Advancing University Teaching and Learning with Analytics: Linking Pedagogical Intent and Student Activity through Data-Based Reflection

Alyssa Friend Wise
Simon Fraser University
Learning Analytics
Sub UniquePostsRead()

For k = 1 To MaxUser Step 1
    RowCount = Range("A1").CurrentRegion.Rows.Count
    For w = 1 to MaxWeek Step 1
        StartTime = Sheets("Week").Cells(w + 1, 2)
        EndTime = Sheets("Week").Cells(w + 1, 3)
        PostNum = 0
        PostsIndex = 0

        Do While Cells(i, datestamp) <= EndTime And i <= RowCount
            If Cells(i, Source) = "Read" Then
                If Cells(i, Message_Author) <> Val(ActiveSheet.Name) And Cells(i, Scan) <> "X" Then
                    flag = 0
                    For j = 1 To PostsIndex Step 1
                        If Posts(j) = Cells(i, Message_Id) Then
                            flag = 1
                            j = PostsIndex
                        End If
                    Next j
                    If flag = 0 Then
                        PostsIndex = PostsIndex + 1
                        Posts(PostsIndex) = Cells(i, Message_Id)
                    End If
                End If
            End If
        Next i
    Next w
    PercentPostsRead = ΣUniquePostsRead
        TotalPostNumber

Next k
End Sub
Learning Analytics

The collection and analysis of data traces related to learning in order to inform and improve the process and/or its outcomes

(Siemens et al., 2011)
There's Learning Analytics & Learning Analytics

Completed Activities
Outcome Data
Long Time Cycle
Global Changes

Activities in Progress
Process Data
Short Time Cycle
Local Adjustments
HOW DO WE HELP
LEARNING ANALYTICS BE
AN INNOVATION THAT
MAKES A REAL IMPACT
ON TEACHING AND
LEARNING?

and maybe even revolutionizes higher education!
WE NEED TO DESIGN FOR
WAYS IN WHICH ANALYTICS
CAN USEFULLY
REFLECT & INFORM
THE TEACHING AND
LEARNING PRACTICES OF
INSTRUCTORS AND STUDENTS
Learning Analytics

Capturing / calculating meaningful traces of activity

Presenting data in a useful form (to learners, teachers, designers, administrators...)

Supporting interpretation and use of the analytics in decision making
How do we develop rich indicators that can be meaningful to teachers and students as reflections of their particular practices of teaching and learning?
HOW DO WE CONSIDER AND DESIGN FOR WAYS IN WHICH ANALYTICS CAN PLAY A PART IN THE LARGER ACTIVITY PATTERNS OF INSTRUCTORS AND STUDENTS?
Part 1: Rich Indicators
How do we develop rich indicators that can be meaningful to teachers and students as reflections of their particular practices of teaching and learning?
DATA MINING

Image Credit: Scott Clark via Flickr (CC BY 2.0), adapted
DATA ARCHEOLOGY
(WISE, 2013)
DATA ARCHEOLOGY

(WISE, 2014)
DATA ANTHROPOLOGY
(WISE, 2014)
What’s the learning model?
More is Better
WE CAN DO BETTER!
“Second Generation” Learning Analytics
ONE SIZE DOESN’T FIT ALL
An online discussion forum is a tool. It's educational purpose can change.

Q & A

Dialogue

Reading Response

Peer Review

Team Decision Making

Argumentation
Externalizing one’s ideas by contributing posts to an online discussion

Taking in the externalizations of others by accessing existing posts

Focus on how students contribute comments ("speak") and attend to other’s messages ("listen")
Speaking

- Mechanism for sharing ideas
- Value in speaking that is
  - Recurring, responsive, rationaled
  - Distributed temporally and conversationally
  - Moderately portioned
- While “speaking” is visible, not all qualities are salient in the system (esp. as related to time)
- Post quality info valuable, but complex to assess

