

Constructing a Pragmatic Science of Learning and Instruction with Functional Contextualism

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Notable Quotable

- “We teach only the techniques of learning and thinking. As for geography, literature, the sciences—we give our children opportunity and guidance, and they learn them for themselves.”

— B.F. Skinner, *Walden Two*

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Constructivism

- Constructivism is a powerful—if not the dominant—perspective in American education
- Constructivists have challenged the philosophical and epistemological underpinnings of the systems approach to instruction
- Some claim that “the findings of constructivism replace rather than add to our current understanding of learning” (Bednar, Cunningham, Duffy, & Perry, 1995, p. 110)

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The Rise of Constructivism

- Constructivists seem dissatisfied with the information-processing approach of cognitive psychology (Bredo, 1994)
- Constructivists are concerned that students are learning decontextualized skills in the classroom that do not transfer well to “real-world” situations (Gredler, 1997)
- Constructivists have an increased sensitivity to postmodern perspectives on knowledge, truth, and language (Solomon, 2000)

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Constructivism: Debate & Criticism

- Constructivists mischaracterize non-constructivist approaches (Merrill, 1991)
- Constructivist methodology is labor-intensive and inefficient (Merrill, 1991)
- Extreme constructivist position makes the practice of designing instruction pointless or impossible (Winn, 1993)
- Constructivist interventions are costly to develop and difficult to evaluate (Dick, 1991)

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Constructivism: Debate & Criticism

- “In place of behaviorism, constructivists and constructionists propose an equally simplistic, though vaguer, image of what goes on in the classroom” (McCarty & Schwandt, 2000)
- Lack of practical applications and empirical validations of the constructivist approach is a growing concern (Cobb, 1999)
- “Constructivist theory and conjecture far outstrip empirical findings” (Driscoll, 2000)
- Is constructivism incompatible with a scientific approach to learning and instruction?

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What is Constructivism?

Constructivism *n.* 1 (in epistemology) the theory that knowledge is not something we **acquire** but something that we **produce**; that the objects in an area of inquiry are not there to be discovered, but are invented or constructed.

(Mautner, 1996)

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What is Objectivism?

Objectivism *n.* 1 (in epistemology) the position that the real world exists externally to the knower and has a complete and correct structure (or meaning) determined by its entities, properties, and relations. Knowledge of the world comes about through an individual's interactions with it, and with growing experience knowledge becomes an ever-closer approximation of how the world really is.

(Mautner, 1996)

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Constructing Confusion

- Why is constructivism proving to be such a perplexing and contentious issue in instructional design and technology (IDT)?
- One primary reason: Lack of theoretical clarity and lack of philosophical cohesion in constructivist writing

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Constructing Confusion

- There are perhaps dozens of different strains of constructivism (Matthews, 2000), and some rely on very different philosophical assumptions than others
- "Constructivism refers to many ideas, joined by the merest thread of family resemblance and often expressing quite contradictory views" (Burbules, 2000)
- "Many in education call themselves constructivists without much awareness of the fundamental differences among the varieties of constructivism." (McCarty & Schwandt, 2000)

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Constructing Confusion

- In IDT, constructivists typically borrow indiscriminantly from the full range of constructivist perspectives, offering only a general (and vague) "constructivist view of learning"

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The Wacky World of Philosophy

- There are many different ways to describe, interpret, and understand the events of our world
- Philosophy guides how we choose to speak about these events
- Philosophy consists of pre-analytic assumptions and rules of evidence (or criteria for truth) that are used to create, assess, and evaluate knowledge claims and theories

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A Guide Through the Wacky World of Philosophy



- In *World Hypotheses: A Study in Evidence* (1942), philosophy Stephen Pepper argued that philosophical systems tend to cluster around a few core “world hypotheses” or world views
- Each world view is characterized by a distinctive root metaphor and truth criterion

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A Guide Through the Wacky World of Philosophy



- **Root Metaphors**
 - Based on well-understood, common-sense, everyday objects or ideas
 - Serve as the basic analogy by which we attempt to understand the world
 - Categories and concepts derived from the root metaphor serve as the basis for constructing theories and statements about the world

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A Guide Through the Wacky World of Philosophy



- **Truth Criteria**
 - Inextricably linked to the root metaphor
 - Provide the basis for evaluating the validity of analyses
 - Rules of evidence that are used to evaluate the “truth” or validity of theories, knowledge claims, and statements about the world

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Pepper’s “Relatively Adequate” Worldviews

- These world views have good (but not perfect) precision and scope
- **Precision** – the number of ways a particular phenomenon can be explained with a world view’s concepts (the fewer, the better)
- **Scope** – the number of phenomena that can be explained with a world view’s concepts (the more, the better)

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Pepper’s “Relatively Adequate” Worldviews

Worldview	Root Metaphor	Truth Criterion
Formism	Similarity	Correspondence
Mechanism	The machine	Correspondence
Contextualism	Act-in-context	Successful working
Organicism	Process of organic development or integration	Coherence

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Worldviews: Formism

- The formist assumes all events are instances of specifiable forms, and thus the purpose of analysis is to know these forms and name them.
- The formists' simple correspondence is nothing more than the "truth" of common sense language.

