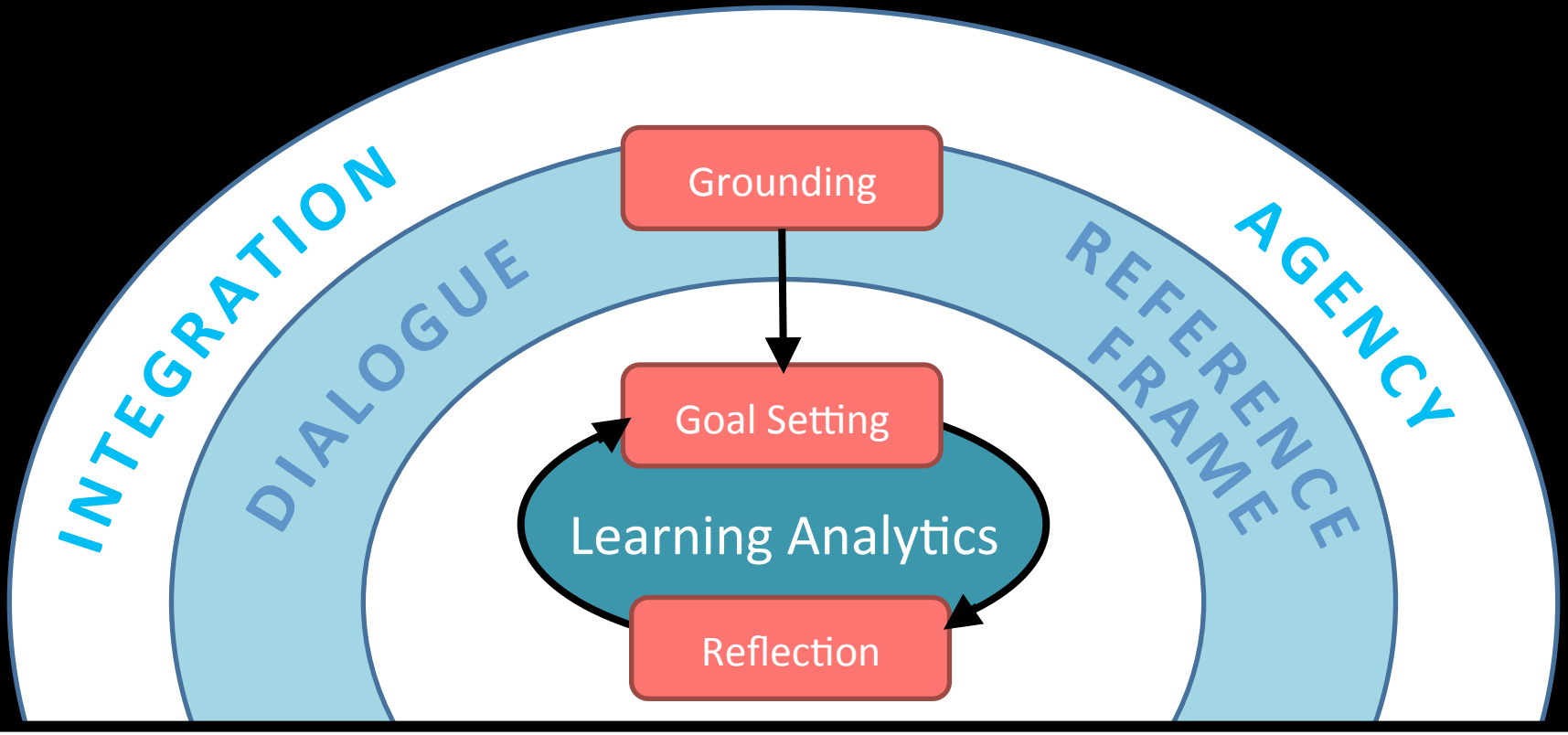


Advancing University Teaching and Learning with Analytics: Linking Pedagogical Intent and Student Activity through Data-Based Reflection

♦

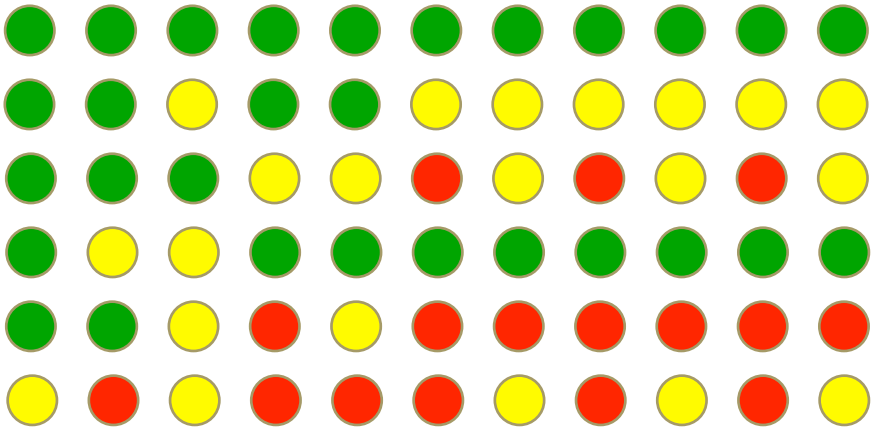
Alyssa Friend Wise

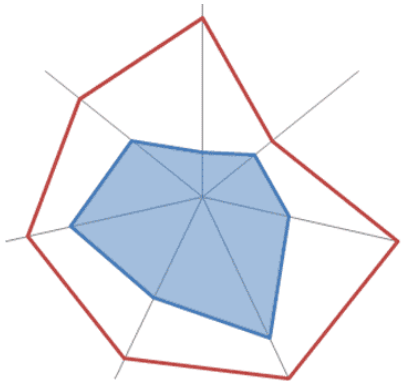
Simon Fraser University

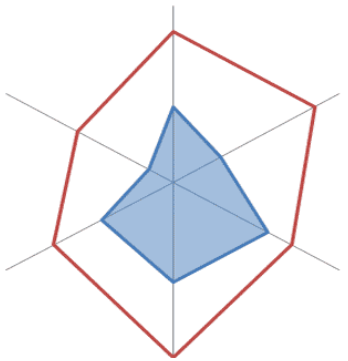
Learning Analytics

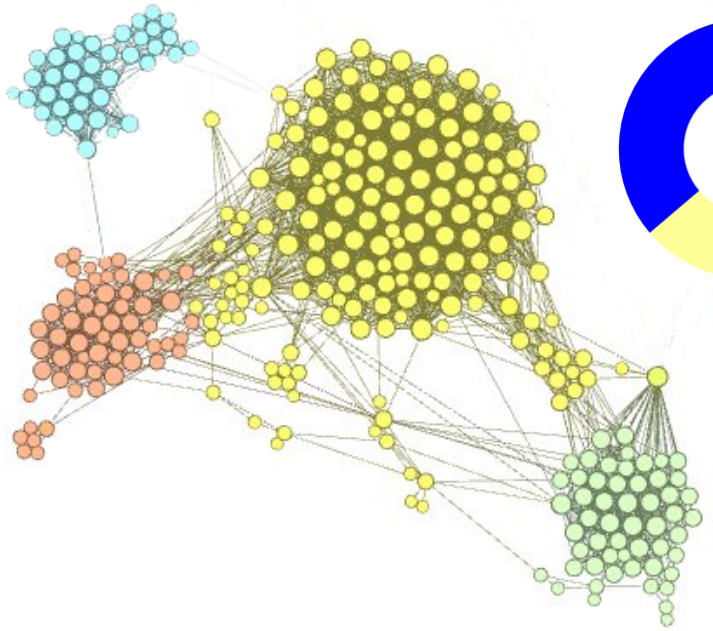
```
Sub UniquePostsRead()

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
                Sheets(“Stats").Cells(Line, 22) = PostsIndex
        Next w
Next k

End Sub
```

