# EMBEDDED LEARNING ANALYTICS

# Integrating Tools & Pedagogy

## ALYSSA FRIEND WISE

## SIMON FRASER UNIVERSITY

**Student Learning and Analytics at Michigan Seminar Series**
**February 7, 2014**

# this talk is about

# LEARNING ANALYTICS

# What did you just picture?

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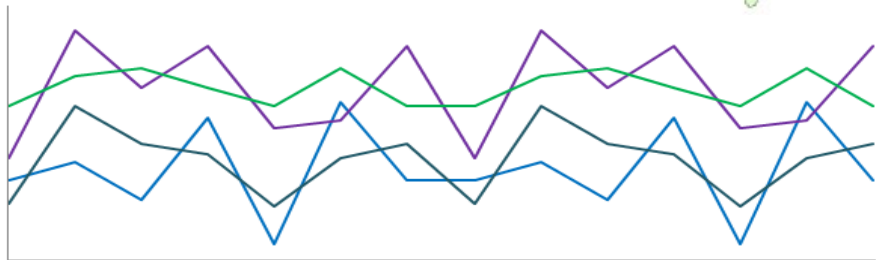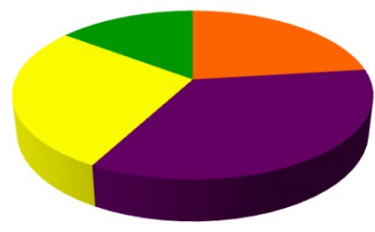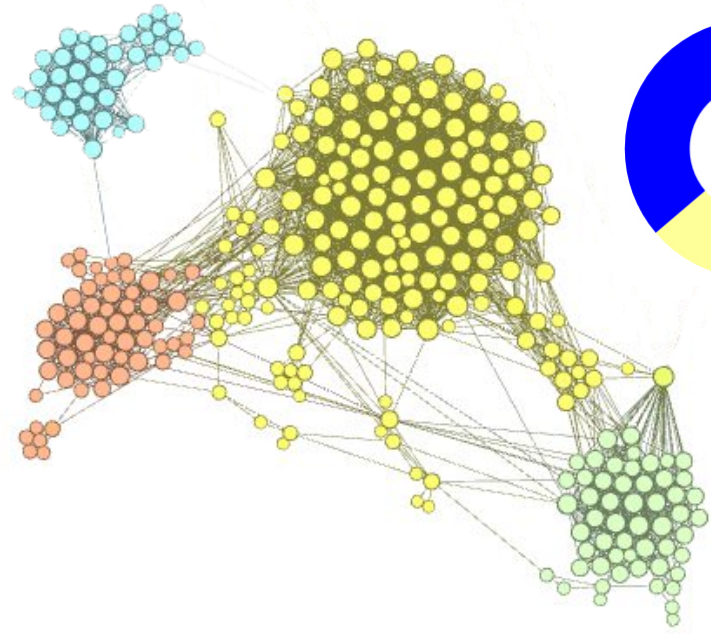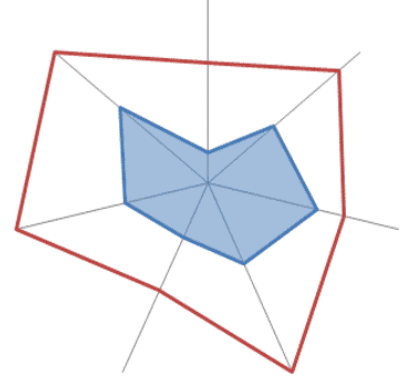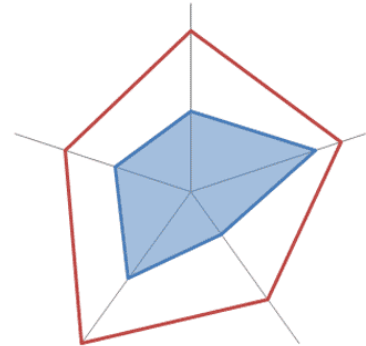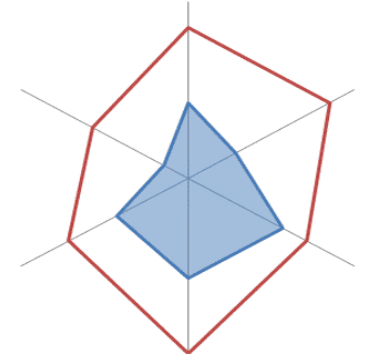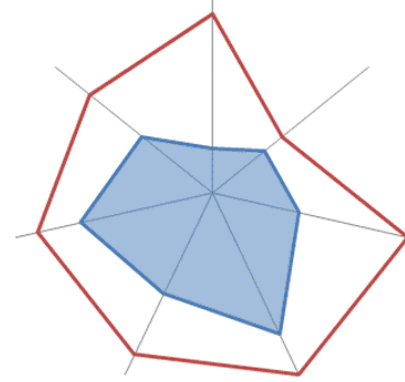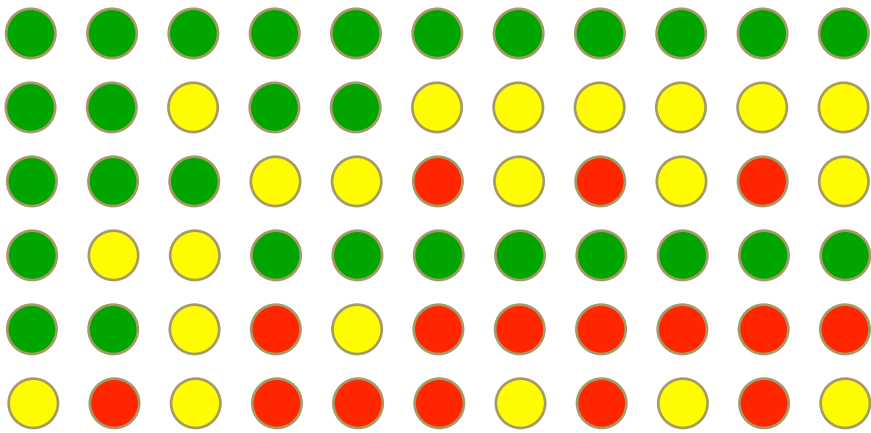
$$PercentPostsRead = \frac{\Sigma UniquePostsRead}{TotalPostNumber}$$

