"Building and Organizing Effective Curricula/Courses"

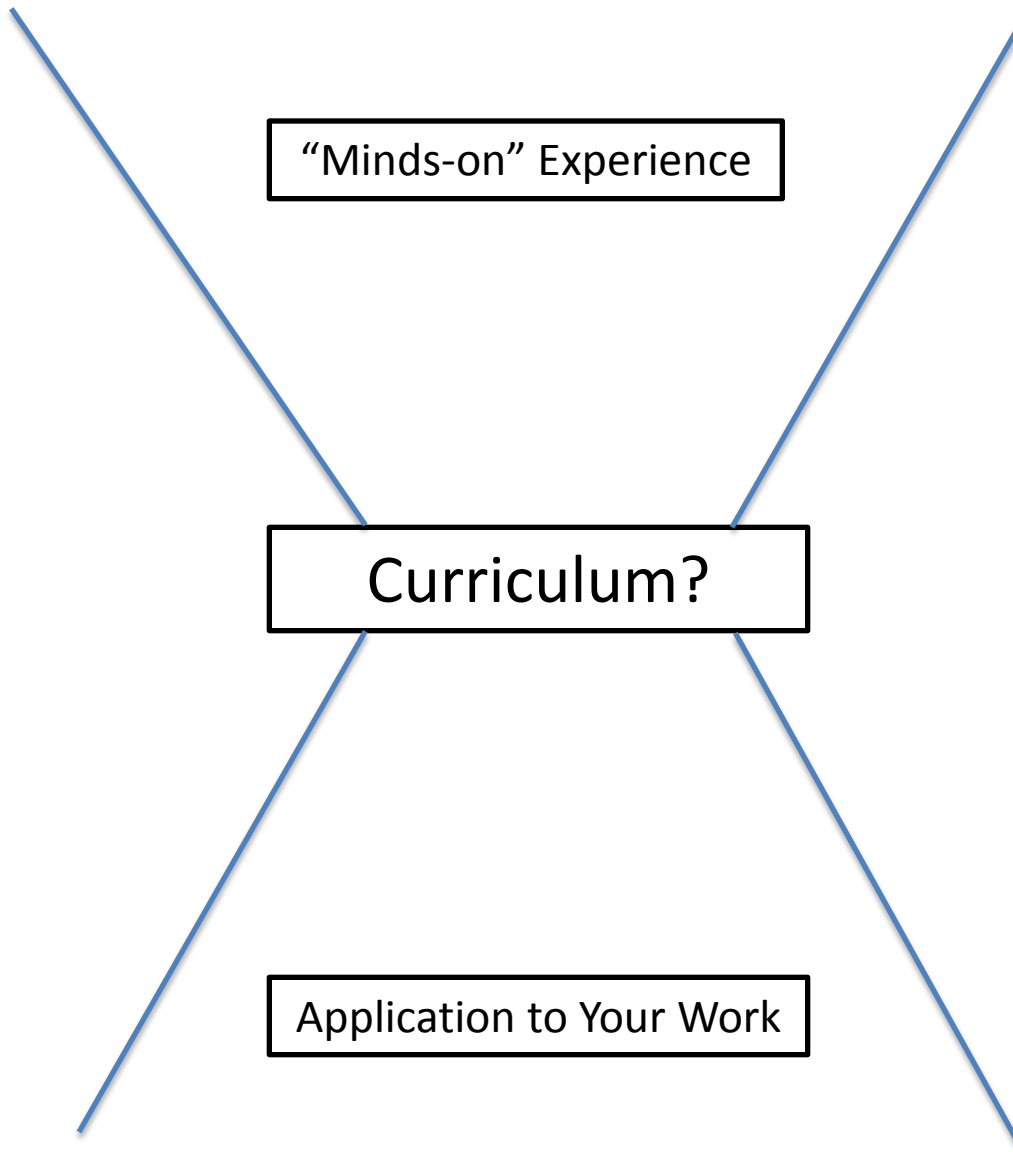Martin H. Smith, MS, EdD

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Words of the Day

- Systematic

- Intentional

- Aligned

"Minds-on" Experience

Curriculum?