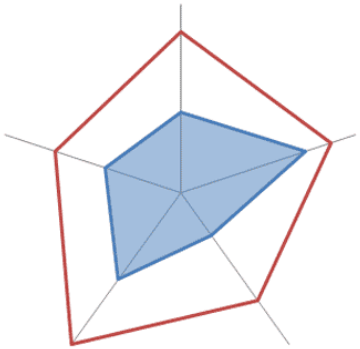
$$\text{PercentPostsRead} = \frac{\Sigma \text{UniquePostsRead}}{\text{TotalPostNumber}}$$

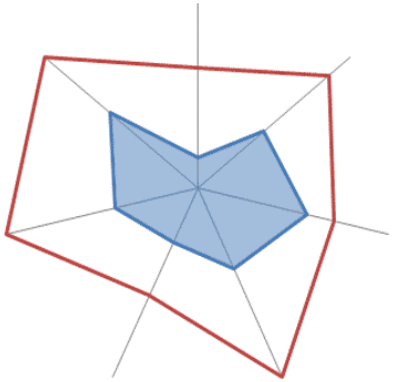


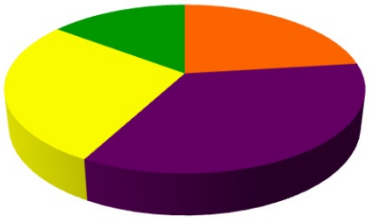












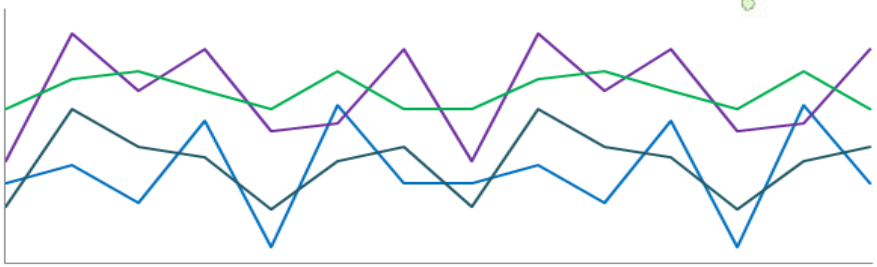


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Image Credit: US Department of Education via Flickr (CC BY 2.0), adapted

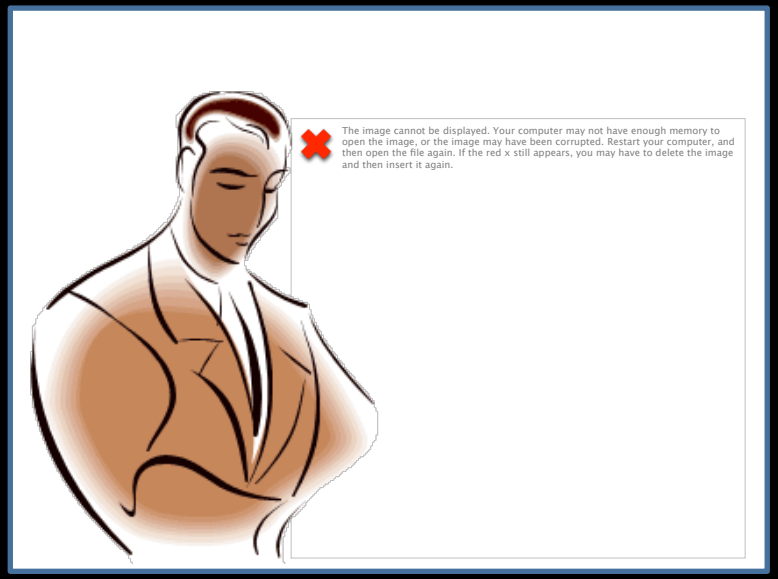
Image Credit: MoDOT Photos via Flickr (CC BY 2.0)

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

Image Credit: Christopher Sessums via Flickr (CC BY 2.0), adapted

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 Geology

(Shaffer, 2013)

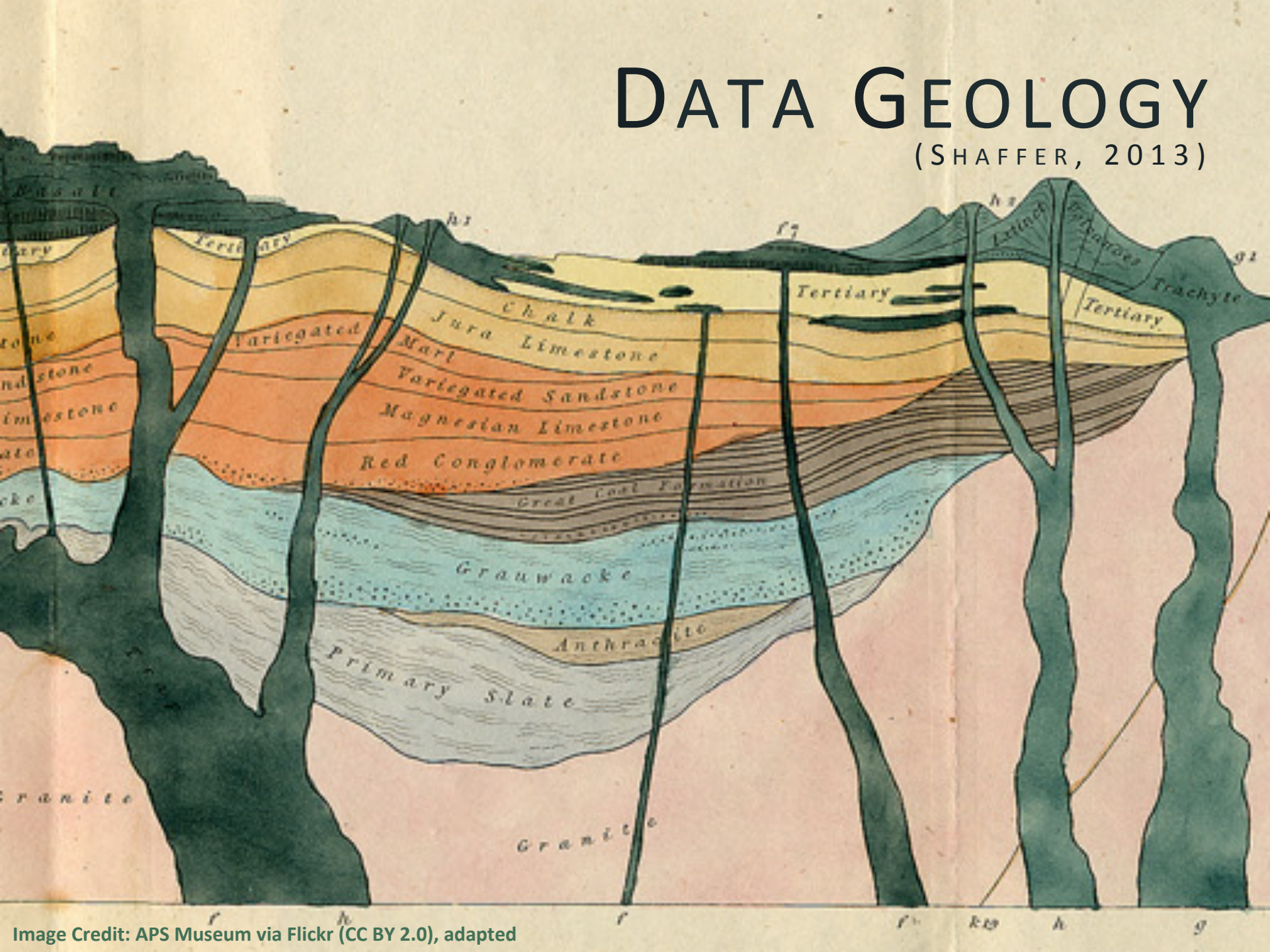


Image Credit: APS Museum via Flickr (CC BY 2.0), adapted

Data Archeology

(Wise, 2013)

Image Credit: U.S. Army Corps of Engineers Europe District via Flickr (CC BY 2.0), adapted

Data Archeology

(Wise, 2014)

Image Credit: Pedro Szekely via Flickr (CC BY 2.0), adapted

Data Anthropology

(Wise, 2014)

Image Credit: Pedro Szekely via Flickr (CC BY 2.0), adapted

What's the learning model?

