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EDUCATION AS DESIGN FOR LEARNING

A Model for Integrating

Education Inquiry Across Research Traditions

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Recently we were asked to coteach a seminar at the University of Wisconsin–Madison as part of the School of Education's Doctoral Research Program (DRP). The purpose of the DRP is to provide an interdisciplinary experience for students from across the School of Education including historians, policy analysts, curriculum designers, learning scientists, and critical theorists. The idea behind it was to create a common background for motivated students to be able to understand the breadth of education as a field of study and to broaden their horizons beyond their disciplinary training and their advisor's program of research. Toward that end, the course is taught by two faculty members from different departments in the school in order to represent diverse perspectives and to create opportunities for broad-ranging pedagogical discussions. Past DRP curricula highlighted the structural similarities of education research—

students worked on developing curriculum vitaes (CVs), crafting their own independent pieces of research, and instructors often brought in multiple guest speakers to describe their perspective on research. In so doing, past DRP curricula sought to advance a vision for coherence in education research, one in which education research focused on the common goals that students were expected to complete in their graduate career.**[AU: Insertion OK?]**

When we sat down to plan our version of the course, we pushed ourselves to ask a deeper question about educational research. Rather than focus on the tasks of research, we wanted to explore the epistemological, as opposed to the structural, similarities in education research. We all call ourselves education researchers; therefore, we must have some shared set of beliefs and values and a common core of pursuits. This did not prove easy—designing the course meant putting a stake in the ground in terms of what we saw as these core values, beliefs, and pursuits and then trying to bring students along this journey with us. Current education research inquiry is marked by its astounding diversity. Education researchers have eagerly adapted methods and ideas from across the social sciences and humanities, and developed unique approaches to understand and improve the complex conditions for improving teaching and learning within and outside of schools. The abundance of epistemologies, methods, and fields of investigation employed indicates a vibrant—and expanding—mode of professional inquiry to understand how disciplined investigation can be brought to bear, at scale, to improve ancient traditions of teaching and learning. The growing range of approaches to inquiry is reflected in the exploding rate of professionals seeking PhD's in education—a 70.6% increase in the number of PhD's awarded in education from 1996–2007.[1] This burgeoning growth in education research could well be taken to indicate the robust health of the field.

Yet, even as education departments continue to flourish and expand, many are troubled by the perceived lack of quality research in the field and the lack of demonstrated impact research has had on practice. Derided as "educationists" at work in "diploma mills," educational researchers are criticized for the lack of rigor in their inquiry and for the quality of their professional preparation programs (Feuer, Towne, & Shavelson, 2002; Levine, 2005). Some researchers have situated the "problem" of educational research in the institutional and political culture of education schools (Clifford & Guthrie, 1988; Powell, 1980). Lagemann (2000) locates the origins of the fractured identity of educational research in the early history of the field. Achieving respect for a new field of study in the world of academia led early educational researchers to "emulate their brethren in the 'hard' sciences (or at least the more developed social sciences)" (p. xii). Educational researchers latched onto prevailing standards of academic quality in other fields in order to legitimize their own work. The search for respect was compounded, according to Lagemann, by the lower status of people attracted to the field of educational research, which in turn reinforced the field's quest for legitimacy both in schools of higher learning and with the public. Labaree (2006) notes that normal schools historically addressed the needs of four academically stigmatized populations: women, children, teachers, and the working class. As normal schools grew into schools of education, these stigmatized associations reinforced a diminished status for education research compared to other fields of inquiry. Further, the derivative approach to methods made education research too applied for theory, yet too abstract for practice. The low status attributed to education research, from both inside and outside the profession, has led to a wholesale dismissal of educational research from legal disputes, policy making, or local school governance issues in favor of experts in disciplines outside of education.

The status of education research and schools of education has led to much soul-searching. Some writers have attempted to draw out the defining characteristics of the field in terms of research that is truly educational (Ball & Forzani, 2007); others have pushed the discourse toward defining research in terms of what counts as scientific in other fields (Feuer et al., 2002; Slavin, 2002). Still others draw on a critical tradition that seeks to cast the effects of education into appropriate social, political, and economic contexts (e.g., Apple, 2010; Giroux, 2009; Popkewitz, 2007). The multivocal expression of education research has led to an uneasy state of affairs in which advocates of disciplinary fidelity within education zealously enforce perceived standards of methodological rigor while at the same time questioning the legitimacy of rivals dedicated to (what is viewed as substandard) educational inquiry. The quest for legitimacy via disciplinary affiliation has diverted educational researchers from "pondering what distinctive characteristics might compromise rigor and relevance in this particular domain of scholarship" (Lagemann, 2000, p. xii). The rhetoric of failure, compromise, critique, and lack of quality and prestige pervades the our arguments for legitimacy. Schools of education are characterized as the "butt of jokes in the university" and portrayed as "intellectual wastelands" (Labaree, 2006, p. 3).