IF LEARNING ANALYTICS ARE TO
TRULY MAKE AN IMPACT ON
UNIVERSITY TEACHING AND LEARNING

◆ **and maybe even
  revolutionize education**

WE NEED TO CONSIDER AND DESIGN
FOR WAYS IN WHICH THEY WILL
IMPACT THE LARGER ACTIVITY
PATTERNS OF INSTRUCTORS AND
STUDENTS

# this talk is about

EMBEDDING LEARNING ANALYTICS IN UNIVERSITY LEARNING AND TEACHING PRACTICES

Or learning analytics will just end up another oversold and underused technology that did not fulfill its potential for education
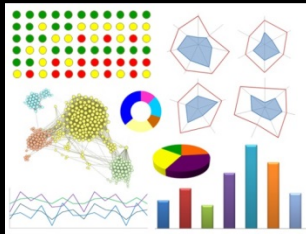
# some definitions

# LEARNING ANALYTICS

THE COLLECTION AND ANALYSIS OF DATA TRACES RELATED TO LEARNING IN ORDER TO INFORM AND IMPROVE THE PROCESS AND/OR ITS OUTCOMES

CAPTURING / CALCULATING MEANINGFUL TRACES OF LEARNERS' ACTIVITY

PRESENTING DATA IN A USEFUL FORM (TO LEARNERS, TEACHERS, DESIGNERS, ADMINISTRATORS...)

SUPPORTING INTERPRETATION AND USE OF THE ANALYTICS IN

# LEARNING ANALYTICS INTERVENTIONS

SURROUNDING FRAMES OF ACTIVITY THROUGH WHICH LEARNING ANALYTICS ARE TAKEN UP BY PEOPLE AS PART OF SOME LARGER EDUCATIONAL ACTIVITY

# 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

**Who should be accessing particular kinds of analytics?**

**(instructors, students, administrators, learning designers, teaching assistants, combinations of these)**

# 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)**

# Support for Decision Making



Completed Activities

Outcome Data

Long Cycle / Aggregation



Activities in Progress

Process Data

Short cycle

# PEDAGOGICAL LEARNING ANALYTICS INTERVENTIONS

INTERVENTIONS IN WHICH ANALYTICS ARE USED TO MAKE DECISIONS THAT HAVE A DIRECT AND IMMEDIATE IMPACT ON ONGOING TEACHING AND LEARNING PROCESSES