Image Credit: Torley via Flickr (CC BY 2.0)

More is Better

Image Credit: Torley via Flickr (CC BY 2.0)

We can do Better!

Image Credit: Torley via Flickr (CC BY 2.0)

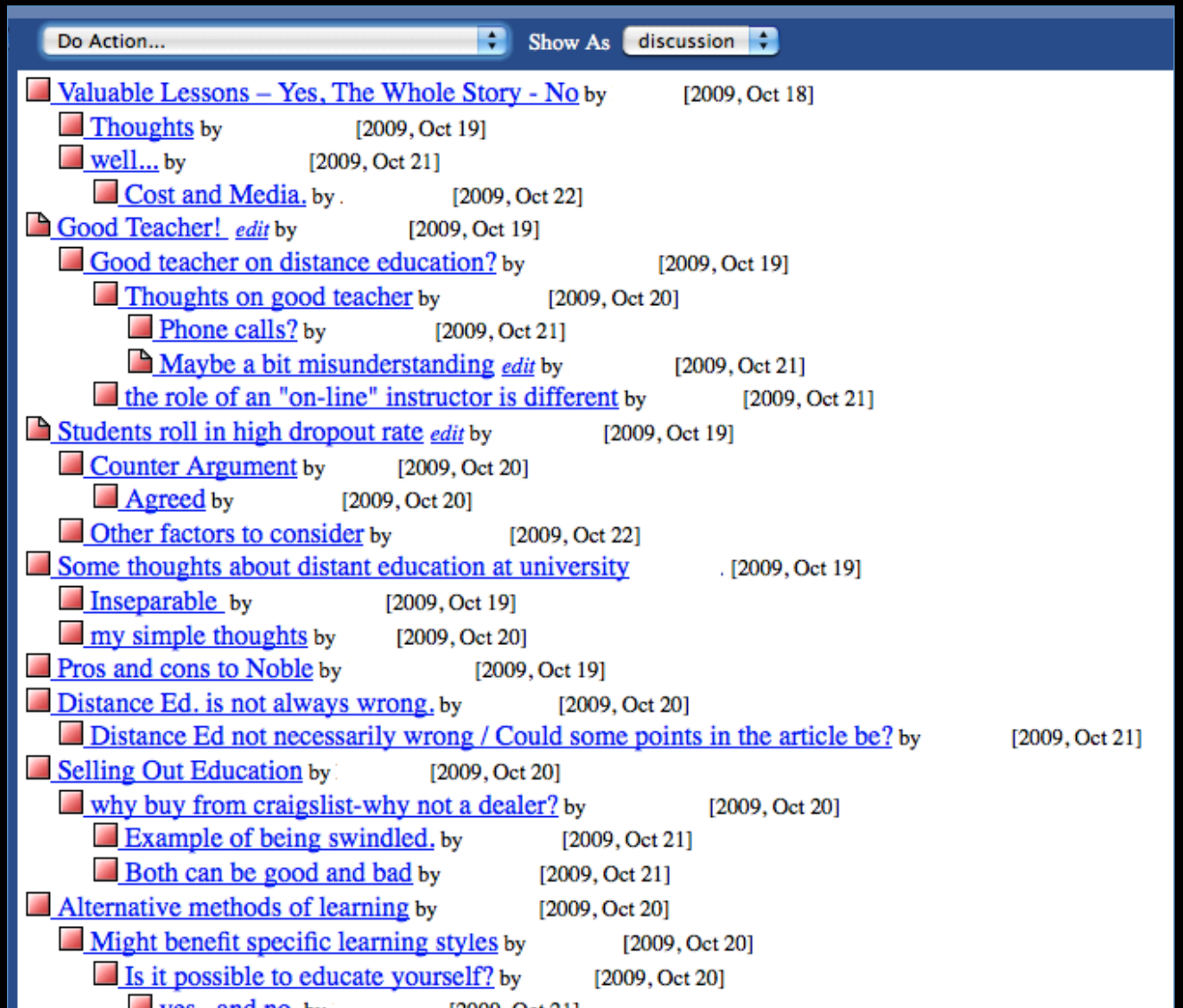
“Second Generation” Learning Analytics

An Online Discussion Forum is a Tool
It's Educational Purpose can change

Q & A

Reading Response

Team Decision Making



Dialogue

Peer Review

Argumen-tation

E-Listening

Research Project

Social Sciences and Humanities Research Council of Canada

Conseil de recherches en sciences humaines du Canada

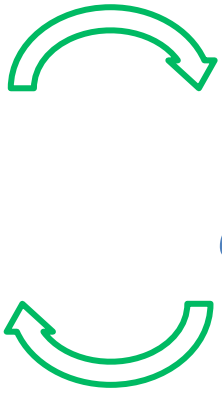
Canada

E-Listening Research Project

Online Discussion Learning Model

- Social constructivist perspective - online discussions as a forum for **learning through conversation**
- Students learn as they **articulate** their ideas, are **exposed** to the ideas of others, and **negotiate** differences in perspective

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")**

E-Listening Research Project

Online Discussion Learning Model

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**

E-Listening Research Project

Online Discussion Learning Model Analytics

Criteria	Metric	Definition
Temporal Distribution	Percent of sessions with posts	Number of sessions in which a student made a post, divided by their total of number sessions
Speaking Quantity	Number of posts	Total number of posts a student contributed to the discussion
	Average post length	Total number of words posted by a student divided by the number of posts they made to the discussion
Listening Breadth	Percent of posts viewed	Number of unique posts that a student viewed divided by the total number of posts in the discussion
	Percent of posts read	Number of unique posts that a student read divided by the total number of posts in the discussion
Listening Recurrence	Number of reviews of own / others' posts	Number of times a student revisited posts that they had made / viewed previously in the discussion
Conversational Distribution	Posts made / viewed throughout discussion	Dispersion or concentration of posts made / viewed by a student in the discussion space

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 Learning Analytics 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