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Worldviews: Mechanism

- The mechanist assumes that the universe is organized a priori into events, relations, parts, and forces.
- Truth is found through the construction of verbal formulas and statements that reveal, via predictive verification, the assumed organization of the universe.

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Worldviews: Organicism

- The organicist assumes that there is a grand story evolving, in which all apparently contradictory elements will be found to be part of the evolving whole.
- Such a changing, developing organic system "tells a story" that can either be read correctly or not. Truth is the removal of all contradictory elements; coherence

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Worldviews and Ontology

- The **formist** assumes, without question, the ontological reality of the forms to be known and named.
- The **mechanist** assumes, without question, the ontological reality of the to-be-revealed organization of the universe
- The **organicist** assumes, without question, the ontological reality of the evolving whole
- In these worldviews, the task of the analyst is to "discover" what is **really** there or uncovering the true nature of reality

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Pepper's "Relatively Adequate" Worldviews

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The contextualist does not make ontological assumptions...contextualism is a-ontological

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Contextualism's Root Metaphor

- The "act-in-context"
- The common-sense way in which we experience and understand any life event
- Consider the (hopefully) everyday event of brushing your teeth...



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Contextualism's Root Metaphor

- "Context" refers to both the **current context** and the **historical context**
- The meaning, purpose, and function of a current event is determined by **past events** – by historical context
- Dewey's notion of the "the historical situatedness of the meaning and function of behavior"

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Contextualism's Root Metaphor

- Contextualists analyze all events as acts-in-context. The whole is primary; the parts we **construct** are secondary
- When a contextualist constructs theories and analyses that divide the world into parts, it is to aid in the achievement of some goal, not to reveal the one "true" organization and structure of the world
- Truth is tied to practical consequences, not to ontological assumptions

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Contextualism's Root Metaphor

- The context of any event ultimately includes the entire universe and extends through all of time
- How much of the potentially infinite context must be included in an analysis to adequately characterize an act?
- When is a contextual analysis considered "true" or "valid"?

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Contextualism's Truth Criterion

- Contextualists determine the validity or "truth" of an analysis by looking at the purpose or function of the analysis
- If the analysis includes enough features of the context to successfully achieve the goal of the analysis, it is deemed "true"
- Often called "successful working" – analysis is said to be true or valid insofar as it leads to effective action

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Contextualism's Truth Criterion

- It is a pragmatic truth criterion – contextualism has its roots in *philosophical pragmatism*
- Pragmatists and contextualists are not concerned with the existence (or non-existence) of absolute, foundational truths about the universe.
- "The truth of an idea is not a stagnant property inherent in it. Truth *happens* to an idea. It *becomes* true, is *made* true by events" (James, 1907)

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Contextualism and Analytic Goals

- The root metaphor and truth criterion of contextualism hinge on the **purpose** of analysis
- **Root metaphor:** act-in-context is rendered meaningless without an explicit goal because there would be no basis on which to restrict the analysis to a subset of the potentially infinite context
- **Truth criterion:** "Success" can only be measured in relation to the achievement of some objective

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Contextualism and Analytic Goals

- Without a clear analytic goal, the contextualist could analyze the endless context of an act in perpetuity, without ever knowing when the analysis was complete or good enough to be deemed "true" or "useful"
- It is very difficult for a contextualist without an explicit goal to construct or share knowledge

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Varieties of Contextualism

- Contextualists can, and do, adopt different analytic goals, and this dramatically effects the kind of knowledge they value and the types of analyses they conduct
- Different varieties of contextualism emerge out of different analytic goals:
 - *Descriptive Contextualism*
 - *Functional Contextualism*

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Comparing Contextualisms

	Descriptive	Functional
Example	Social constructivism	Behavior analysis
Analytic Goal	To understand the complexity and richness of a whole event	To predict and influence events with precision, scope, and depth
Knowledge Constructed	Personal, ephemeral, specific, local, spatio-temporally restricted (e.g., a historical narrative)	General, abstract, and spatiotemporally unrestricted (e.g., a scientific principle)
Content & Focus	Individual-in-context	Behavior-in-context
Preferred Methods	Qualitative and narrative	Quantitative and experimental
Disciplinary Type	Natural history	Natural science

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Descriptive Contextualism and Constructivism

- Most constructivists are descriptive contextualists. This is particularly evident in their preference for, and heavy reliance on, qualitative research methodologies.
- Qualitative research methods closely resemble historical narrative, which exemplifies the type of knowledge pursued and constructed by descriptive contextualists