# Pedagogical

# Learning

# Analytics

# Interventions

# For Students

ENGAGE STUDENTS AS ACTIVE PARTNERS IN THEIR OWN LEARNING

ACTIVATE METACOGNITIVE PROCESSES THAT SUPPORT LEARNING

Empowerment not enslavement

one-to-one ratio at

# 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**

E-Listening
Research Project

# TYPICAL ASYNCHRONOUS ONLINE DISCUSSION FORUM

E-Listening
Research Project

| Do Action... | Show As | discussion |
|---|---|---|

Valuable Lessons – Yes, The Whole Story - No by          [2009, Oct 18]
    Thoughts by          [2009, Oct 19]
    well... by          [2009, Oct 21]
        Cost and Media. by .          [2009, Oct 22]
Good Teacher!  edit by          [2009, Oct 19]
    Good teacher on distance education? by          [2009, Oct 19]
        Thoughts on good teacher by          [2009, Oct 20]
            Phone calls? by          [2009, Oct 21]
            Maybe a bit misunderstanding edit by          [2009, Oct 21]
        the role of an "on-line" instructor is different by          [2009, Oct 21]
Students roll in high dropout rate edit by          [2009, Oct 19]
    Counter Argument by          [2009, Oct 20]
        Agreed by          [2009, Oct 20]
    Other factors to consider by          [2009, Oct 22]
Some thoughts about distant education at university          . [2009, Oct 19]
    Inseparable  by          [2009, Oct 19]
    my simple thoughts by          [2009, Oct 20]
Pros and cons to Noble by          [2009, Oct 19]
Distance Ed. is not always wrong. by          [2009, Oct 20]
    Distance Ed not necessarily wrong / Could some points in the article be? by          [2009, Oct 21]
Selling Out Education by          [2009, Oct 20]
    why buy from craigslist-why not a dealer? by          [2009, Oct 20]
        Example of being swindled. by          [2009, Oct 21]
        Both can be good and bad by          [2009, Oct 21]
Alternative methods of learning by          [2009, Oct 20]
    Might benefit specific learning styles by          [2009, Oct 20]
        Is it possible to educate yourself? by          [2009, Oct 20]
            yes, and no by          [2009, Oct 21]

# PROJECT OVERVIEW

- Research program investigating how students learn in asynchronous **online discussions** as they articulate their ideas, are exposed to the ideas of others, and negotiate differences in perspective

- Focus on how students **contribute comments ["speak"]** and **attend to other's messages ["listen"]**

- High degree of **learner control** over timeline and pace of activity in the online context -> large decision space

  - Frequency and length of log-in sessions

  - Which peer posts they attend to, in what order, for how long

  - Revisit posts as much as needed, unlimited time to prepare reply

- Opportunities for **thoughtful listening** and **reflective speaking** but challenges in how to **allocate time**, esp. in prolific discussions

**LEARNING MODEL**

*Externalizing one's ideas by contributing posts to an online discussion*

*Taking in the externalizations of others by accessing existing posts*

# 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 but Deep (to consider multiple ideas; **predicts posts' content quality**)
  - Integrated (so comments are informed by others' views)
  - Reflective (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**

# SAMPLE ANALYTICS

| Criteria | Metric | Definition |
|---|---|---|
| Temporal Distribution | Range | Span of days a student logged in to the discussion |
| | Percent of sessions with posts | Number of sessions in which a student made a post, divided by his/her 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 he/she made to the discussion |
| Listening Breadth | Number (or Percent) of posts viewed / read | Number of unique posts that a student viewed/ read (divided by the total number of posts in the discussion) |
| Listening Reflectivity | 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 | Post made / viewed Distribution | Dispersion or concentration of posts made / viewed by a student |