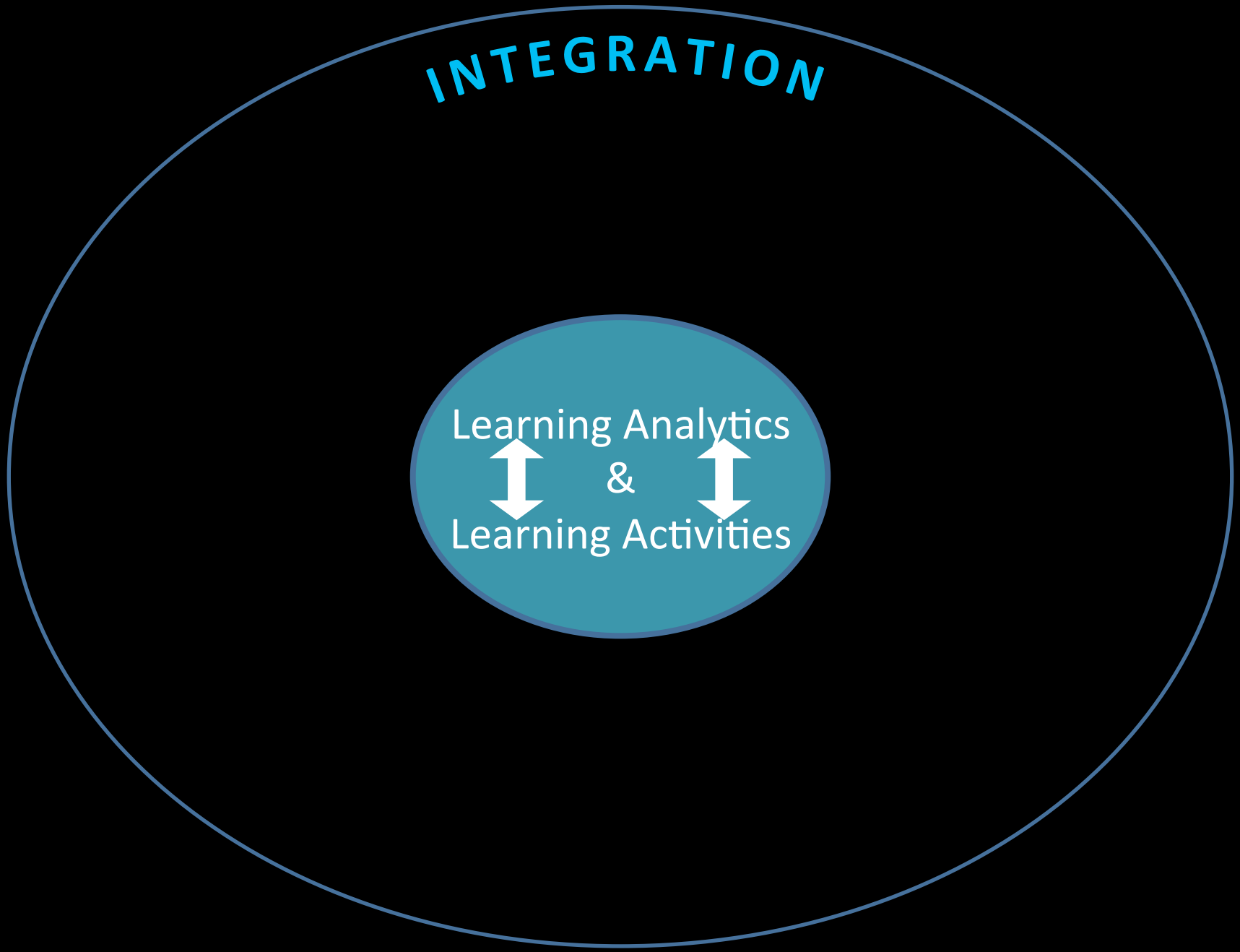
---

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

E-Listening Research Project

Online Discussion Learning Model Analytics

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E-Listening Research Project

Metrics of Focus

Criteria	Metric	Definition
Temporal Distribution	Percent of sessions with posts	Number of sessions in which a student made a post, divided by their total of number sessions
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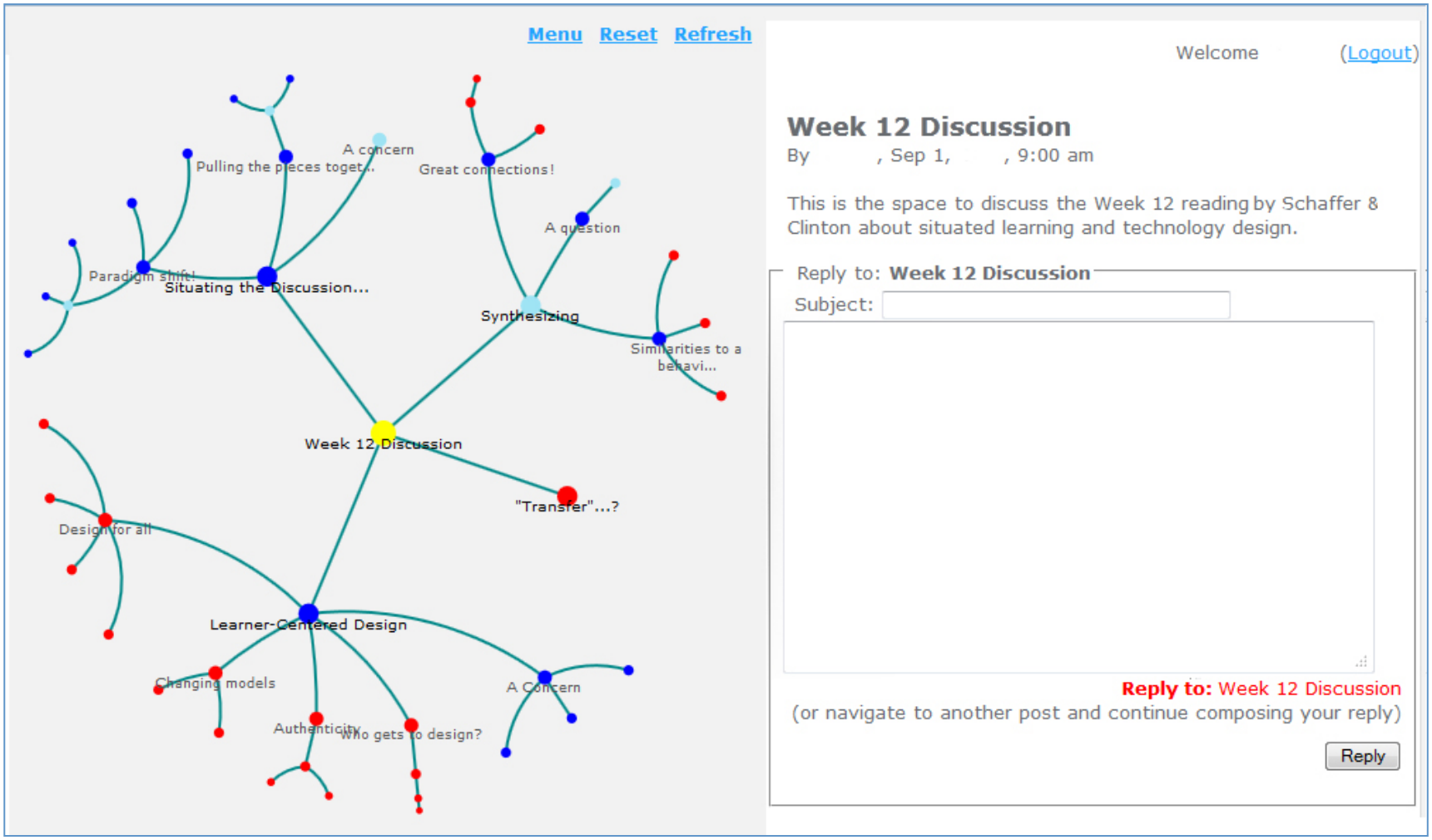
E-Listening Research Project