Application to Your Work

What is Scientific Literacy?

- "End Goal" – But what's common across courses or disciplines?

- Four "Anchor Points" of Scientific Literacy
  - Content Knowledge
  - Practices of Science
  - Interest and Attitudes
  - Applied Participation → Civic Engagement

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What is Scientific Literacy?

- "End Goal" – But what's common across courses or disciplines?
  - **Content Knowledge**
    - Specific to Course/Discipline*
  - Practices of Science
  - Interest and Attitudes
  - Applied Participation → Civic Engagement

  *Return to thought; *horizontal organization*

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What is Scientific Literacy?

- "End Goal" – But what's common across courses or disciplines?
  - Content Knowledge
  - **Practices of Science (Scientific Thinking Skills):**
    - Asking questions; developing and using models; collecting, analyzing, interpreting data; constructing explanations; communicating information.
  - Interest and Attitudes
  - Applied Participation → Civic Engagement

What is Scientific Literacy?

- "End Goal" – But what's common across courses or disciplines?
  - Content Knowledge
  - Practices of Science
  - **Interest and Attitudes**
    - Stimulate career interest
    - Enhance motivation for civic engagement
  - Applied Participation → Civic Engagement

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What is Scientific Literacy?

- "End Goal" – But what's common across courses or disciplines?
  - Content Knowledge
  - Practices of Science
  - Interest and Attitudes
  - **Applied Participation; Authentic Contexts → Civic Engagement**
    - Deepens understanding of content and skills
    - Enhances critical thinking
    - Civic engagement: Use of knowledge and/or production of knowledge re. public concerns

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What is a Curriculum?

- Spend 2-3 minutes thinking about how you would *define* or describe the term, and what you see as the *purpose* of a curriculum.

- Discuss ideas with 2-3 others.

- Reach consensus?

- Share?

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Defining Curriculum

- **Poorly defined.**
  - Vague descriptions
    - Formal coursework taken by students.
    - Subjects taught at particular levels of school.
  - Metaphors/Word derivations
    - A path from here to there
    - A course to be run (derived from *currere =* to run)
    - A map to guide learners
    - A prescription for learning and teaching

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Curriculum: "So what?" Factor

- Operationalizing a definition of a curriculum can be used in the development of new or adaptation of existing curricula and applied to the various learning contexts

- Accomplished by considering necessary elements and limiting factors

Three Pillars of a Curriculum & Curriculum Development

- Purpose

- Organization

- Theory

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Curriculum Purpose

- Purpose: The advancement of learning

- Operates across three domains:
  - *Institutional*: Society and societal concerns
  - *Programmatic*: Translation of institutional-level goals into documents/materials (**learning experiences**)
  - *Classroom*: Implementation of documents/materials (learning experiences) by educators with learners

Curriculum Organization

- Learning experiences:
  - The fundamental components of a curriculum
  - Interactions between learners and their environment
  - Support acquisition of knowledge, skills, interest, and attitudes; lead to opportunities for application
- Spend 3-5 minutes thinking about and discussing the organization of learning experiences across a course/curriculum

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Curriculum Organization

- **Vertical Organization**
  - Sequential organization of learning experiences
  - Subsequent learning experiences build upon previous ones; investigate matters more broadly and deeply (*spiral curriculum*)
  - Helps produce a maximum cumulative effect
  - Needed for significant changes in learners to occur