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Descriptive Contextualism and Constructivism

- “The basic tenets of constructivism as an epistemology demand an acceptance of a contextualist world view” (Mancuso, 1993)
- Understanding the contextualistic core of constructivism may help explain some of the confusion surrounding constructivism in education

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Descriptive Contextualism and Constructivism

- If knowledge is said to be a human construction, it is vitally important to specify what one means by “knowledge” and the process by which one is claiming it is “constructed”
- In taking different approaches to defining “knowledge” and “construction,” constructivists are actually adopting different analytic goals and content areas

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Descriptive Contextualism and Constructivism

- **Radical constructivists** are primarily focused on describing how individuals make sense of the world
- **Social constructivists** are more interested in describing how social forces shape our cultural knowledge

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Descriptive Contextualism and Constructivism

- Since the purpose of analysis in contextualism guides how the root metaphor is applied and how truth is determined, different constructivist theories are evolving into different contextualistic systems that value and develop different types of knowledge
- Makes it unwise to treat the variety of constructivist perspectives as though they represent a singular theoretical perspective

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Disadvantages of Descriptive Contextualism

- Analytic goal is somewhat ill-defined, difficult to tell when it has been accomplished
 - When is the story or narrative complete?
- Personal or holistic appreciation of an event may not yield any practical knowledge or benefits
- Difficult to use descriptive contextualism as a philosophy of science or the basis of an applied academic discipline (like IDT!)

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Functional Contextualism

- Philosophy of science
- In psychology, supports science known as behavior analysis (or contextual psychology)
- Seeks development of empirically based concepts and rules that allow psychological phenomena to be **predicted and influenced** with precision, scope, and depth

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Implications of the Analytic Goal (Predict & Influence Psychological Events)

- **Emphasis on environmental and historical variables**
 - Much research in psychology and education is focused on correlations between one type of psychological event (such as an attitude or learning style) and another type of psychological event (such as academic achievement or workplace performance)
 - To change or influence the behavior or psychological events of another person, we must focus on environmental or historical variables

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Implications of the Analytic Goal (Predict & Influence Psychological Events)

- **Emphasis on environmental and historical variables**
 - We are **part of** that other person's environment
 - Anything we could do to affect the learning or performance of an individual occurs in the environment of that individual – in the context of their behavior
 - To develop theories that directly help us influence or change the performance of others, we must include environmental or historical (e.g., learning history) variables

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Implications of the Analytic Goal (Predict & Influence Psychological Events)

- **Emphasis on experimental methods**
 - Most effective strategy for identifying and isolating variables that allow both the prediction and influence of learning is controlled experimentation
 - Allows researchers to isolate which features of the context are functionally related to changes in the psychological event – purely descriptive or correlative research generally does not provide such knowledge

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Implications of the Analytic Goal (Predict & Influence Psychological Events)

■ Emphasis on experimental methods

- Diverse set of methodologies is encouraged, provided that value is always measured against pragmatic goals
- Correlational, predictive, and qualitative methodologies have their uses because they can provide clues about contextual variables that might impact learning
- Experimental methods are preferred because they are more effective for testing the influence of contextual variables and for verifying the general utility of principles

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Contextualistic Science

- Functional contextualism is a philosophy of **science**, and it supports a **science** of behavior known as behavior analysis
- Why should we seek a scientific approach to instructional design and technology?
- For the contextualist, science is **not** the only valid form of knowing, does **not** provide complete objectivity in the analysis of events, and it does **not** reveal the “true” nature of the universe

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Contextualistic Science

- Science is **useful**
- Scientific activity—characterized by careful observation, open analysis, experimentation, theorization, and the free exchange of ideas—has proven remarkably successful in allowing humans to interact with their world more effectively
- Science seeks to develop rules and principles that apply to events **generally**, not particularly
- Such knowledge allows us to interact more effectively with the natural world in a wide variety of settings

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Contextualistic Science

- We demand scientific knowledge be used for things such as:
 - Manufacturing and repairing the buses in which our children ride to school
 - Constructing the buildings in which they attend school
 - Evaluating and verifying the safety of the food they eat at school
- Why should we abandon scientific knowledge when it comes to the methods and materials used to teach our children (and others)?