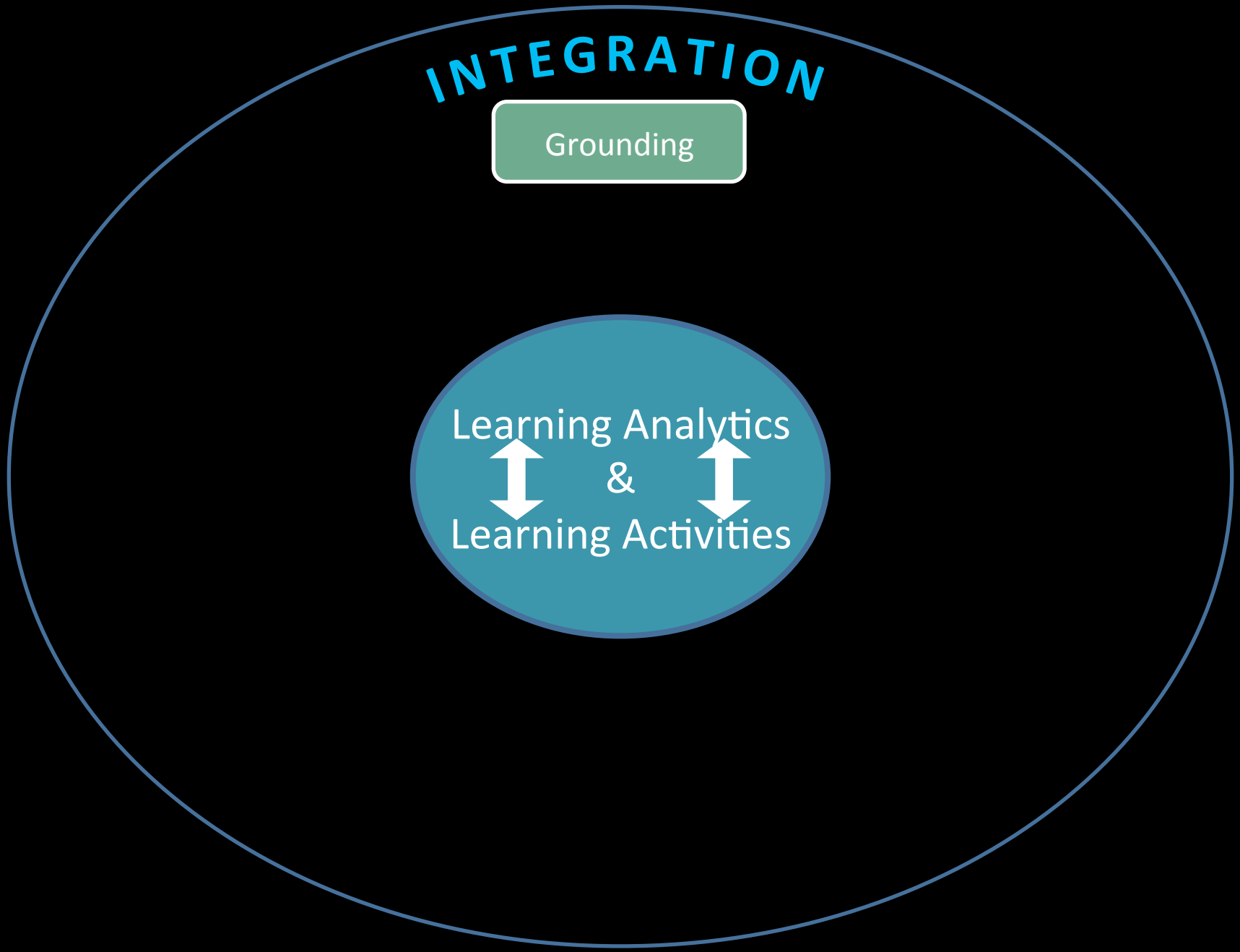
Some Analytics Can Be Embedded Directly into the learning Activity



E-Listening Research Project

Other Analytics Need to be Extracted & Reintegrated into the Learning Activity

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


INTEGRATION
Grounding
Learning Analytics
&
Learning Activities

E-Listening Research Project

GROUNDING

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 rationaled,

- 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

E-Listening Research Project

GROUNDING

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.

E-Listening Research Project

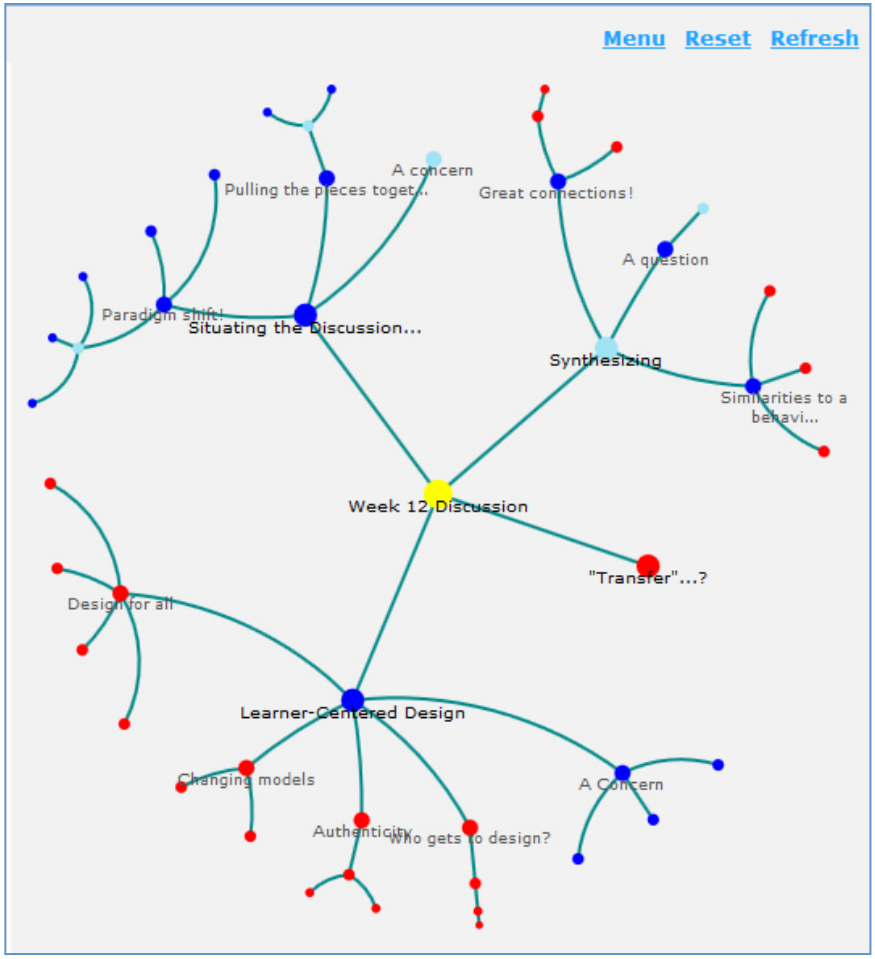
GROUNDING

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.