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Curriculum Organization
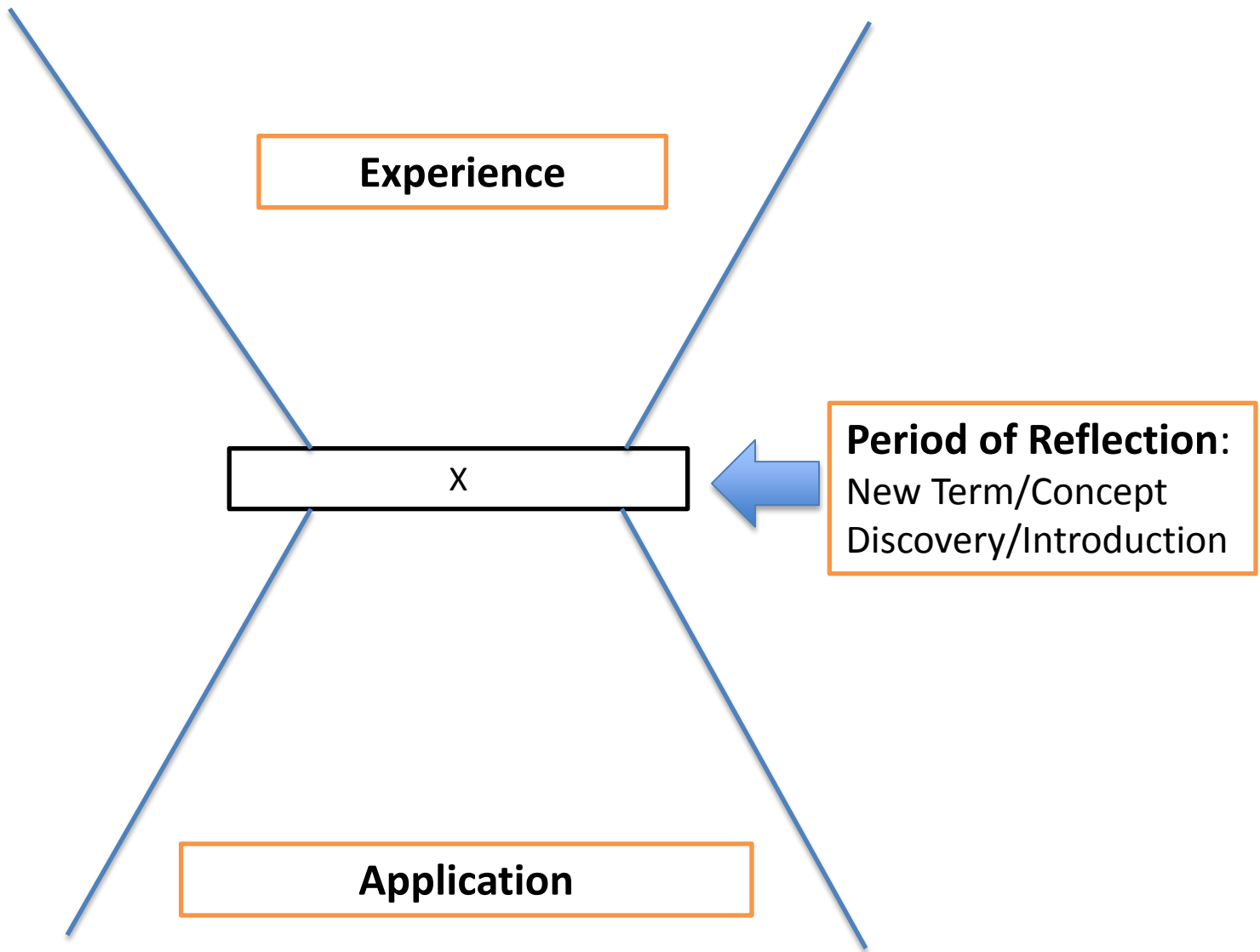
- **Horizontal Organization**
  - Connecting learning experiences to:
    - Other subject matter
    - Real-world situations
  - Connects learning to everyday life; provides a broader vision and significance to learning experiences

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Learning Theories and Curriculum

- To be effective it is important to have a theoretical underpinning

- Learning theories in effective science education:
  - Experiential Learning
  - Constructivism

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Experiential Learning

- Three distinct components:

  o **Concrete experience**: "Hands-on/Minds-on"; engages learners in exploration

  o **Reflection**: Time where new learning is discussed and analyzed; new concepts/terms are discovered or introduced

  o **Application**: New knowledge and skills are used in real-world situations; helps maximize learning

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Constructivism

- ***Constructivism*** holds that knowledge is developed through experience

- According to Dewey (1933), learning experiences are interactions between learners and their environment, each new experience draws upon prior ones, modifying them in some way.

