

The background features a light beige, textured surface. In the center, there is a stylized topographic map of a human head in profile, facing right. To the right of the head, there is a vertical illustration of a willow tree with drooping branches and small, dark, round leaves. The overall aesthetic is academic and artistic.

Thinking Scientifically

An educational approach to
systematizing the way we use
knowledge

Second Annual International Conference on Building the Scientific Mind, Vancouver, Canada

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What's the problem?

- ❖ Teaching is an art, not a science!
- ❖ Science is about measurement and causation, education is about context.
 - Education variables are hard to measure
 - There are too many variables to measure
 - We haven't defined the variables to measure
 - Science provides either incomplete information or information on such a narrow domain that it is useless at best, inaccurate at worst.

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Getting past the problem

- ❖ Make science relevant for teachers, not just scientists
- ❖ Demystify science and research
 - Scientific dispositions and methods
- ❖ Change teacher perceptions
 - Exposure to scientific processes and outcomes
- ❖ Move from teaching science to modeling scientific dispositions within teacher practice

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Waking up

- ❖ What was the very first thing you did when you woke up this morning?
- ❖ Immediately started asking questions, collecting data, analyzing data, building conclusions.
 - What time is it? What am I doing today? What is the weather/traffic? How should I dress?

Scientific dispositions

- ❖ Scientific dispositions are about systematic process, broad definitions and outcomes
- ❖ *Systematize* the process and *intentionally* apply to practice
 - Observation
 - Hypothesis/question
 - Data collection
 - Analysis
 - Sharing
 - Refinement



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Scientific dispositions

- ❖ Expand the definitions:
 - Observations and data extend beyond test scores or quantitative data and can include multiple data sources and formats
 - Hypothesis/question can be embedded in practice and personally focused
 - Analysis (systematic not necessarily complex)
 - Sharing (collegial and informal)
 - Refinement (collegial and supportive)

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Scientific dispositions

- ❖ Expand the outcomes
 - Science is not about causation and certainty
 - It is about the minimization of uncertainty
 - How many planets are in the solar system?
- ❖ Research in education is not causal
 - Research informs policy and practice within current contexts, rather than constraining it across contexts.
- ❖ Research is simply one more data point

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Implications

- ❖ If we view science, knowledge, and data in this manner, what are the implications for policy and practice, and how can this vision be operationalized?

Implications

- ❖ Requires that teachers be sophisticated consumers of research
 - Understanding of scientific method, data gathering methodologies, and of appropriate data analysis procedures
- ❖ Teachers must become scientifically literate
- ❖ Teachers must become systematic in their practice
 - Proceed toward a defined goal
- ❖ Teachers must become intentional in their practice
 - Teachers do what they do for a reason

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Operationalizing

- ❖ Support systemic *observation*
- ❖ Build intentional reflection and *questioning*
- ❖ Increase access to *data*
- ❖ Focus on *analysis* skills
- ❖ *Share* professional knowledge
- ❖ *Refine* observations

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Operationalized

- ❖ Reflective practice
 - Record *observations* of daily experiences
 - Ask *questions* about those observations
- ❖ Action research
 - Gather *data* to inform those questions
 - *Analyze* the data to answer the questions
 - *Test* your answers to refine your knowledge
- ❖ Professional Learning Communities
 - Share observations, questions, data, analyses across systems
- ❖ Systems thinking
 - Expand conception of data and data gathering networks

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Building the scientific mind

- ❖ Strengthening scientific frameworks teachers use to interpret data
 - By using the scientific method to model scientific dispositions
- ❖ Democratize knowledge, increase data points
 - Open access, knowledge networks
 - Building skeptical knowledge consumers
- ❖ Applying the scientific frame across contexts
 - Content neutral (variation occurs within the frame without altering the framework)

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Questions and comments

- ❖ Questions?
- ❖ Comments?
- ❖ Lengthy testimonials?

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