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



E-Listening Research Project

GROUNDING

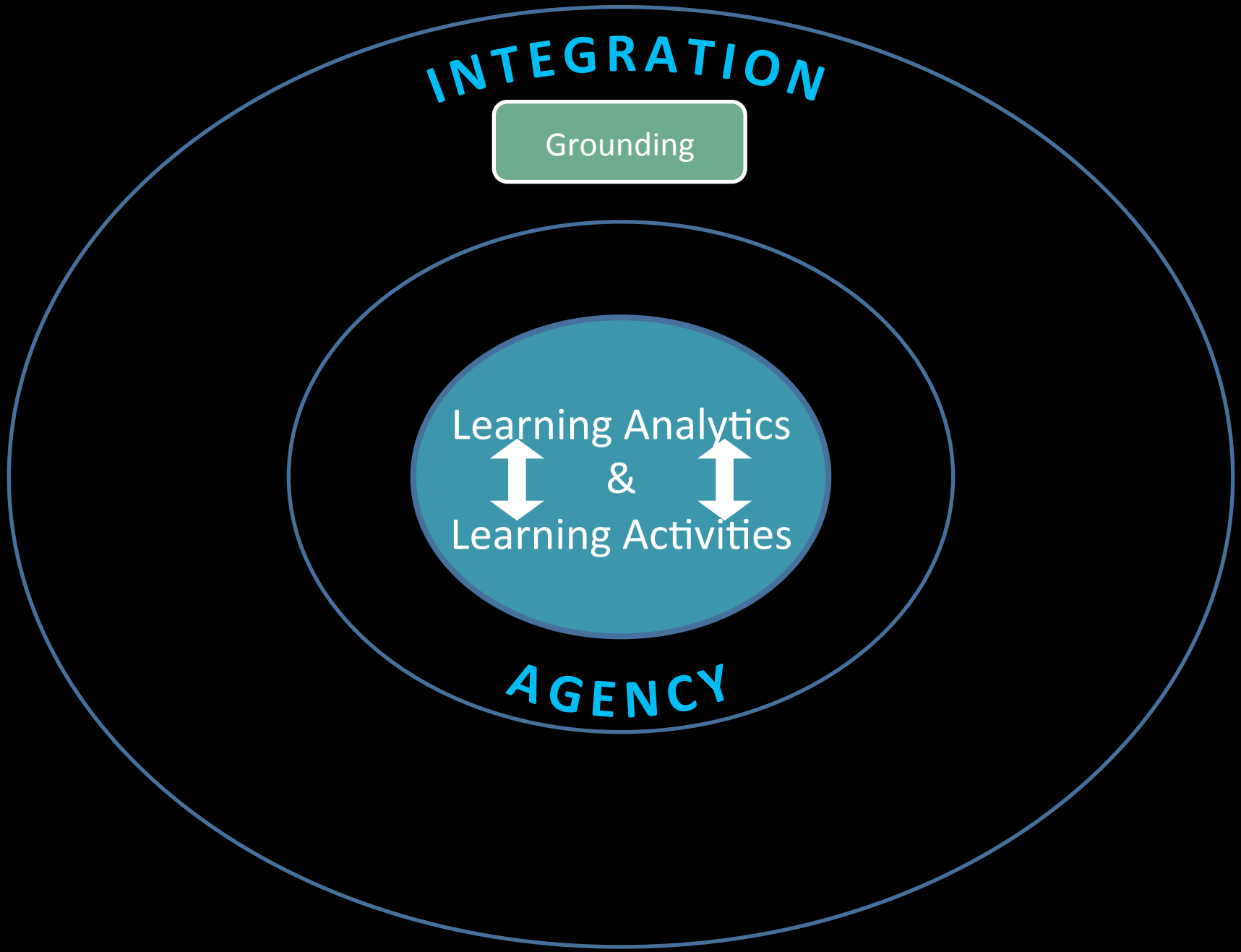
Discussion Participation Guidelines

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.

Learning Analytics Guidelines

Attending to Others' Posts	
% of posts read	The proportion of posts you read (not scanned) at least once.
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.	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Grounding
Learning Analytics
&
Learning Activities
AGENCY

WHO IS WATCHING ME?

Image Credit: Adam Thomas via Flickr (CC BY 2.0), adapted

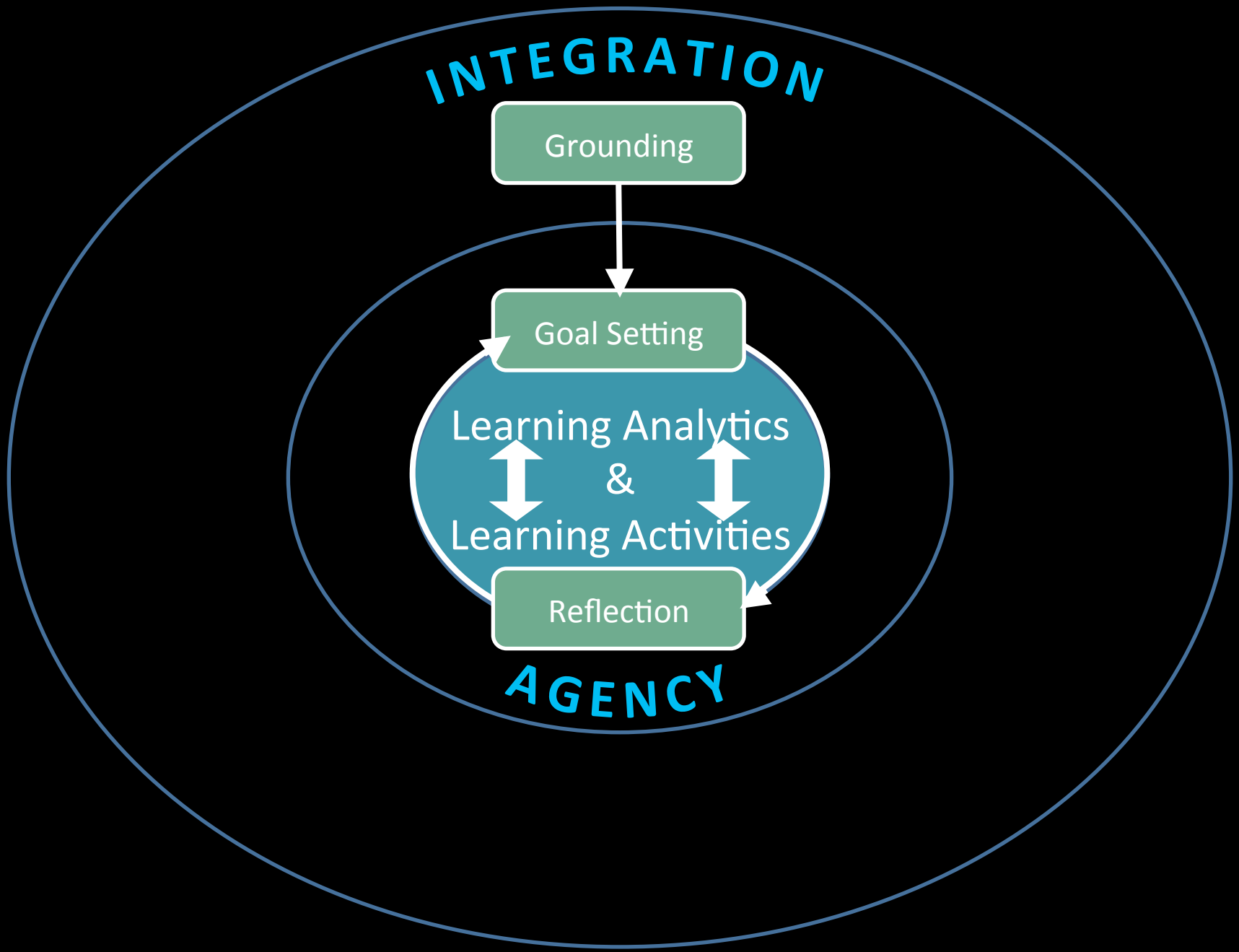
Student Agency

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
Grounding
Goal Setting
Learning Analytics
&
Learning Activities
Reflection
AGENCY