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Functional Contextualism and Instructional Design & Technology (IDT)

- IDT has been defined as a field that “encompasses the analysis of learning and performance problems, and the design, development, implementation, evaluation, and management of instructional and non-instructional processes and resources intended to improve learning and performance in a variety of settings” (Reiser, 2002)

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Functional Contextualism and Instructional Design & Technology (IDT)

- In short, IDT is a field that seeks to predict and influence psychological events in certain contexts using certain methods.
- At the very least, IDT involves the creation of instructional materials which, by definition, are produced to **influence** the learning of those who use them

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Functional Contextualism and Instructional Design & Technology (IDT)

- Functional contextualists and behavior analysts have been working toward a broader version of IDT's goals for many years, and have developed a coherent philosophy and psychological science focused on its achievement
- It is a coherent, parsimonious, and empirically based approach with remarkable scope and depth

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Functional Contextualism and Instructional Design & Technology (IDT)

- Functional contextualism provides a clear philosophical grounding that allows us to embrace both systems and constructivist approaches, depending upon their empirical support and relevance to achieving desired outcomes
- Exemplifies how a **science** of learning and instruction can be conducted without adhering to objectivism or mechanism

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Functional Contextualism and Instructional Design & Technology (IDT)

- Functional contextualism offers IDT:
 - **Precision** – set of carefully defined technical terms and concepts for talking about learning
 - **Scope** – these terms can be used to analyze virtually all types of psychological events
 - **Coherence** – has a strong and coherent philosophical basis, with assumptions clearly outlined

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Instructional Methods from Behavior Analysis

- **Personalized System of Instruction (PSI)**
 - Characterized by unit mastery, self-pacing, on-demand course content, peer tutoring
 - Flexible approach to mastery learning
 - Popular in 1970s, saw interest decline in decades since
 - Seeing renewed interest as model for distance education courses
 - Over 2,000 PSI research studies
 - Overwhelming support for its effectiveness and superiority to traditional lecture-based methods

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Instructional Methods from Behavior Analysis

- **Direct Instruction**
 - Teacher-centered classroom characterized by highly sequenced instruction, clear and concise directions, teacher guidance, and active student participation
 - Tremendous research support, outperformed numerous other instructional models in the extensive Follow Through project
 - Provides powerful and proven technology for providing learners with some of the key components of intellectual independence

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Instructional Methods from Behavior Analysis

- **Precision Teaching & Behavioral Fluency**
 - Focuses on both the accuracy and the **speed** of academic skills
 - Rate of responding is key characteristic of truly expert or fluent performance
 - **Behavioral fluency** describes the combination of accuracy plus speed of responding characteristic of expert performance
 - May offer a broader and more authentic conception of “mastery”

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Instructional Methods from Behavior Analysis

■ **Comprehensive Application of Behavior Analysis to Schooling (CABAS)**

- Systems approach to managing the performance of all stakeholders in schooling—students, teachers, parents, supervisors or teacher mentors, administrators, etc.
- Relies on a construct called the **learn unit** as a standard measure of learning that incorporates measures of both student and teacher behavior

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Instructional Methods from Behavior Analysis

■ **Comprehensive Application of Behavior Analysis to Schooling (CABAS)**

- Incorporates elements of empirically based methods of instruction and includes extensive curriculum for training teachers to become “strategic scientists” of instruction
- Has been implemented in several schools in US, Ireland, and England
- Found to help students learn 4 to 7 times more (in terms of objectives met) than with traditional teaching techniques, and can be more cost-effective

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Instructional Methods from Behavior Analysis

■ **Morningside Model of Generative Instruction**

- Incorporates elements of empirically based methods of instruction (including programmed instruction, PSI, precision teaching/behavioral fluency)
- Implemented with 86 schools and agencies in US and Canada
- Model formed and evolves at Morningside Academy in Seattle

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Instructional Methods from Behavior Analysis

■ **Morningside Model of Generative Instruction**

- Mean standardized test gains for elementary and middle school students at Morningside Academy:
 - Reading: 2.5 grade levels per year
 - Language arts: 4 grade levels per year
 - Math: 3 grade levels per year

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Instructional Methods from Behavior Analysis

- Morningside and CABAS exemplify how functional, scientific approach to learning can be used to systematically work toward the complex, molar goals of education described by constructivists

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A Pragmatic Approach to Language and Cognition

- **Relational Frame Theory** – contextual approach to language and cognition that does not rely on inferred, hypothetical, and unobservable “mental” structures
- Learn more at relationalframetheory.com!

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Conclusion

- Constructivists have made important contributions to IDT:
 - Encouraged critical analysis of philosophical and epistemological assumptions
 - Encouraged the instruction of relevant and meaningful skills and knowledge
 - Emphasized authentic learning environments and assessments
 - Promoted student self-reflection and independence

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Conclusion

- The methods and analyses of constructivism permit a personal appreciation of the rich complexity of an individual's learning experience
- This type and level of understanding is important, but does not lend itself well to empirical evaluation or the construction of general principles of learning

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Conclusion

- An applied academic discipline like IDT requires that more scientific goals be adopted
- Functional contextualism exemplifies how one need not become an objectivist to be a scientist
- The scientific knowing engendered by functional contextualism and the historical knowing engendered by constructivism can both be embraced by educators – the relative value of each will depend upon purpose and context

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Conclusion

- Even in these postmodern times, we can have an art of teaching that is based on a science of learning

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