Diversity, however, should not necessarily result in discord, dysfunction and dismissal. So how can we, as researchers and educators, embrace this diversity in building a shared research enterprise? This was the focus of our doctoral seminar and now the argument we pose here. In this chapter, we propose that what all of these various methods, questions, and interpretive frameworks of education research share a common commitment to the principle that *education is design for learning.* Let us say what we mean by that. "Education" and "learning" are highly interrelated terms; they are not, however, synonymous. *Learning,* describes a natural human process that happens as people interact with tools and with one another in the world. We

are always learning, whether we like it or not and whether or not we are learning what others want us to. This is where *design* comes in. Learning communities emerge or are created for a reason—they are fundamentally goal-oriented. These goals can be intended for individuals, as in traditional classrooms that are created so students can achieve learning goals set forth in a curriculum, or they can be goals that are authentic to that community as in Jean Lave's classic studies of Gola and Vai tailors (Lave & Wenger, 1991) or the growing body of research documenting what people accomplish in online participatory cultures (Jenkins, Purushotma, Clinton, Weigel, & Robison, 2007). What all of these communities share is that they are not satisfied with the natural learning that characterizes human development. Rather, they are *designed* in an effort to ensure that certain outcomes—personal or communal—are achieved. Cohen (1988) characterizes these attempts to guide interaction in certain directions as "practices of human improvement." Education requires imposing a structure that diverts natural development into a new intended state.

Following this logic, if education is the design for learning, then education research is the *study* of the design for learning. Questions for education research revolve around the assessment, development, implementation, and critique of design efforts to improve teaching and learning. In the sections that follow, we argue that by using this metaphor, we can characterize education research efforts as one of three types:

- *Type 1* (positivist) inquiry creates *scientific knowledge* for policy makers and the general public about education policy effects on teaching and learning;

- *Type 2* (practical) inquiry creates *practical knowledge* to guide the work of local educators;

- *Type 3* (hermeneutic) inquiry creates *critical knowledge* by situating education processes in historical, social, economic, or political contexts.

Each type of inquiry often positions itself at odds with the other two, resulting in a fractured universe of education research in which practitioners from different traditions have great difficulty communicating process and results outside the realm of their discourse. This chapter describes recent efforts to promote Type 1 inquiry as an exclusive knowledge-producing path in education research; then proposes a revised account of design-based Type 2 inquiry as a necessary complement to Type 1 knowledge. The iteration between Type 1 and Type 2 inquiry describes a path for how differing epistemological and methodological approaches can be linked in an iterative inquiry on the results, process and nature of teaching and learning. Type 3 approaches call into question both the intentions and consequences of the Type 1-Type 2 cycle. We will describe how integrating the concepts of artifacts and design can help Type 3 inquiry show the way toward to a more representative education research discourse.

The challenge for research methodologists is how to consider education research as committed to a shared metaphor of design for learning. How then can we characterize the considerable disagreements in the field in terms of a common metaphor? We suggest that the seemingly mutually exclusive approaches to education inquiry often presented in the literature might in fact serve as countervailing movements in an iterative design discourse of education research.[2] In order to make this argument concrete, we will draw mainly on examples from research in one field, education leadership and policy analysis, to illustrate how three key movements can be understood as attending to different aspects of design for learning.

Type 1 Inquiry

Education policy discussions and discussions about professional practices in schools share a common goal of using inquiry to improving teaching and learning. Contemporary policy researchers are clearly motivated by what we will call "Type 1" inquiry. Type 1 inquiry aims to improve learning by developing methods and practices modeled on statistical social science investigation. Type 1 research is characterized by careful assessment and evaluation practices that measure how interventions work across educational contexts. Policy researchers have made remarkable progress with Type 1 strategies, leading education research into new areas for investigation inspired by quantitative sociology, economics, and value-added models of evaluation.

Type 1 research focuses on what educators should do to produce predictable, reliable learning outcomes for all students. While this "what" question could be asked of all education-related learning environments, we focus on the school as environment in order to highlight what the research approach looks like and how it impacts practice. In research on education, Type 1 inquiry is grounded in a systemic reform perspective that involves common content standards and summative assessments, sophisticated assessment and student information systems technologies, and interventions to reshape local teaching and learning environments (Elmore, 2000). The role of research in a Type 1 perspective is to conduct rigorous assessment of the effects of the interventions sponsored by governing organizations (Feuer et al., 2002). Type 1 researchers focus on the methodological issues of random assignment, experimental design, and inferential power to guarantee the quality of intervention testing (Feuer, 2006). A typical approach to Type 1 scientific research is to implement an intervention in multiple contexts, and then to compare the results of the intervention with a control group to determine intervention

effects (Mosteller & Boruch, 2002). The Type 1 research world is bounded by the world of interventions. Research exists to determine boundary conditions of the subgroup of interventions that produce desired, reliable, and robust results. The research program is designed to yield estimates of the intervention effects across implementation contexts. Interventions that produce predictable, positive effect sizes across local contexts and across study designs then meet the gold standard for dissemination.

The Type 1 model of change unfolds within the systemic reform context. From a Type 1 perspective, local actors are implementers of state and district programs proven to be effective by scientific methods. The Type 1 change model includes several key premises: (1) Local actors need to *select* appropriate research-based interventions to address student learning needs; (2) local actors need to establish *conditions* to ensure appropriate implementation; and (3) local actors need to develop *incentives and consequences* to motivate staff compliance with research-based practices. Type 1 implementation research is concerned with measuring the *fidelity* of program implementation (i.e., the degree to which leaders established the specified conditions for action). Type 1 inquiry thus focuses on the degree to which local actors comply with the requirements of scientifically proven interventions. Implementation variation introduces a kind of (undesirable) noise into the implementation process that undermines intervention quality. Type 1 research programs rely on minimizing the unpredictable variation of local implementation from calculating intervention effects (Howe, 2004; Olson & Katz, 2001). Local discretion is considered as important only to the degree that local actors can recreate the necessary conditions for implementation, and even then, the study of the role of this kind of discretion is a marginal concern to the central scientific activity of intervention certification.