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Constructivism

- Constructivism is an active process; specifically, knowledge is constructed through two processes: new information challenges prior knowledge – the process of *assimilation* – and an adjustment in understanding – the process of *accommodation* – is necessary (Richardson, 2003).

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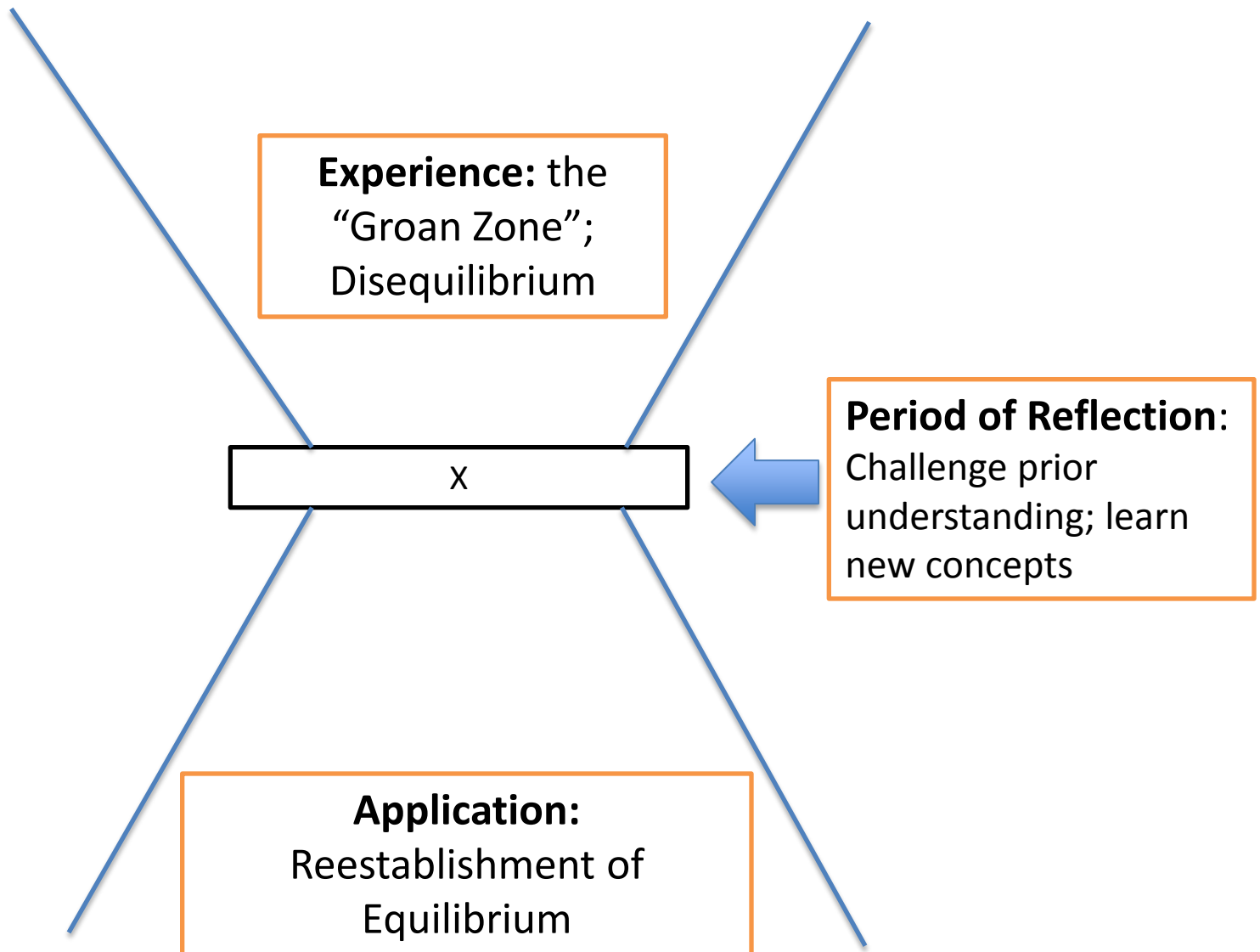# Experiential Learning, Constructivism, and Inquiry

- Inquiry is constructivist-based strategy; an effective way to do, learn, and teach science.