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

E-Listening Research Project

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

E-Listening Research Project

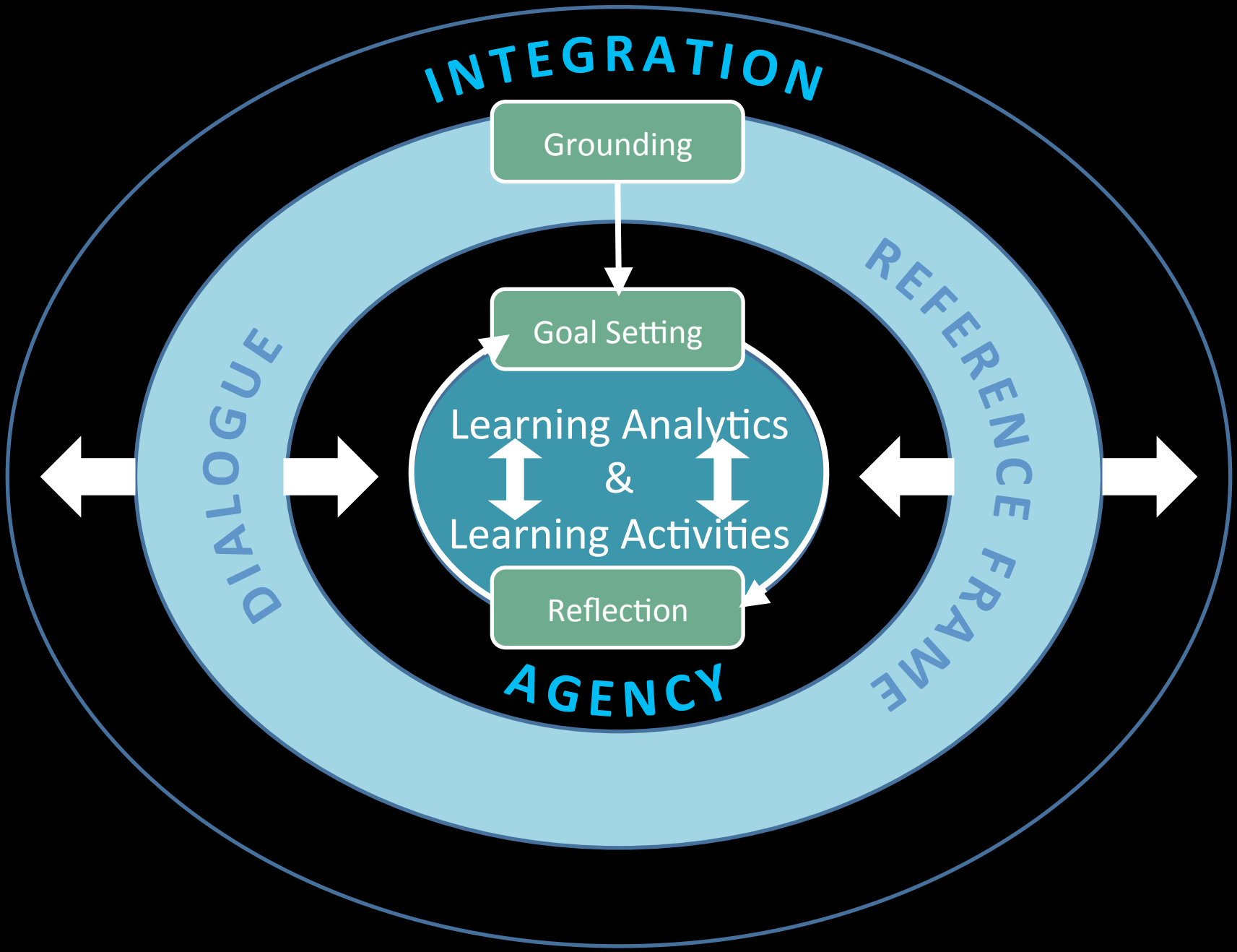
Reflection

- 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."


INTEGRATION
Grounding
Goal Setting
Learning Analytics
&
Learning Activities
Reflection
DIALOGUE
REFERENCE FRAME
AGENCY

Reference Frame

- comparison points to which students orient when they examine their analytics
  - Theoretical Patterns
  - Peer Activity
  - Their own prior activity

E-Listening Research Project

Reference Frame

- 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

E-Listening Research Project

DIALOGUE

- 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."

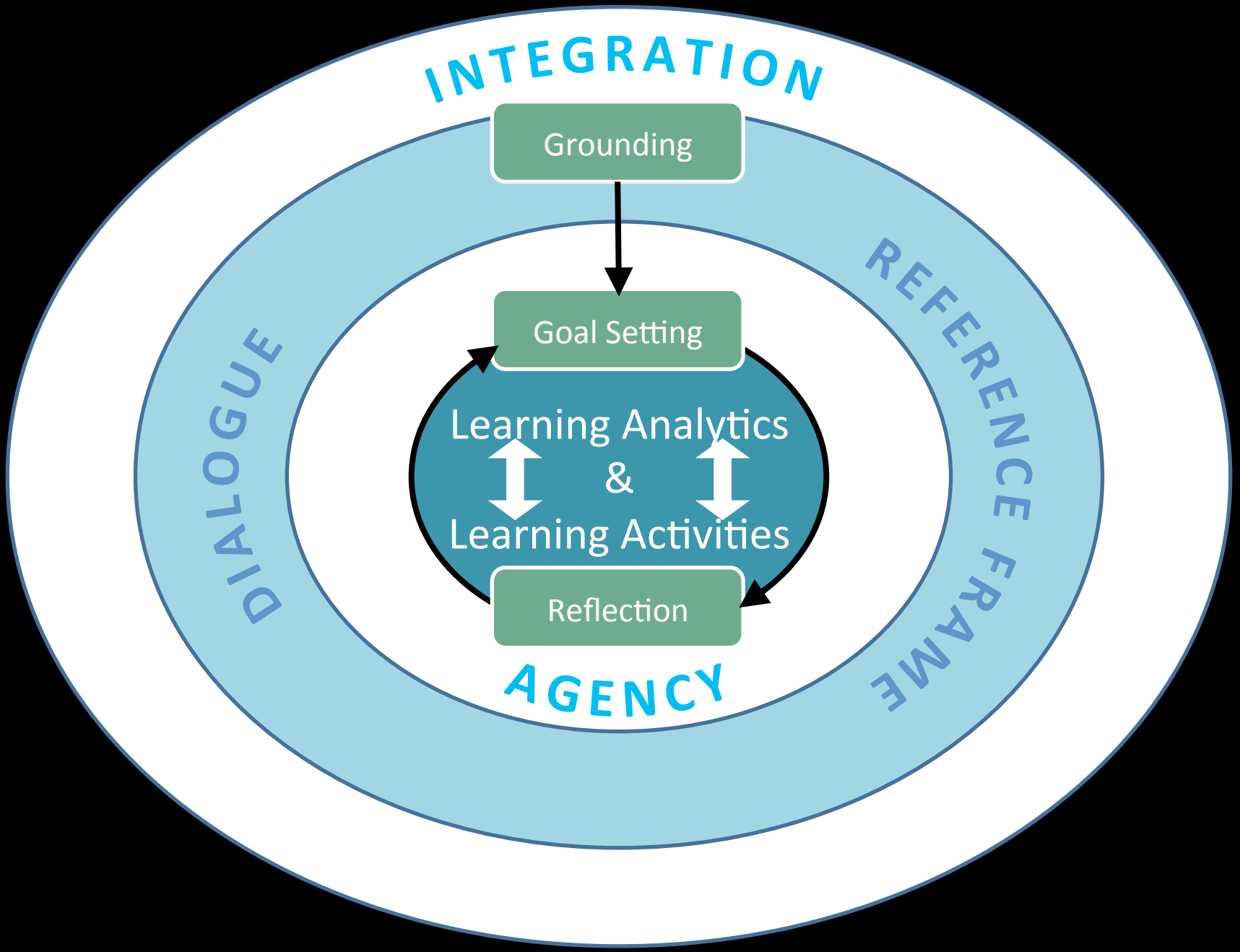
E-Listening Research Project

A (Particularly Rich) Dialogic Exchange

I was overwhelmed to see the volume of the comments, sometime 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.)"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Grounding
Goal Setting
Learning Analytics
&
Learning Activities
Reflection
DIALOGUE
REFERENCE FRAME
AGENCY