The Type 1 approach has evolved from a long-standing federal (and constitutional) theory of action that preserves the autonomy of the local educational agencies (LEAs) while pursuing larger, system-wide policy goals (Anderson, 2005). In this view, decisions about school management and classroom learning practices are left to local actors. The role of the federal government is to persuade (rather than to compel) LEAs to comply with recommended practices. This approach is allows LEAs to select the means (programs, assessments, and practices) deemed necessary to produce mandated ends (educational outcomes). Type 1 persuasion to comply with recommended practices involves rewards and sanctions for local actors, and may also seek to establish a public climate that makes it difficult for local actors to resist recommended practices (Slavin, 2002). For example, state websites that publish disaggregated student achievement data (and community demographics) create public pressure for schools to improve learning outcomes for the sake of learning, but also to preserve perceived economic values (e.g., property values and tax bases).

While the Type 1 model respects the need to preserve local autonomy, Type 1 actions also tend to devalue the role that local actors, left to their own devices, can actually play in improving teaching and learning. As Richard Elmore (2000) framed the "conundrum" of systemic reform,

> Schools are being asked by elected officials—policy leaders, if you will—to do things they are largely unequipped to do. School leaders are being asked to assume responsibilities they are largely unequipped to assume, and the risks and consequences of failure are high for everyone, but especially high for children. (p. 2)

From a Type 1 perspective, local autonomy is respected as a *political* necessity, but cannot be relied upon as a form of *professional* capacity to enable reform. Type 1 policy interventions frequently prod local actors to abandon ineffective local practices and in favor of research-proven approaches (Schneider & Ingram, 1997; Stone, 2002). At best, local discretion supports the received wisdom of with policy initiatives; more often it obstructs or corrupts the quality of interventions that researchers and reformers have work so hard to establish.

Evidence for the pervasiveness of the Type 1 model is reflected in the contemporary transformation of the "best practices" discourse into "what works." *Best practice* models emerged in the 1980s to describe techniques that produced good results. Researchers collected and wrote about best practices; professional networks and conferences buzzed with the latest, most interesting "best practices" that emerged from local contexts to address complex problems. The word *practices* was pluralized to reflect a diversity of options. The best practices perspective assumed that practitioners could select from among appealing practices in a particular domain, and after experimenting, could then contribute a "better" variation on the practice. The advent of the *what works* discourse changed the terms of the relation between interventions and local autonomy. An intervention is only included in the What Works Clearinghouse (http://ies.ed.gov/ncee/wwc/) when it meets the standards of (Type 1) scientific evaluation:

> Currently, only well-designed and well-implemented randomized controlled trials are considered strong evidence, while quasi-experimental designs with equating may only meet standards with reservations; evidence standards for regression discontinuity and single-case designs are under development.[3]

Type 1 research is guided by a priori decisions about which research methods can legitimately create evidence about the quality of education interventions. The stamp of "what works" provides a quality assurance for LEAs to adopt research-tested practices as the optimal strategies for achieving teaching and learning goals. A best practices approach generates interventions from local practitioners, and relies on a professional community to continuously refine the practice in terms of local circumstance. A "what works" approach markets interventions to local actors as consumers and warns that (a) interventions that are not validated by Type 1 research should not be labeled "what works," and (b) interventions must not be changed in any way, lest the change damages chances for predictable results.

The prevailing model for Type 1 research seeks to bring some measure of predictability into the ever-changing context of education practice. A full-throated concern with education has produced a research community focused on finding solutions for the "problem" of public schooling. Both the public and policy makers seek reliable criteria to determine what constitutes effective practices in education. The struggle to improve teaching and learning is embedded in volatile political struggles over how (and whether) schools can address chronic social and racial inequalities and continue to serve as an engine of economic growth. Type 1 inquiry investigates how education reform can be framed as a technical matter in which the rich tradition of social scientific methods can help to determine the most effective means to achieve agreed-upon learning goals. This enables Type 1 research to bracket the murky, contested sociocultural issues seek to define the "soul of education" by instead determining what works. Type 1 inquiry aims to provide the kinds of validated tools that researchers and reformers can reliably use to improve education for all by defining education research in the technical terms of measuring the relation of means to ends.

Type 2 Inquiry

"Type 2" inquiry seeks to improve learning by understanding and developing the practical capacity of local actors to select from among a variety of available reform initiatives and to adapt tools to local needs. Local leaders seek insights into how to assemble and assess the education contexts they develop to improve teaching and learning. The "what works" model fostered by Type 1 strategies does not provide sufficient guidance to shape a Type 2 "best practice" world. By contrast, Type 2 research focuses on how local actors orchestrate education interaction for learning. Rather than black-box the local context, Type 2 approaches to inquiry *radiate from* the local context of action. Type 2 inquiry considers the school improvement process from the perspective of local actors. Providing evidence for the quality of interventions (Type 1) is a necessary but insufficient component of Type 2 research (Erickson, 2005; Gee, 2005). Since only a small part of local work involves intervention implementation, Type 2 research must document and support a much wider range of practices (Erickson & Gutiérrez, 2002). Type 2 research treats local autonomy as a capacity to be cultivated, and more importantly, studied.