Listening

- Attending to the ideas of others is critical, but “invisible”
- Value in listening that is
  - Broad yet Deep (to consider multiple ideas; predicts posts’ content quality)
  - Integrated (so comments are informed by others’ views)
  - Recurrent (to provide context for discussion flow; predicts responsiveness)
- Early research suggested universally poor behaviors, but recent work shows students listen in very distinct ways
  - E.g. Disregardful, Coverage, Focused, Thorough
<table>
<thead>
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ONE SIZE (STILL) DOESN'T FIT ALL
Part 2: Activity Patterns
HOW DO WE CONSIDER AND DESIGN FOR WAYS IN WHICH ANALYTICS CAN PLAY A PART IN THE LARGER ACTIVITY PATTERNS OF INSTRUCTORS AND STUDENTS?
Learning Analytics

Capturing / calculating meaningful traces of activity

Presenting data in a useful form (to learners, teachers, designers, administrators...)

Supporting interpretation and use of the analytics in decision making
Learning Analytics Interventions

Surrounding frames of activity through which learning analytics are taken up by people as part of some larger educational activity

(Wise et al., 2013)
Locally Contextualized Questions of Interpretation & Action

Who should be accessing particular kinds of analytics?

(instructors, students, administrators, learning designers, teaching assistants, combinations of these)
Locally Contextualized Questions of Interpretation & Action

When should analytics be consulted?

(at what points in what processes, with what frequency)
Locally Contextualized Questions of Interpretation & Action

Why are the analytics being consulted?

(what questions are they answering)
Locally Contextualized Questions of Interpretation & Action

What do the analytics mean in this situation and what do we do about it?

(how should the information be interpreted and used in this context)
Locally Contextualized Questions of Interpretation & Action

How does the use of the analytics articulate with the larger educational practices and processes taking place?

(what is done differently, how do the components of the system interact)
Thinking Like a Designer I

Connect the use of Learning Analytics to the Practice of Learning Design

(Lockyer, Heathcote, & Dawson, 2013)
THINKING LIKE A DESIGNER II

EMBED USE OF LEARNING ANALYTICS TO SUPPORT INTENTIONAL STUDENT LEARNING PRACTICES
Why focus on students as users of learning analytics?

Engage them as active partners in learning

Ability to make immediate local changes

Activate metacognitive processes

Empowerment not enslavement

Democratize access to data

One-to-one ratio at any scale
CHALLENGES & OPPORTUNITIES FOR STUDENTS AS LEARNINGAnalytics USERS

CHALLENGES

• Comprehending pedagogical intent (early on)

• Recognizing productive patterns of activity

• Developing / activating self-regulatory skills

OPPORTUNITIES

• Sharing instructional purpose increases potential for purposeful alignment of student behavior

• Being proactive in monitoring and directing one’s learning supports better processes and outcomes
Some Additional Concerns

- Transparency of data capture, analysis and access

- Rigidity of interpretation (more isn’t always better)

- Danger of optimizing to only that which can be measured
A model for interventions that embeds the use of Learning Analytics to support purposefulness in Student Learning Practices

2 Foundations

3 Processes

4 Principles
Learning Analytics
INTEGRATION

Learning Analytics & Learning Activities
INTEGRATION

• MAKE THE USE OF LEARNING ANALYTICS AN ELEMENT OF THE LEARNING DESIGN

• POSITION THE USE OF ANALYTICS AS AN INTEGRAL PART OF COURSE ACTIVITIES TIED TO GOALS AND EXPECTATIONS

• PROVIDE A LOCAL CONTEXT FOR MAKING SENSE OF THE DATA
Conceptual Questions

1. **Given the goals of this particular educational activity, what metrics are important to focus on?**

2. **What do productive and unproductive patterns in these metrics look like?**
Practical Questions

1. How to make this thread between learning goals, student actions and analytics feedback clear

2. How to make analytics use embedded in course activity flow
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## Metrics of Focus

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Some Analytics can be embedded directly into the learning activity
### Other Analytics Need to be Extracted & Reintegrated into the Learning Activity

