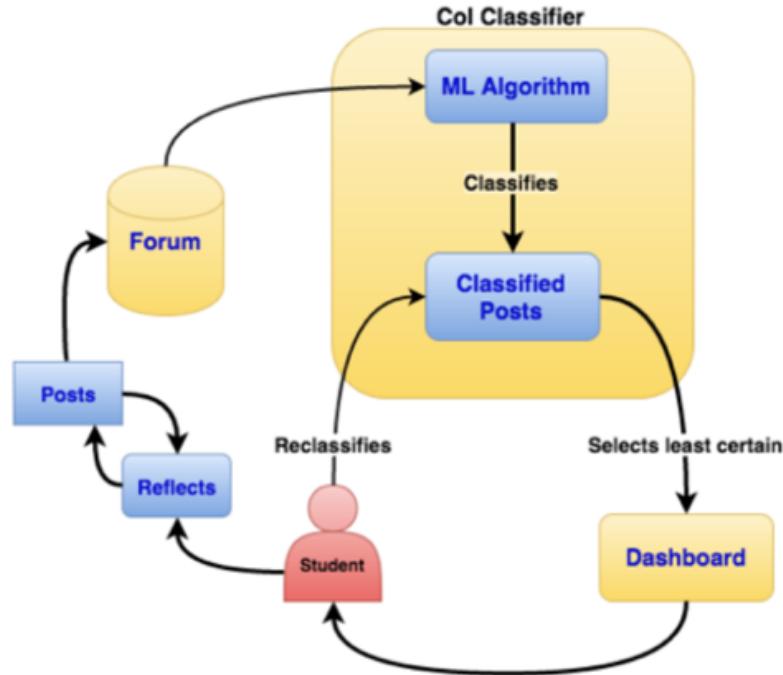
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active learning squared (AL^2)

the student trains the classifier...

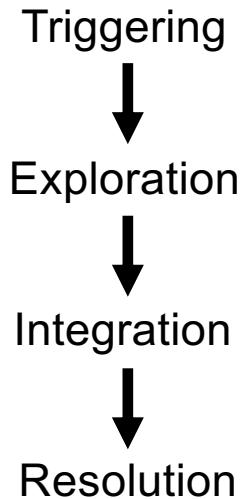
...while it is training the student...



Kitto, K., Buckingham Shum, S., Gibson, A. (2018). Embracing imperfection in learning analytics. In Proceedings of the 8th International Conference on Learning Analytics and Knowledge (LAK '18). ACM, New York, NY, USA, 451-460. DOI: <https://doi.org/10.1145/3170358.3170413>

cognitive presence

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



The screenshot shows a Google+ post from Stefan P. Schmid. The post includes several annotations:

- Problem presentation, Triggering phase:** Points to the first comment by Stephan F. Schmid.
- Relation to previous post, Triggering phase:** Points to the second comment by Stephan F. Schmid, which refers back to the first post.
- Tagging participants:** Points to the 'Tagged' section where Stephan F. Schmid is mentioned.
- Shared resource, Triggering phase:** Points to a blue link labeled "The secret of creating super-industry business message!"
- Insight, Opinion, Trigger phase Exploration phase:** Points to Stephan F. Schmid's response, which contains an image of a presentation slide titled "Lösungsidee".
- Related video, Exploration phase:** Points to a video thumbnail in Stephan F. Schmid's response.
- Reference to previous post, Integration phase:** Points to Stephan F. Schmid's response, which quotes a previous post by Stephan F. Schmid.
- Related original content, Integration phase:** Points to a link in Stephan F. Schmid's response.
- Insight, opinion, Resolution phase:** Points to Stephan F. Schmid's final response at the bottom of the thread.

Garrison, Anderson, Archer (2001) Critical thinking, cognitive presence, and computer conferencing in distance education. American journal of distance education, 15(1):7-23

<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

Kovanović, Joksimović, Waters, Gašević, Kitto, Hatala, Siemens (2016). Towards automated content analysis of discussion transcripts: a cognitive presence case. In Proceedings of the Sixth International Conference on Learning Analytics & Knowledge (LAK '16). ACM, New York, NY, USA, 15-24.

Towards Automated Content Analysis of Discussion Transcripts: A Cognitive Presence Case

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ABSTRACT

In this paper, we present the results of an exploratory study that examined the problem of automating content analysis of student online discussion transcripts. We looked at the problem of encoding discussion transcripts for the levels of cognitive presence, one of the three main constructs in the Community of Inquiry (CoI) model of distance education. Using Cosine Matrix and L2WC features, together with a set of custom features developed to capture discussion contexts, we developed a random forest classification system that achieved 93.9% classification accuracy and 0.63 Cohen's kappa coefficient. This is higher than previous reported classification studies. Besides improvement in classification accuracy, the developed system is also less sensitive to variations as it uses only 205 classification features, which is around 100 times less features than in similar systems based on bag-of-words features. We also provide an overview of the classification features most indicative of the different phases of cognitive presence that gives additional insights into the nature of cognitive presence learning cycle. Overall, our results show great potential of the proposed approach, with an added benefit of providing further characterisation of the cognitive presence coding scheme.