E-Listening
Research Project

INITIAL FINDINGS

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

E-Listening Research Project

Distinct Change Profiles

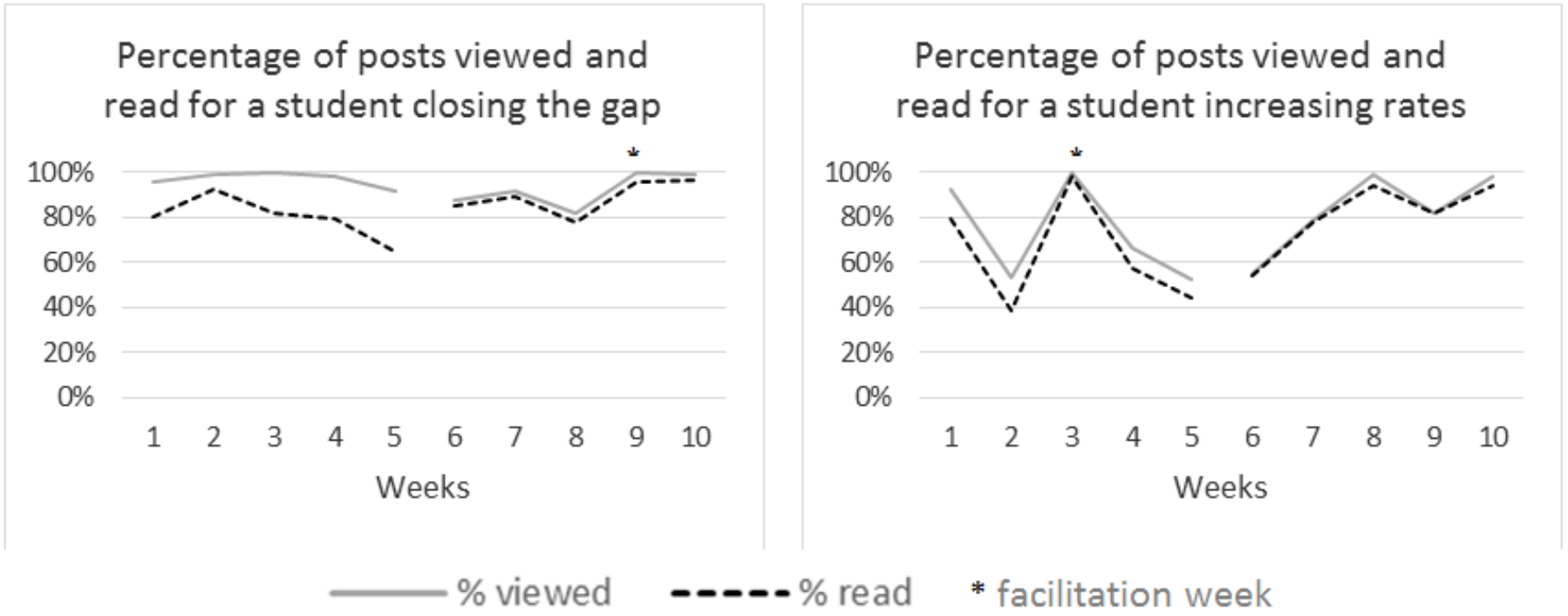


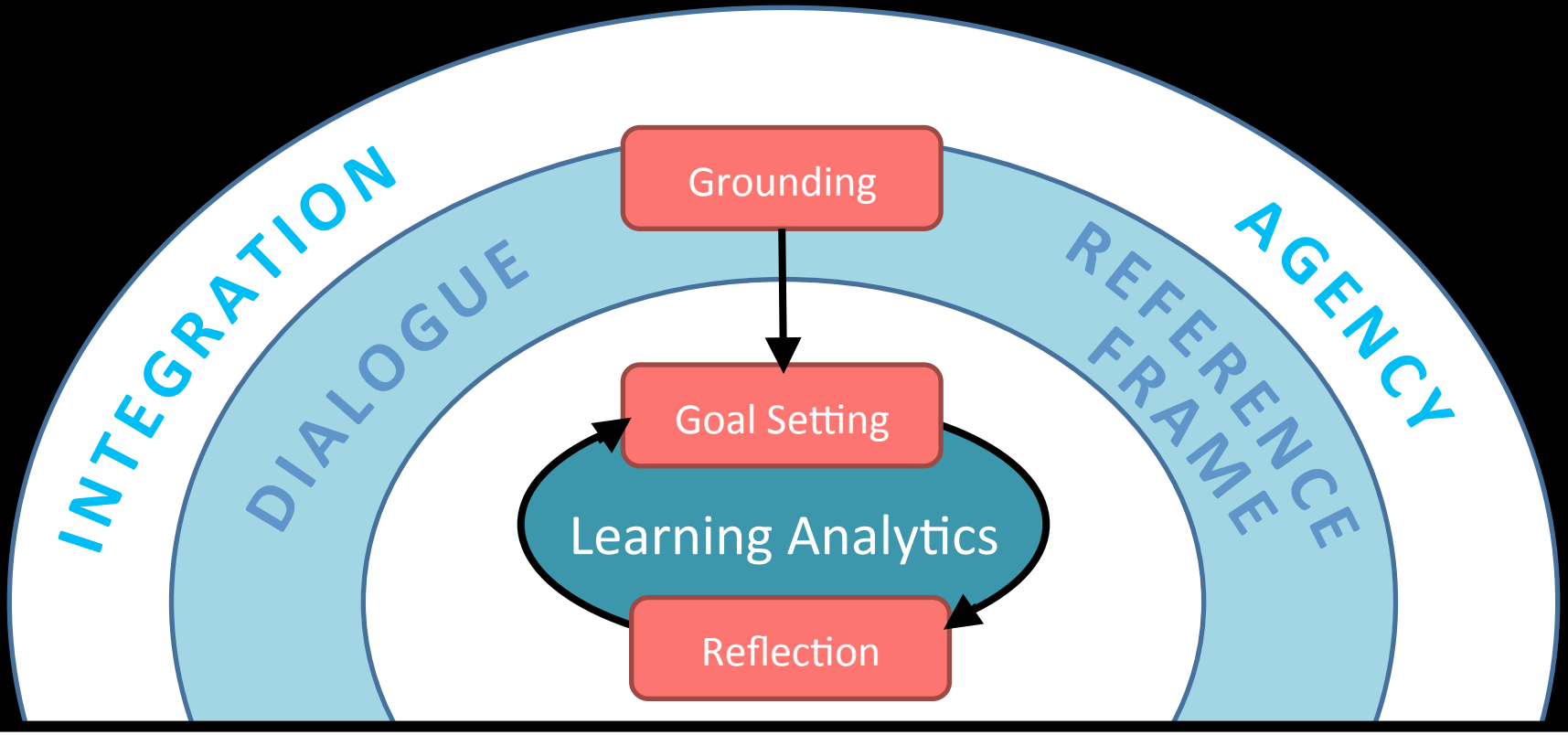
Figure 5. Percentage of posts viewed and read for students who after the introduction of the extracted analytics (a) narrowed the gap between posts viewed and read and (b) raised the percentage of posts both viewed and read

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?



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

♦

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