The concept of a "deficit model" in educational research criticizes the assumption that learners have little to add to their learning process, and that the educational value of teaching must be introduced to enhance the (assumed) paucity of resources learners bring (cf. Moll, 1990; Valencia, 1997). Deficit thinking is becoming more widely recognized as an inappropriate perspective to frame teaching and learning for children in special education (Harry & Klingner, 2006) and English language learners (Tejeda, Espinoza, & Gutiérrez, 2003). Type 1 inquiry adopts a deficit perspective toward the practices of teachers and school leaders (Stein, 2004). Whereas Type 1 research sees context as noise to be filtered out in order to study the true effects of an intervention, Type 2 research seeks to explain the noise in terms of how the interventions

(and their effects) interact with the context in which the interventions are carried out. Systematically bracketing the contexts upon which local education practitioners must draw severely limits the possible effectiveness of using a Type 1 perspective to promote scalable change in schools. When existing practices are treated as noise to be reduced or eliminated so that what works can be properly implemented, we lose the opportunity to trace the functions and evolution of practitioner community "funds of knowledge" (González, Moll, & Amanti, 2005).

Type 2 takes as its central concern the residuum bracketed out by Type 1 inquiry. In order for us to understand how to design for improved practices, we have to develop a better understanding of the practices we wish to reform. Constructivist theories of learning suggest that people build new understanding on prior knowledge and experience. From a teaching perspective, if we know what and how learners know, new messages can be shaped to accommodate prior understanding. Type 2 researchers must begin their work with the humbling realization of how little the research community can systematically anticipate the patterns of expert, competent, and deficient local teaching and learning practices across disciplines and grade-levels in schools. Anticipating what learners know is difficult enough in domains where children engage with new topics in math, science, or literacy. It is far more difficult in professional fields where practitioners are hired based on their ability to master and exercise complex bodies of professional knowledge and practice (see, for example, Argyris, 1991). To borrow an analogy from another field, it is almost as if our approach to education research is driven solely by medicine, with little attention to anatomy. A Type 2 perspective suggests that we need better approaches to studying anatomy (practice) *as a necessary condition* for improving medicine (reform). Type 2 research is needed to understand why a certain practice is considered as a possibility in a certain context, and why it escapes consideration on other

occasions; why some communities of practitioners rely on a well-established set of organizational routines that another group considers anathema; and how accounts of expert practice can be framed to be considered as possible practices for a novice community.

We suggest that Type 2 researchers are bound by a commitment to uncovering how actors "make sense" of their practice in local contexts. Teaching practice, for example, is bound by a variety of local constraints, such as disciplinary knowledge, instructional resources, student knowledge, aspirations and background, community expectations, etc. Type 2 researchers cannot simply inventory the overwhelming number of resources and routines of local actors. The resulting taxonomies and lists of practices would not tell us anything about how practice makes sense to local actors. Instead, Type 2 researchers must be able to understand how these myriad factors "hang together" for local actors, and, more importantly, to be able to identify which the "joints" in the fabric of local practice lend themselves to reflection and change. Type 2 researchers assume that the integrity and context of local practice form the essential arena for improving teaching and learning, and that the secret to improving teaching practice lies in understanding the fit (or lack of fit) between the existing and the desired practice. In part, this need for understanding of local condition arises from the frequent distance between the positionality of the designers (policy-maker; curriculum publisher) and the practitioner (teacher, school leader). Fostering designed change at a distance requires the researcher to understand the reasons why current practices continue to abide and to carefully observe and encourage the occasions where change might take hold. How do researchers conduct themselves and decide what matters in the investigating education research as design for learning? In the subsections that follow, we describe suggested components of a model for Type 2 inquiry, grounded in the

philosophical and situated cognition concepts of practical wisdom, significance, focal practices, tasks, and artifacts.

Practical wisdom. From the perspective of the local actor, school improvement research can seem impossibly complex. There are so many programs to implement, priorities to establish, problems to set and solve, teacher issues to address, and community concerns to defuse. More often than not, all of the options have potential for making positive change (or for being ineffectually implemented). The challenge for local school actors is to select the appropriate problems to address, with the appropriate means, at the appropriate time, with the appropriate staff. Aristotle's concept of practical wisdom, or *phronesis,* captures how local actors frame and solve complex organizational problems (Halverson, 2003, 2004). Practical wisdom describes how actors determine which techniques or theories are appropriate for use in a situation. Studying practical wisdom means describing the patterns of how leaders set and solve the problems that emerge in day-to-day practice. More broadly, Type 2 research seeks to access, document, and communicate the practical wisdom of local actors.

Significance. Even if researchers can discern phronetic patterns in what local actors know and do, actions still unfold in specific contexts with definite features. (Knowing how to solve a problem *in general* is not the same as knowing how to solve it *here*). Practical wisdom research must disclose how actors navigate and alter the specific environments of their practice. A challenge for Type 2 research is to identify the *significant* structures, actors and strategy that matter for improving teaching and learning. Significance is often considered an internal measure of the quality of the research process—a finding is significant when analysis shows that there exists a relationship between the predictor(s) and the outcome(s). In Type 2 research, significance emerges from the context of practice rather than from the technical aspects of the

methods. Actions are significant if they mean something to local actors—Type 2 research attempts to capture the contexts, structures, and practices that make local action significant. Obstacles are recognized as significant limits to action; affordances point to significant pathways that enable action. Documenting the significant practices/contexts of typical practitioners reveals occasions for authentic pedagogical opportunities to expand local horizons of investigation. Studying what expert practitioners perceive as significant provides insight into which features of local contexts can be highlighted, enhanced, or eliminated, and how best practices mitigate obstacles and find opportunities in contexts that thwart similarly situated colleagues. The challenge for Type 2 research is to identify the *significant* structures, actors, and strategy that matter for improving teaching and learning.