- Inquiry is used by researchers (scientific inquiry), students (inquiry learning), and educators (inquiry teaching)

- Common forms of inquiry: *guided; open*

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Knowledge Construction & Inquiry

- **Confrontation:** The process of active engagement should create <u>cognitive dissonance</u> (the "groan zone"); violating expectations; creating some level of doubt, uncertainty and tension. A state of <u>disequilibrium</u>.

- **Assimilation:** Reflection provides opportunities to challenge prior understanding and address skepticism related to new understanding. <u>Learning is a social endeavor</u>; it is important to <u>reflect</u> from multiple perspectives.

- **Accommodation:** The <u>use of new knowledge and skills</u> to make decisions and solve problems in <u>authentic settings</u>. Allows learners to adjust and solidify their new/revised understanding. This helps make "learning last." Establish/reestablish <u>equilibrium</u>.

Inquiry and the Curriculum

- Curricula that use inquiry are typically embedded in experiential learning
  - Experience: The "groan zone"; creates disequilibrium (confrontation)
  - Reflection: Challenge prior understanding; develop new understanding (assimilation)
  - Application: Adjust and solidify new understanding (accommodation)

Experience: the "Groan Zone"; Disequilibrium

Period of Reflection: Challenge prior understanding; learn new concepts

X

Application: Reestablishment of Equilibrium

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Curriculum/Course Development

- Spend 2-3 minutes thinking about principal factors you think are important to consider when developing a curriculum/course.

- Discuss ideas with 2-3 others.

- Reach consensus?

- Share?

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Curriculum Commonplaces

- Content

- Learners

- Context

- Educators

- Curriculum Making

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Curriculum/Course Development

- Spend 2-3 minutes thinking about principal steps necessary in the process of developing a curriculum/course.

- Discuss ideas with 2-3 others.

- Reach consensus?

- Share?

1. Determining Need

- Identification of a societal need and associated learning objectives

- By framing learning objectives, such as content knowledge, attitude, skills, disposition, and identity around authentic societal needs or issues, learners make sense of concepts and theories while also finding meaning and connections to the real world

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2. Organization of Content

- Systematic and Intentional: Organization is a challenge of curriculum development

- Organization can affect meaning:

  The king died, the queen cried.

  The queen cried, the king died.

- Must be addressed early in process

- Allows for the establishment of vertical and horizontal organization

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3. Determining Acceptable Evidence of Learning

- Critical step – How will I determine if learning has occurred?

- Once learning objectives have been identified and content organized, select the type of evidence that will be used to determine if learning was achieved

- **Note:** Think beyond quizzes and exams

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4. Identification and Development of Learning Experiences

- Curriculum development requires deliberate attention to detail as to how learning experiences are to be taught

- Develop experiences based on organized content; acceptable evidence of learning can help drive development; and ground experiences in effective pedagogy (e.g., inquiry; experiential learning)

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5. Preliminary Evaluation

- Developers commit to review:
  - Learning objectives
  - Content organization
  - Sequence of experiences
  - Evidence of learning

6. Pilot Testing

- Focuses on feedback informs developers of the usability of a curriculum and potential revisions

- Specific information obtained from pilot testing:

  - Developmental appropriateness

  - Evidence of understanding
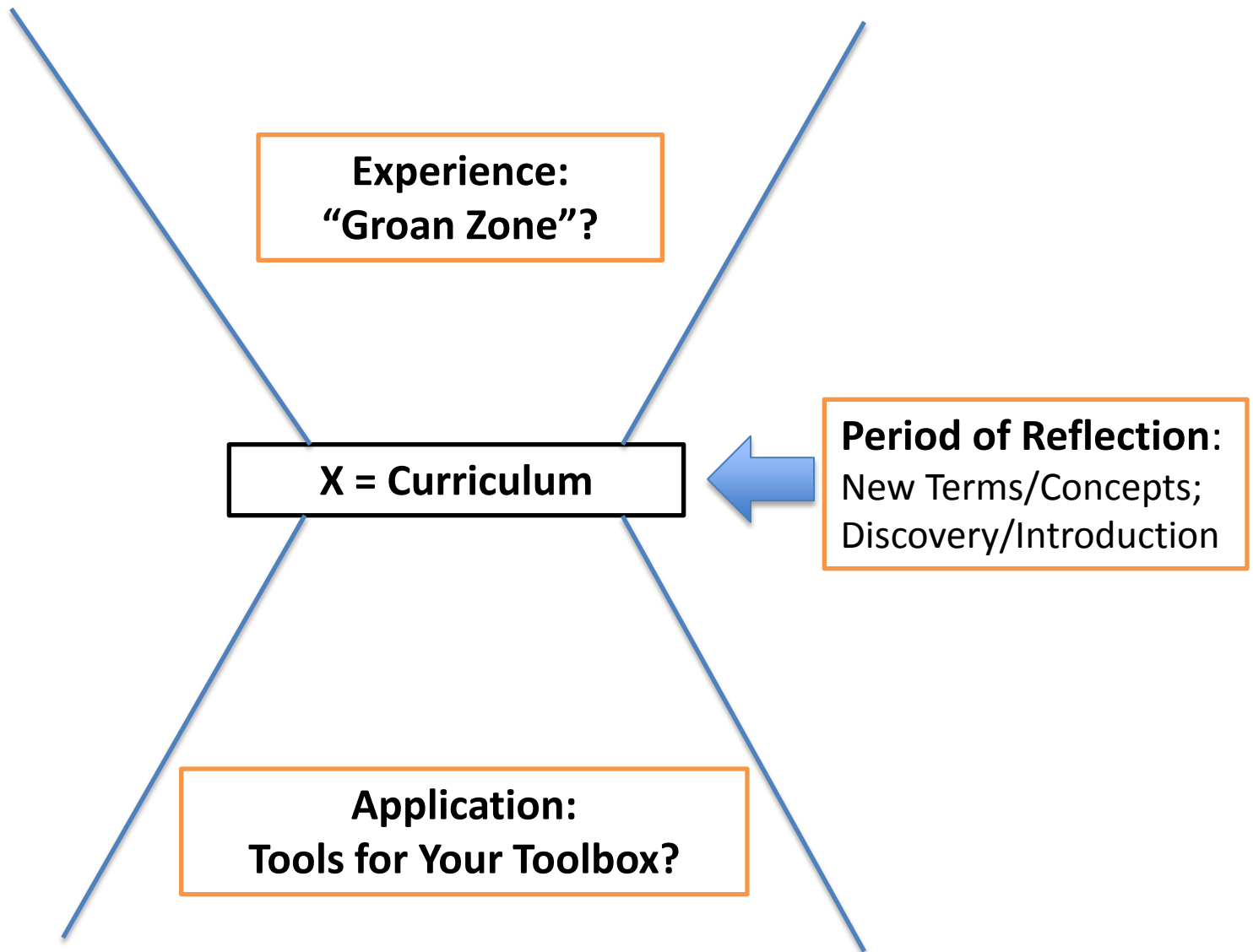
  - Requisite materials and resources

7. Outcome Evaluation

- Necessary final step in the curriculum development process

- Used to determine if intended results have been achieved through the use of a curriculum

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Curriculum Definition

A curriculum addresses a **societal issue or need** through the translation of relevant content into **learning experiences** that are **organized** sequentially such that concepts build on one another (**vertical organization**) and connect to other content areas or real-world situations (**horizontal organization**). It needs to be **developmentally appropriate**, grounded in **relevant learning theories**, and provide necessary resources and techniques for effective implementation with the intended audiences in **specified learning settings**. Finally, a curriculum must be **evaluated empirically** and shown to realize intended learning objectives.

(Smith et al., *under peer review*)

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