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<th>Metric</th>
<th>Your Data (Week X)</th>
<th>Class Average (Week X)</th>
<th>Observations</th>
</tr>
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<tbody>
<tr>
<td>Range of participation</td>
<td>4 days</td>
<td>5 days</td>
<td></td>
</tr>
<tr>
<td># of sessions</td>
<td>6</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Average session length</td>
<td>33 min</td>
<td>48 min</td>
<td></td>
</tr>
<tr>
<td>% of sessions with posts</td>
<td>67%</td>
<td>49%</td>
<td></td>
</tr>
<tr>
<td># of posts made</td>
<td>8</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Average post length</td>
<td>386 words</td>
<td>125 words</td>
<td></td>
</tr>
<tr>
<td>% of posts read</td>
<td>42%</td>
<td>87%</td>
<td></td>
</tr>
<tr>
<td># of reviews of own posts</td>
<td>22</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td># of reviews of others’ posts</td>
<td>8</td>
<td>112</td>
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INTEGRATION

Grounding

Learning Analytics & Learning Activities
Clear guidelines and discussion of

- the purpose of engaging in [online discussions]

  *articulating one’s ideas, being exposed to the ideas of others, negotiating differences in perspective*

- the instructor’s expectations for a productive process of engaging in [online discussions]

  *attending deeply to a spectrum of others’ ideas, and contributing comments that are responsive and rationally,*

- how the learning analytics provide indicators of this process

  *percent of posts read introduced not just as a number but one which have clear meaning in the context of the activity*
Discussion Participation Guidelines

Attending to Others Posts

**Broad Listening**: Try to read as many posts as possible to consider everyone’s ideas in the discussion. This can help you examine and support your own ideas more deeply. However, when time is limited it is better to view a portion in depth, then everything superficially.
**Discussion Participation Guidelines**

**Attending to Others Posts**

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*The visual interface shows posts that you have viewed in blue and new ones in red to help you track this.*
Discussion Participation Guidelines

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Learning Analytics Guidelines

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It is good to read as many posts as possible to consider everyone’s ideas in the discussion. However, when time is limited it is better to view a portion in depth, then everything superficially.
WHO IS WATCHING ME?
STUDENT AGENCY

CAN GIVE STUDENTS THE OPPORTUNITY TO

– ESTABLISH PERSONAL GOALS FOR THE ACTIVITY (IN RELATION TO THE GIVEN INSTRUCTIONAL INTENT)

– HAVE (SOME) AUTHORITY IN INTERPRETING WHAT THE ANALYTICS SAY ABOUT THEIR PROGRESS TOWARDS THE GOALS

– PROVIDE HUMAN CONTEXT TO THE DATA

[THAT’S DATA ANTHROPOLOGY !]

– DECIDE WHAT ACTIONS TO TAKE AS A RESULT OF THE INFORMATION PROVIDED
INTEGRATION

AGENCY

Grounding

Goal Setting

Learning Analytics & Learning Activities

Reflection
**Goal-Setting**

- **Individual goal-setting allows for multiple possible profiles of productive activity and improvement (rather than a single path all must follow)**

- **(Self-set) goals motivate learners to put in greater efforts, support self-monitoring and increase commitment to meet challenges encountered**
GOAL SETTING

• Discussion guidelines present metrics as a starting point for consideration, not as absolute arbiters of engagement

• Goal-setting is an explicit and structured part of the learning activity as students set weekly goals for engaging in the online discussions in an online reflection journal (in the LMS)

SAMPLE STUDENT GOALS

“I aim to read all (most) posts [in the discussion], and actively participate in two threads in addition to any I create”

“Well, since I didn't hit last week’s goal really I [still] need to do that, also keep the length [of my posts] down and get more interactive with the other kids.”