# SOME ANALYTICS CAN BE EMBEDDED TECHNOLOGICALLY
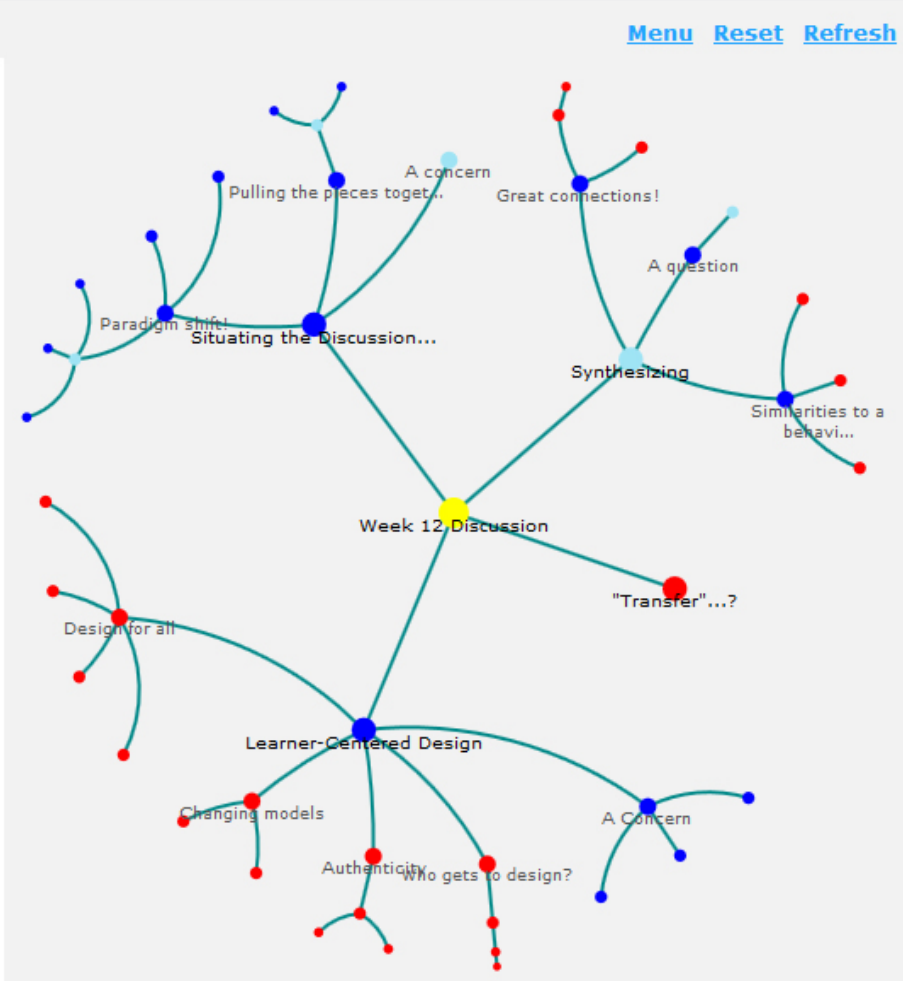
# OTHER ANALYTICS NEED TO BE EMBEDDED PEDAGOGICALLY

| 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

Learning Analytics

# Integration

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

- POSITION THE USE OF ANALYTICS AS AN INTEGRAL PART OF COURSE ACTIVITY TIED TO GOALS AND EXPECTATIONS

- PROVIDE A LOCAL CONTEXT FOR MAKING SENSE OF THE DATA

INTEGRATION

Learning Analytics
&
Learning Activities

# Conceptual Questions

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

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

# METRICS OF FOCUS

| 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 | |

# Practical Questions

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

2. How to make analytics use part of course activity flow
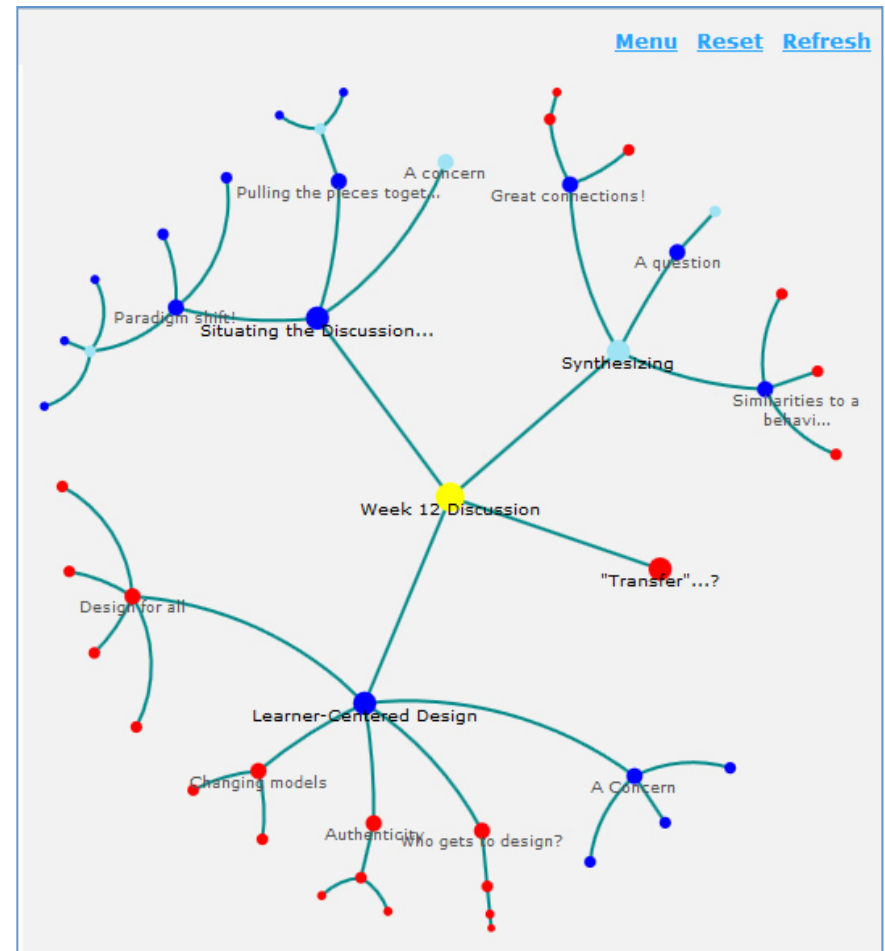
Clear guidelines and discussion of