Focal practices. Albert Borgmann's (1984) concept of "focal practices" is useful here. We are all surrounded by taken-for-granted tools that shape the contexts of our lives. *Focal practices* reflect our ability and willingness to select from among the tools that direct our activities toward significant concerns. Focal practices illustrate how we can create cohesive systems that support intentional work from the given everyday contexts of technology. Borgmann uses examples of everyday focal practices such as running and dining to show how we organize our world to achieve our ends. Focal practices are well-suited for education research because they address how we arrange our tools and the routines and social networks through which we engage in practices. Because focal practices illustrate how we organize the world to achieve our ends, we can compare how actors organize their worlds around focal practices to highlight the variations in how similarly situated practitioners perceive significance. Although not using Borgmann's ideas, researchers in education have long engaged in methods that seek to capture practitioner focal practices. Deborah Ball and her colleagues (Ball, Hill, & Bass, 2005; Lampert & Ball,

2005) study how teaching math problems acts as a focal practice to unpack and make public the strategies and prior knowledge teachers bring to bear in their teaching. Julian Orr (1996) takes a similar approach to investigating how Xerox technicians repair machines. Orr uses the "war story" as focal practice to explore how technicians determine and resolve significant aspects of repair problems.

Investigations of focal practice phenomena can also be seen in cognitive ethnographies that investigate how local actors use tools and social interaction to create networks of meaning. Hutchins' (1995, 1996) seminal work in distributed cognition, for example, examines how understanding individual cognition alone is insufficient to explain complex technological tasks. Research on computer-based cognitive tutors and user testing illustrates another path toward studying focal practices. Design-based educational research generates rich models of existing understanding as a consequence of developing efforts to improve learning. Cognitive tutoring (for an overview, see Koedinger & Corbett, 2006) develops a model of student understanding in order to appropriately customize lessons. While the aim of building tutors is to improve math learning, an important consequence of tutor design is deeper insight into how students organize knowledge and experience prior to intervention. Testing cognitive tutors typically involves some form of *user testing,* an iterative process that generates data on design quality from the user perspective. User testing provides important data to refine intervention design, while at the same time allowing designers to construct powerful cognitive and behaviorist models of how users encounter new tools. In other words, design and user testing can be used to reveal existing focal practices. Insights generated by the user testing are often regarded as a kind of residuum generated on the way toward the genuine research end (i.e., improvement), and thus rarely

reported as research findings. Type 2 inquiry explores these residual insights of design to uncover the significant characteristics of focal practice.

The role of tasks. The closer researchers get to the actual day-to-day activities of local actors, the more difficult it becomes to parse the connection between the stated goals and actual work. Spillane, Halverson, and Diamond (2004) on distributed leadership describe this problem in terms of how/whether micro-tasks correspond with macro-tasks. While a leader's micro-tasks are observable, leadership discourse often takes place at the level of macro-tasks. This gap between what leaders say and what they do introduces an interpretive challenge for leadership researchers. Data on micro-tasks and macro-tasks provide the two essential information sources in Type 2 research. Type 2 researchers can discern patterns by iteratively investigating the gap between micro- and macro-tasks—by using (macro-task) interviews and surveys to draw conclusions about daily practices, and by engaging in (micro-task) observations or practice logs of micro-tasks to discern larger patterns of practice.

Artifact analysis model. Borgmann's (1984) analysis suggests that identifying focal practices can reveal focal things, or *artifacts,* as the significant tools that connect us with our world. In education, artifacts serve as mediational means (Wertsch, 1993) designed to influence teaching and learning. Local actors work with artifacts such as programs, policies, and procedures to establish conditions for improving teaching and learning in schools (Spillane et al., 2004). Artifacts such as curriculum packages, daily schedules, faculty professional development programs, literacy assessments, data warehouse systems, and union agreements can be found in any school context. Artifacts can be received (or inherited) from outside the school context, or can be designed by local actors (Halverson, 2004); they can begin, compound, or assess change

processes (Halverson, 2007). In a sense, artifacts act as media to support asynchronous communication between designers and users (Halverson, 2010).

[Insert Figure 19.1 about here]

Figure 19.1 Artifact Analysis Model

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The artifact analysis model (Figure 19.1) can be used to analyze design, implementation, or outcomes in ways that situate Type 1 and Type 2 into a common context of education research. Artifacts provide four key analytic opportunities: intentions, features, affordances, and outcomes. Designers build *intentions* into artifacts in the form of *features* that will hopefully guide use. Leadership artifacts, such as policies and programs, include features such as prescriptions for practice, resources to support intended use, consequences for appropriate implementation, and suggestions for how to organize practices. For example, leaders can build master schedules that include features such as assignments for teachers and students, plans to organize space and instructional time, and provisions to allow teachers to engage in collaborative planning. Users, on the other hand, perceive artifact features as *affordances.* Affordances reflect how users make sense of artifact features. In the example above, the master schedule affords teachers knowing where and when to teach, and guidelines for students on how the instructional day is organized. However, the inevitable gap between features and affordances is a commonplace one in implementation research. Users typically read artifact affordances in terms of prior knowledge, experience, and desires. Features intended to promote collaboration, such as common planning time structures in a master schedule, can instead afford teachers the chance to

take care of routine tasks in the course of demanding teaching schedules. Finally, *outcomes* display the effects of artifact use on practices.