“As a goal for the next discussion, I will try to synthesize ideas from different thread areas”
[Data Informed] Reflection

• **Key Element of Learning Analytics Use**
  — Connects the information to the context to generate meaning and initiate action

• **Dual Danger of Omnipresent Analytics**
  — Ability to review “anyplace/anytime” means it happens nowhere/never
  — Attention to constantly available metrics distracts from engagement in learning
Establish a rhythm for reflection
- Weekly cycle of reviewing the analytics
- Evaluate progress towards the goals
- Assess when the goals themselves need to be updated or revised

Provide a dedicated space
- Online reflective journal (private wiki in the LMS)
- Supports examination of trajectory over time

Sample Student Reflection

“I found that I wanted the challenge of trying to up the % of overall posts that I reviewed each week. This also meant slowing down my reading since the data would not record a quick read of the information. The overall result was that I think I learned more and was able to get a broader sense of opinion concerning the readings.”
Reference Frame

• Comparison points to which students orient when they examine their analytics
  – Theoretical patterns
  – Peer activity
  – Their own prior activity
• Continually reminding students of theoretical patterns
• Prompting reflection on individual progress and goals
• Value and danger of comparisons to peers

SAMPLE MENTIONS OF REFERENCE FRAMES

“I was surprised to see that most of my classmates checked the forum more than I did…I also did not expect that they referred [back to] their own post quite many times.”

“Since all my numbers are below the average so that makes me feel, ‘Oh my gosh, I’m kind of jumping out of this class’ or something like that. It is kind of a little bit – sometimes depressing.”

“Compared to the previous week, [my] number of reviews of others’ posts has been hugely increased ... and I did spend more time to read and understand others’ posts.”
Dialogue

• Space of negotiation around the interpretation of the analytics

• Analytics as a start, not the end
  – What to change is not always clear
  – Students may need help taking action

• Use of “neutral” data as leverage
• Conversation between each student and the instructor about their participation, grounded in the analytics
• Conducted thought the online reflective journal
• Simultaneously creates an audience for the reflection and allows for feedback, suggestions etc.

**SAMPLE DIALOGIC COMMENTS**

“This week I was out of town to renew my entry visa, so I went to the discussion forum later than usual, as a result, my role was mainly to build on others' comments or answer questions, studying more as a listener. Timing is very important for online discussion :) ...I hope I could ...do better next week”

“Despite your comment that you made fewer posts than in previous weeks I notice that you are still way above the class average. I'm curious to know your thoughts on this - especially in relation to your goal of wanting to focus more on quality rather than quantity.”
I was overwhelmed to see the volume of the comments, sometimes they help me to get inspiration but I [also]... tend to change my thoughts after... [if] it seemed to be making a very good point....that also delay the timing to post my comment. While I am readjusting, more comments were posted, I get more nervous, since I feel I also have to address those new comments.

A couple of ideas that may help you: (1) It is okay to post your initial ideas before reading everything (even if they will change after) (2) It might help if you pick one reading and one thread of the discussion to participate in first instead of trying to do it all at once. (3) It is okay (and good) if you are constantly readjusting your thinking - this is part of the learning process

“I think that the strategy [you gave me] helped me to ease my stress. By posting at least one comment earlier, I could feel that I achieved. (I still know I need to make much more contributions on the forum, though.”
Integration (technological and pedagogical) made analytics a coherent part of the learning process.

Students embraced agency in setting (often recurring) personal goals and evaluating their progress, no “big brother” issues.

Reference frames were important for making sense of the data; reactions can be both cognitive and emotional.

Reflection on data a powerful starting place
Concrete and proximal goal-setting is harder
Change happens slowly, isn’t always intentional, requires support!

Dialogue was powerful but presents challenges for scalability.
Figure 5. Percentage of posts viewed and read for students who after the introduction of the extracted analytics (a) narrowed the gap between posts viewed and read and (b) raised the percentage of posts both viewed and read.
Integrating student use of analytics as part of learning practices in a principled way offers exciting opportunities to help students become purposeful about their learning based on data-informed decisions.
We need to continue to develop rich indicators that can be meaningful to teachers and students as reflections of their particular practices of teaching and learning.
WE NEED TO CONSIDER AND DESIGN FOR WAYS IN WHICH ANALYTICS CAN PLAY A PART IN THE LARGER ACTIVITY PATTERNS OF INSTRUCTORS AND STUDENTS
How can you design ways for analytics to usefully reflect & inform the teaching and learning practices of your university’s instructors and students?
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