Keywords

Community of Inquiry (CoI) model, content analysis, content analytics, online discussions, text classification

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I. INTRODUCTION

Online discussions are commonly used in modern higher education, both for blended and fully online learning [42]. In distance education, given the absence of face to face interactions, online discussions represent an important component of the whole educational experience. This is particularly true for the social-constructivist pedagogies which emphasize the value of social construction of knowledge through interactions and discussions among a group of learners [27]. In this regard, the Community of Inquiry (CoI) model [22, 23] represents perhaps one of the best researched and validated models of online and distance education, focused on explaining important dimensions – also known as presences – that shape students' online learning experience.

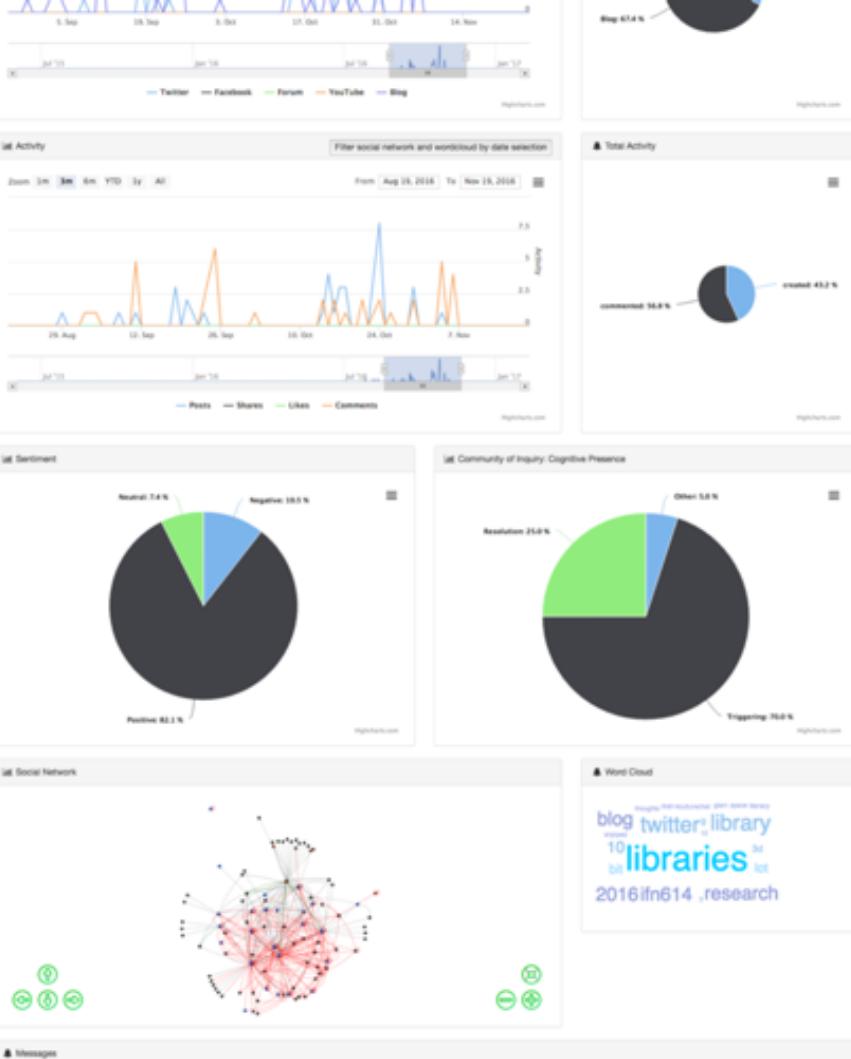
The most commonly used approaches to the analysis of online discussion transcripts are based on the quantitative content analysis (QCA) [12, 54, 31, 35]. According to Kruegerhoff [37] content analysis is "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" [p18]. In the case of the study presented in this paper, contexts are online learning environments. QCA is a well defined research technique commonly used in social science research, and it makes use of specifically designed coding schemes to analyze text artifacts with respect to the defined research goals and objectives. For instance, the CoI model defines a set of coding schemes which are used by the educational researchers to assess the levels of three CoI presences.

In the domain of educational research, QCA of student discussion data have been mainly used for the retrospective and research after the courses are over without an impact on the courses' learning outcomes [53]. In the field of content analysis [38], which focuses on building analytical models based on the learning content including student produced content such as online discussion messages – there have been some attempts to automate some of those coding schemes. Most notable are the efforts of McKinn [44] and Corch et al. [11] on automation of the CoI coding schemes, which served

but contextuality...

- training data sets are rarely shared in education
- and cohorts change – a lot!
- the Col 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

View Community of Inquiry Classifications

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.