– the purpose of engaging in online discussion

*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*

**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

## 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.*

## 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.

# INTEGRATION

## AGENCY

Learning Analytics
&
Learning Activities

# Student Agency

Can give students the opportunity to
- establish personal goals for the activity (in relation to the given instructional goals)

- Have (some) authority in interpreting what the analytics say about their progress towards the goals

- provide human context to the data

- decide what actions to take as a result of the information provided

# 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"*

# Reflection

Dual danger of omnipresent analytics

- Ability to review "anyplace/anytime" means it happens nowhere/never

- Attention to constantly available metrics can distract from engagement in the activity itself

# 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."*
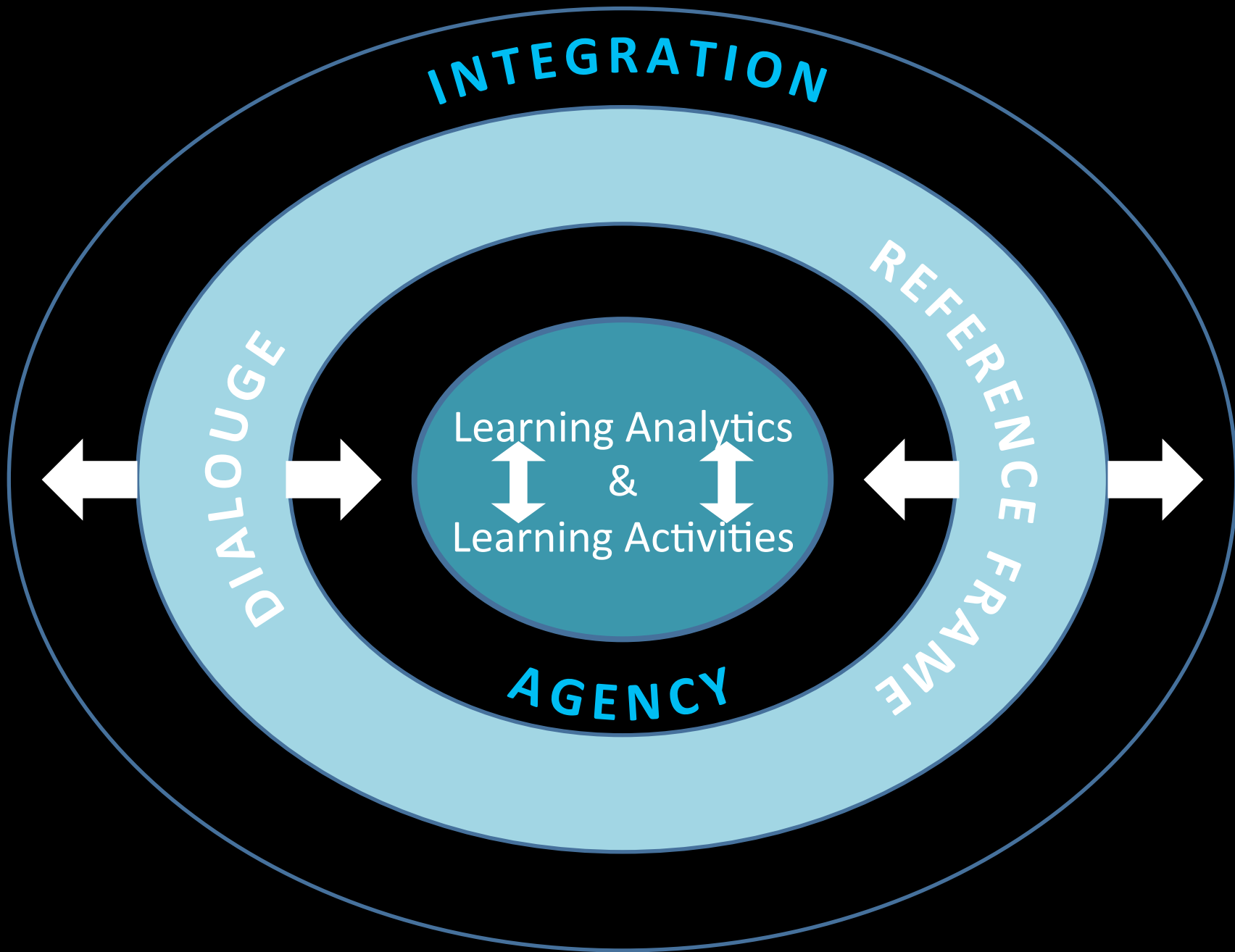
# Dialouge

- 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

# 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."*

*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.)"*
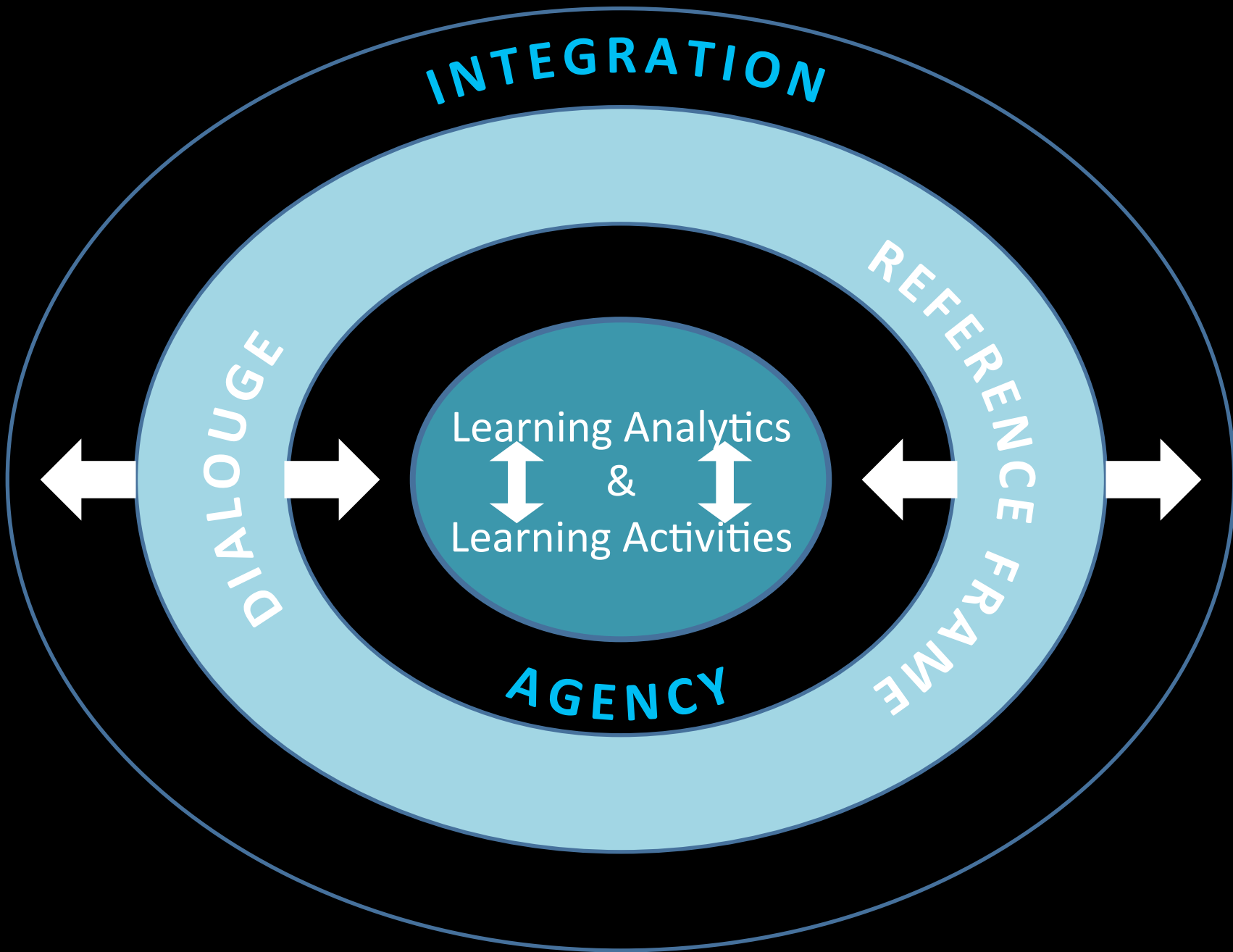
# Reference Frame