In the unfolding of practice, artifacts result *from* intentions. But from the perspective of analysis, artifacts point *toward* stories of how designers build and practitioners use tools in local contexts. Thus, from the perspective of analysis, Type 2 research is more concerned with the sense made around artifacts than the creation and dissemination of specific artifacts. Pressing on artifact creation and use discloses stories of how problems were solved, how resources were used, constraints were recognized and overcome, affordances exploited, and goals intended. Type 2 research involves identifying the artifacts relevant within a local system of practice by interviewing teachers and leaders throughout the school. Researchers must then follow the practices enabled by the artifact in order to trace the relation between features and affordances. Faculty meetings, for example, may fail to afford intended discussions about student work, but faculty members may instead begin to participate in discussions of how formative assessment relates to lesson design. The observation of artifact enactment moves beyond Type 1 fidelity measures to explore the Type 2 adaptation of artifact features to local concerns. Inquiring about how certain artifacts came to act as resources for subsequent practice functions as a catalyst for reflective practice as practitioners recollect the influence prior design efforts can have on future practice.

Taken together, artifacts comprise *systems of practice* that situate teaching and learning in school (Halverson, 2003). Education practice is typically framed by a system of practice. Inquiry into the local system of practice reveals the affordances and obstacles for change. For example, a school with strong assessment practices in literacy can typically trace the origins of strengths to key artifacts such as collaboratively designed assessments, a district-provided

phonics training program, and team-teaching structure that allowed for distributed expertise. Once identified, schools can reflect on the paths that led to the design and implementation of these focal artifacts. Identifying the artifacts local actors select from their systems of practice opens a Type 2 window on the significant focal practices.

Linking Type 1 and Type 2 Inquiry Into an Iterative Research Model

Type 1 and Type 2 approaches to inquiry both address the challenge of how to improve teaching and learning in schools. Both seek to provide reliable knowledge for practitioners to improve local practices. Type 1 inquiry seeks to provide practitioners with reliable estimates of the effects of artifacts on learning; Type 2 inquiry aims to produce reliable practical guidance for how artifacts might be situated in local systems of practice. Further, Type 1 and Type 2 approaches to inquiry fall readily into an artifact analysis model. Type 1 research measures artifact outcomes in terms of designer intentions. Implementation fidelity is determined by the match between intended features and actual affordances. From a Type 2 perspective, the inevitable gap between feature and affordance is the site of productive research. Considering the variance between intended and actual effects produces evidence about design quality, and also provides insight into the conditions of practice. Understanding how users perceive artifact features can lead to better artifact design. Tracing the Type 2 patterns of how users interpret artifact features provides insight into emergent expertise.

The differing markers of quality of Type 1 and Type 2 research is reflected in Bruner's (1986) distinction between paradigmatic and narrative reasoning. Paradigmatic claims (Type 1) are true across contexts and in all situations; paradigmatic methods are organized to reliably and validly verify causal claims. Paradigmatic knowledge grows into a knowledge base that serves both to ground future investigation and to provide opportunities for further retesting and

reconfirmation. Narrative reasoning (Type 2), however, rests on different confirmation grounds. Narratives are "true" when they ring true, when they flow from and are confirmed by the particulars of experience. Narratives trace how our focal practices hang together. Stories come to constitute our identities and to challenge our everyday understanding (and interpretation) of events (Schank, 1990). Successful Type 2 narratives resonate with practitioners while providing alternative interpretations of commonly referenced artifacts within established systems of practice. Eisner's (1991) concepts of coherence, consensus, and instrumental utility apply as criteria for the results of Type 2 research.

A Type 2 research agenda assumes that, in our continuing search for solutions to the problems of teaching and learning, we have rushed past careful consideration of the actual practices we wish to change. This ignorance is shockingly apparent in our knowledge of the everyday practices of school leaders. In the leadership policy research community, for example, we have many models for how leadership practices *should* unfold, and equally many detailed accounts of how education practices are hopelessly broken, corrupted or misguided, but we lack adequate knowledge of how staff are actually hired, how teachers are actually evaluated, how student services are actually delivered, how leaders actually build master schedules, how school discipline policies are actually developed or enacted, how budgets are actually developed, or how resources are actually allocated. A Type 2 research agenda seeks to marshal appropriate qualitative and quantitative research methods to fill in these gaps in our knowledge of leadership practices. Type 2 models do not seek to supplant Type 1 work. Instead, Type 2 models seek to provide more detailed descriptions of the world Type 1 theories of action seek to change. An early benefit of greater access to Type 2 knowledge may result in more "educative" policies that better anticipate and facilitate the conditions for implementation (Cohen & Barnes, 1993). The

real potential for Type 2 research, though, is to generate new approaches to addressing the problems of public education that are grounded in actual school experiences. Type 2 artifact-based narratives promise to situate best practices in recognizable contexts so that novices can draw on and extend local knowledge and expertise in change efforts. Generating viable opportunities for change, by exploring how focal practices are situated in systems of practice, can show how education is itself capable of developing models to solve its own problems.