Begin

Community of Inquiry Classification

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Begin

Community of Inquiry Classification

View Community of Inquiry Classifications

What is this?

Was classified as: Triggering

Here's a free definition for your buzzword bingo card:

Conspectus: 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. Conspectus 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).

Sharing information/outside links

Triggering

Exploration

Integration

Resolution

Other

Preview:

Author Posts

July 27, 2015 at 8:52 pm

#402

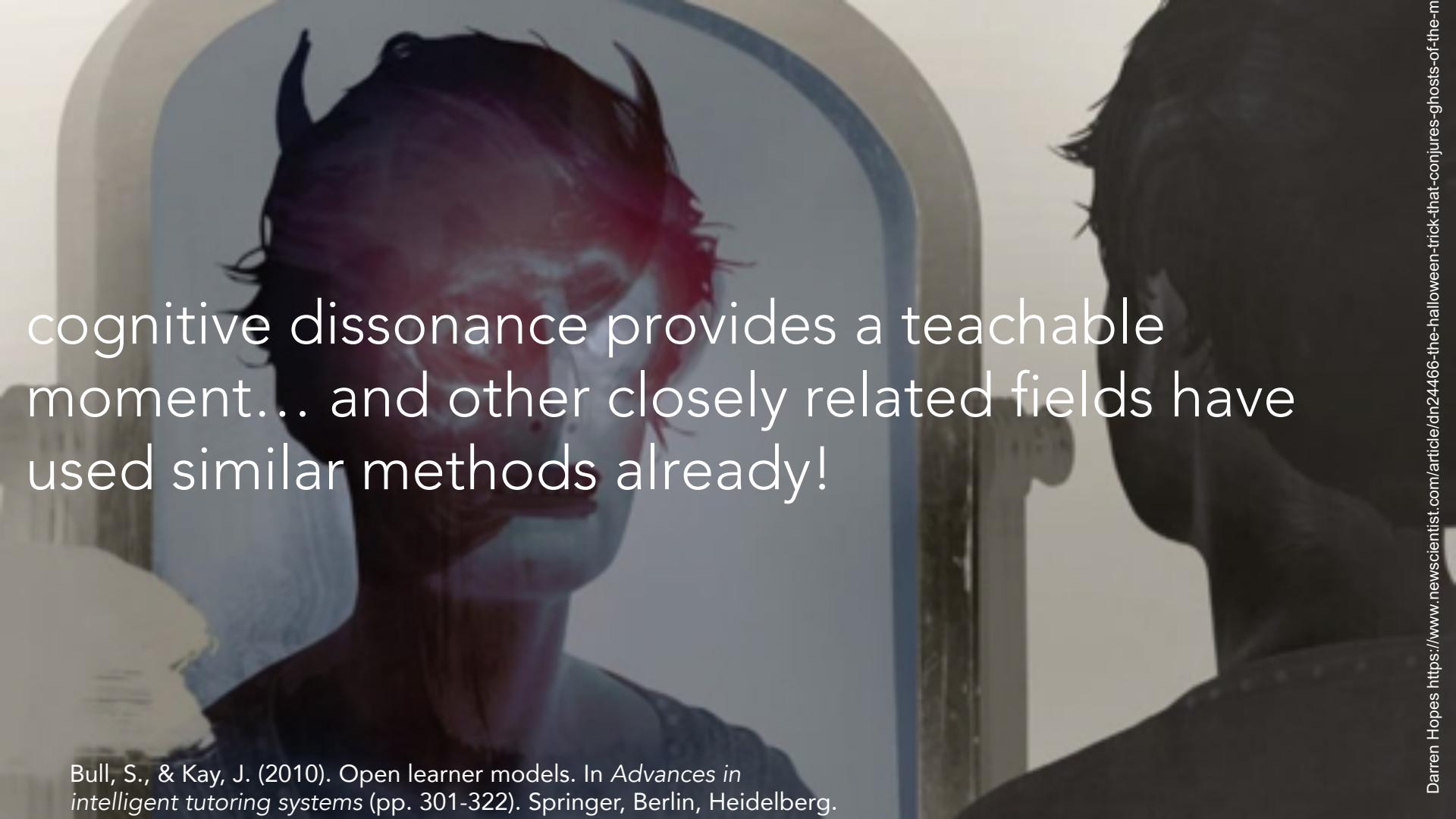


Kate Davis
Keymaster

Here's a free definition for your buzzword bingo card...

Conspectus: 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. Conspectus 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).



A photograph of a woman with dark hair and a purple face paint or mask looking towards the right. She is wearing a dark top. To her right, a man in a dark suit and tie is partially visible, looking back at her. The background is a plain, light-colored wall.

cognitive dissonance provides a teachable moment... and other closely related fields have used similar methods already!

Bull, S., & Kay, J. (2010). Open learner models. In *Advances in intelligent tutoring systems* (pp. 301-322). Springer, Berlin, Heidelberg.

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?



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