- comparison points to which students orient when they examine their analytics

  - Theoretical Patterns

  - Peer Activity

  - Their own prior activity

# 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 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."*
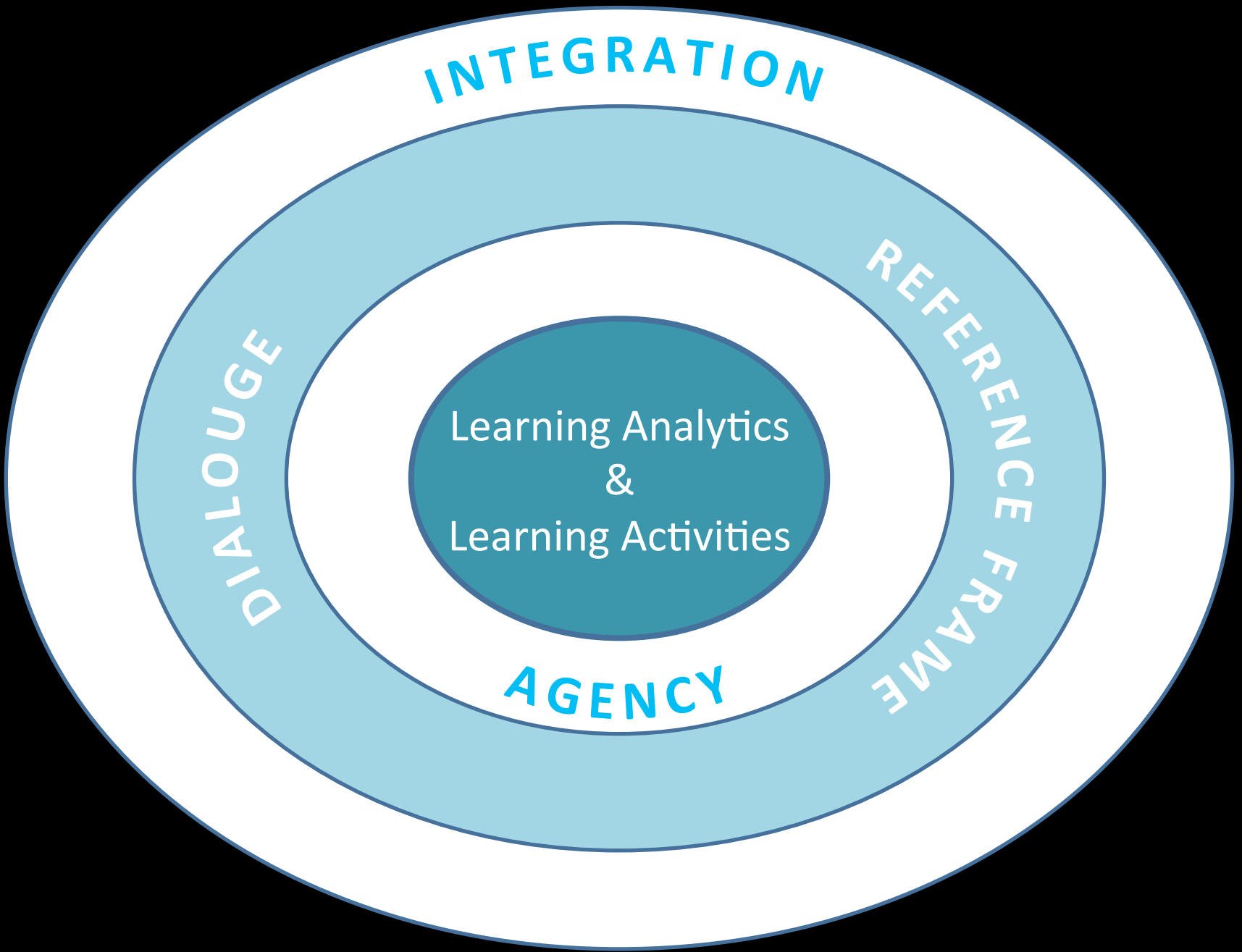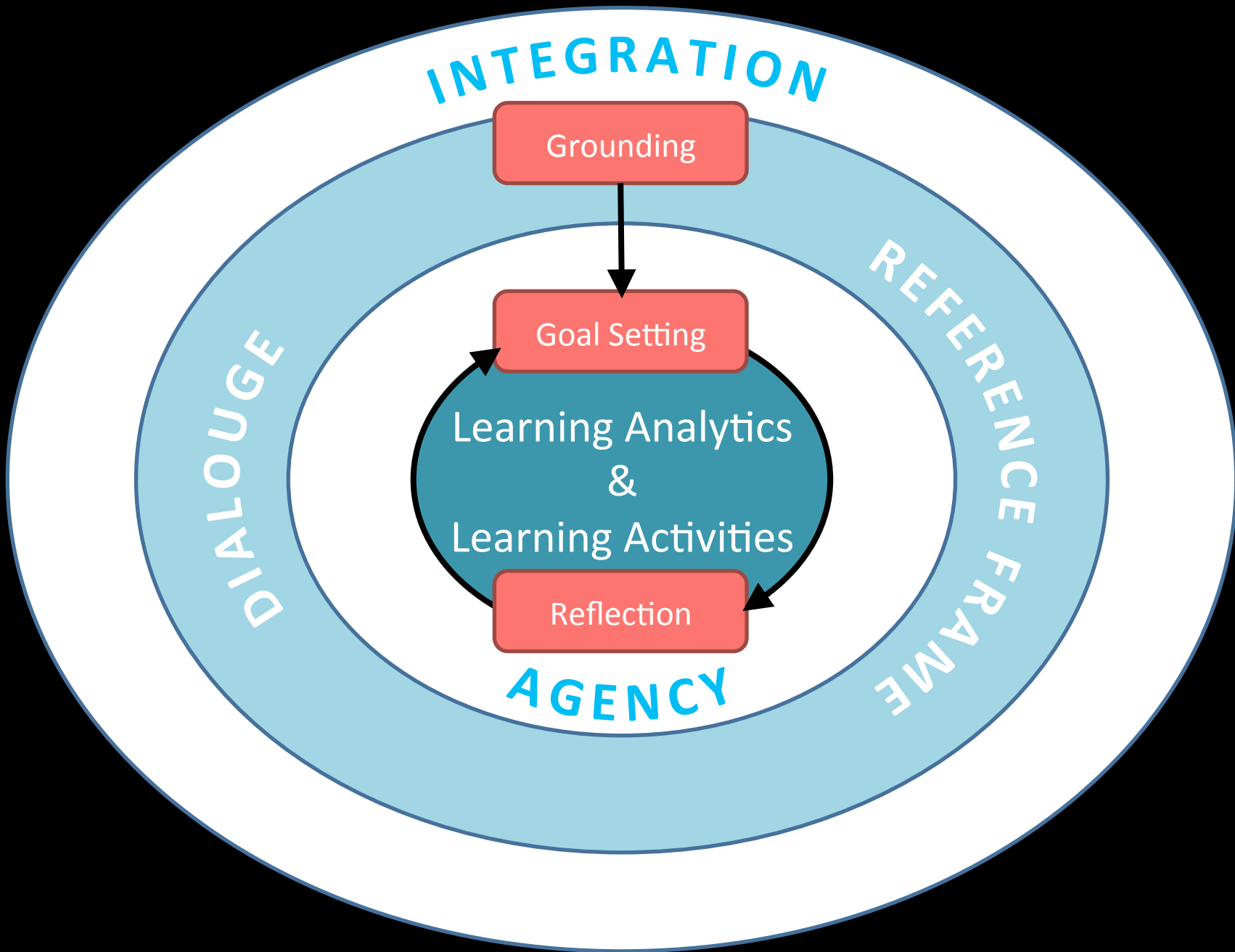
*Integration (technological and pedagogical) made analytics use an coherent part of the learning process*

*Students embraced their agency in setting goals and evaluating their progress, no "big brother" issues*

*Reflection on data a powerful starting place, concrete and proximal goal-setting is harder, change happens slowly and can require support*

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

*Dialouge was powerful but presents challenges for scalability*

Embedding student use of learning analytics in our teaching practices offers exciting opportunities to help students take charge of their own learning based on data-informed decisions

It can also provide important information to help inform the design of better learning analytics tools

How can learning analytics change **your** classroom practices of teaching and learning?

# Thank you!

## Alyssa Friend Wise
## Simon Fraser University
alyssa_wise@sfu.ca

## E-Listening Project
http://www.sfu.ca/~afw3/research/e-listening/
http://www.slideshare.net/alywise