Type 3 Inquiry: The Contextualization of Design

When we began the DRP seminar, we had the artifact analysis model (Figure 19.1) and the iterative relationship between Type 1 and Type 2 inquiry in mind. There were several students in the class, however, who did not see their own research in these terms. As critical theorists and historians, they took issue with our focus on artifacts and design. They reminded us of the rich traditions of critical and historical inquiry that have long constituted much of the research landscape in education policy and leadership. These traditions might not accept on our totalizing definition of education as design. A critical perspective, for example, might cast doubt on the scope and legitimacy of the Type 1-Type 2 artifact analysis model as constitutive of education research as an enterprise. A design model might merely be the latest in a long list of efforts to technologize education research in order to obscure the underlying social forces at work in contemporary education discourse (cf. Apple, 1996; Giroux, 2009). The Type 1-Type 2 reduction of education research to the selection of proven means to tested ends, justified by the insistent refrain “no child left behind,” makes it increasingly lucrative to engage in what proponents tout as “non-ideological” assessment research and marginalize those who continue to investigate the interests such policies serve. Critical race theory, for example, argues that policies typically underplay the role of race in policy artifacts designed to promote economic opportunity, and that

the role of the researcher is not to show how the policies can be implemented, but to bring the tacit assumptions and implications of race and equity to light for public consideration (Ladson-Billings & Tate, 1995).

Historical research in education also calls the Type 1-Type 2 artifact analysis model into question. Historical inquiry can show how contemporary design models movements fail in ways similar to past efforts. For example, Nelson's (2005) description of how efforts to address issues of equity and learning in the Boston public schools fared in the 1950s and 1960s serves as a cautionary tale for current federal efforts to influence education in local political communities. Historical inquiry also brings to light the contrast between prior times and our own. Rudolph (2002), for example, shows how 1960s educators assumed that the power of science (and scientists) to transform our lives could also transform classroom practices. These cultural assumptions seem far away from the contemporary reduction of science learning to literacy development in elementary schools driven by accountability requirements. The rich, evocative contextualization of historical research calls into question the rather mundane proposed reduction of education to a quasi-technical matter of choosing means and measuring ends.

Instead of abandoning the Type 1-Type 2 model in the face of these critiques, we began to wonder how critical and historical perspectives could re-introduce a social, political and economic depth missing from our design perspective. Type 1 research focused on the outcome of education interventions; and Type 2 work focused on the context of practice. We began to consider a new perspective on design, Type 3 research, that would help us to investigate the larger social and historical contexts in which education efforts are situated. Type 3 research contextualizes design and problematizes the simple account of how artifacts are situated to influence learning. When Type 3 inquiry is framed in terms of the artifact analysis model, it

reveals how critical and historical research can deepen our understanding of education as design for learning (Figure 19.2). Thus Type 3 inquiry suggests a *hermeneutic* dimension that situates artifact design and use in the lifeworld. We need not abandon our arguments about "education as design for learning" expressed above. Education could remain defined as an intentional effort to organize teaching and learning for certain outcomes. However, enclosing the outcomes-and-practice emphasis of Type 1-Type 2 research in a Type 3 perspective provides a framework in which design can be interpreted in terms of wider worlds. Here we (briefly) highlight three areas where Type 3 contextualization and critique deepen our understanding of the "education as design for learning" metaphor: (1) problematizing *intentions,* (2) highlighting the distinction between *features* and *affordances,* and (3) problematizing *outcomes.*

[Insert Figure 19.2 about here]

Figure 19.2 Artifact Analysis Model + Type 3

[End Figure]

Problematizing Intentions

Type 3 restates the direct translation of artifact intentions and features into outcomes in several ways. First, Type 3 research problematizes the concept of intentions. Some artifacts are indeed built by designers for express purposes. In these cases, intended uses are inscribed into artifact features in the form of directions or incentives for proper use. In most cases, though, artifacts are shaped as much by the social context of development as by the designer's intentions. Critical theorists document how common beliefs about the nature and purpose of education, or the desired goals for school systems, are developed through public discourse or through

economic and social conditions. Even the expressed intentions themselves are shaped by economic and racial epistemologies not typically brought to light in the artifact development process. Nichols and Berliner (2007) for example, develop a counter-narrative that casts doubt on the stated theory of action at work in national high-stakes accountability policies

Once released into common use, artifacts also take on lives of their own. Commonly used affordances are seen as features, and the original connections between intentions and features can be effaced. For example, the common annual school calendar, with its agricultural roots, has long lost its original intention of protecting the harvest season while acquiring new justifications and requirements that were formerly seen as novel uses. Historical analysis documents the evolution of affordances into features and how artifacts lose connections with designers over time. Type 3 research excels as a diverse body of practices that can expose the tacit strands of intentionality at work in artifact development.

Highlighting the Distinctions Between Features and Affordances

Type 3 research uncovers how artifact feature sets are typically under-delineated. Practitioners need to work with artifacts to learn how new features enable (or prohibit) practices, and researchers can document how the unfamiliarity of new features can obstruct the very practices artifacts were intended to promote (Spillane & Thompson, 1997). The features of artifacts themselves, however, also confuse the distinction between features and affordances. Artifacts, such as textbooks, carry explicit messages about what needs to be taught and learned, but also convey a raft of tacit content. Critical theorists have long studied the tacit features of curriculum dissemination via textbook publishing and distribution, and have documented a hidden curriculum that enables the reproduction of social and economic status (e.g., Anyon, 1981; Apple, 1988). Further, the formal characteristics of artifact types can override innovative

features intended to shape practice in new ways. Although a new series of textbooks, for example, can promise to organize disciplinary knowledge in novel ways, prevailing features, such as pagination, static imagery, and mass production, constitute a tacit feature-set of textbooks as status quo knowledge artifacts. New media researchers take a different approach to considering the formal feature-sets of established media by studying how access to learning can be organized in entirely new ways, such as affinity groups (Gee, 2003) or participatory cultures (Jenkins et al., 2007). Uncovering the underdeveloped and tacit characteristics of artifact features has proven to be fertile ground for Type 3 inquiry.

Problematizing Outcomes

Type 3 inquiry also problematizes outcomes. Type 3 research questions not only the relation of means (artifacts) to ends (outcome), but also investigates the nature of what counts as an outcome. As described above, the measurement of causal inferences from artifacts is a hot topic in Type 1 research. Much of Type 1 debate has focused on the methodological issues of ensuring the conditions under which inferences can be drawn from test scores; much of the Type 2 discussion has focused on creating the conditions for appropriate artifact implementation. Type 3 researchers investigate the value of using test scores as the relevant outcome measure for education. For example, researchers from a variety of traditions have critiqued how statewide standardized tests are used to measure student learning (e.g., Koretz, 2008; Nichols & Berliner, 2007; Noddings, 2007; Ravitch, 2010). Type 3 critiques also contrast outcome expectations to demonstrate the inherent conflicts built into artifacts. Nieto (2009), for example, describes how equity goals can conflict with, and ultimately become corrupted by, expected school and system outcomes for English language learners. These types of critical inquiry create room for reflective re-consideration of the designer's initial assumptions about outcomes.

At another level, Type 3 arguments examine the legitimacy of using any particular form of testing as a universal measure of education. This rich tradition of critique is rooted in Dewey's (1915) account of designing learning environments for student inquiry. Grounding learning in the experience of the learner, rather than the organizational requirements of what needs to be learned, continues to provide a compelling counter-narrative to the standards movement in school reform. Nussbaum (2010), for example, takes the perspective of defending the humanities by contending that teaching children to be compassionate can provide a necessary counterweight to the dominance of economic values and the professionalization of education. Murnane and Levy (1997) use economics to present a counter-narrative of "new basic skills" that argues that the kinds of knowledge we currently measure are not appropriate for a digital workplace. Jenkins et al. (2007) arguing that "participatory cultures" are shifting the focus of learning from measurement to authentic engagement with distributed, interest-based communities of practice. Each of these inquiry trajectories problematizes the conventionally accepted narrative of how to measure the quality of education efforts.

The artifact analysis model provides a guiding metaphor for how Type 3 approaches to inquiry might be integrated into a common education discourse. Type 3 research offers an interpretive, or hermeneutic, dimension to a problematize previously unproblematic assumptions in the design theory of change. Hermeneutic research questions the apparent clarity of intentions, artifact features, and outcomes often assumed by Type 1 and Type 2 research. Surfacing the tacit intentions, unstated features, and unanticipated consequences of design clearly serves a beneficial role in the overall effort to improve education efforts. Reflective investigations of the conditions and outcomes of design create a "space" for inquiry, grounded in the experience of current efforts, in which new avenues for investigation can emerge. Historical research provides

another dimension for reflection on design by showing how similar (and dissimilar) efforts have unfolded. Historical contrast can open a reflective space to consider the limits of current efforts and can raise awareness of new ways to address education issues. Integrating a hermeneutic dimension shows how the artifact design model is not only a process for understanding current practice, but can also serve as a generative source of new possibilities for design.

Education as Design for Learning

We have argued that the pursuit of knowledge around education as design for learning can unify disparate education inquiry. While learning happens naturally through everyday interactions, education involves the design of learning environments that aim to achieve specific goals via specific means. Educators use, create, alter, adapt, and ignore artifacts, in wider contexts of other artifacts, in order to achieve learning goals. When we began our doctoral seminar, we started with the premise that education is design for learning and that the artifact analysis model (Figure 19.1) captures the scope of inquiry for the study of this premise. Through our work with students, we expanded our model to include critical and historical lenses on artifact analysis (Figure 19.2) and (for the most part!) came to consensus with the group that this framework described the work that we do as education researchers.[4] Here, we took our initial argument one step further by giving shape to different approaches to inquiry in the context of an artifact design framework. Type 1 inquiry assumes a *positivist* approach to research that emphasizes the application of established social scientific statistical procedures to discern the effects of education artifacts. Type 2 inquiry aims to provide *practical* guidance on artifact development and implementation by mining the focal practices that emerge in everyday work. Type 3 inquiry provides *hermeneutic* perspective on the meaning of individual artifact design and use efforts, but also generates new ways of understanding the process of education as a whole.

An artifact design model points to how each tradition can contribute strengths to improving education research as a whole. Consider research in reading education. Type 1 researchers determine that a certain reading program produces the most robust third-grade learning gains across education contexts. Type 2 researchers report that practitioners describe the struggle to supplement basic curricula with narrative-based lessons that engage students in sensemaking around content areas. Type 3 researchers conduct critical analyses of how third-grade reading tests reproduce a two-tiered education system in which low-socioeconomic status (SES) students are taught basic skills and high-SES students are encouraged to engage in creative inquiry. An artifact-based analysis can bring each approach to inquiry into proper focus. Each research type considers artifacts at a different grain size. Type 1 researchers consider the effects of the individual artifact (reading program); Type 2 research explores the connection of the given artifact with other tools in the local system of practice; Type 3 research considers the motivations for implementing basic-skills artifacts in the social system as a whole. Asking each genre of research to consider practice from the perspective of the other would open new kinds of research questions. For example, attention to typical focal practice configurations at work in schools could help Type 1 researchers pose new kinds of assessment problems. Attending to the results of Type 1 research could help Type 3 researchers problematize their own (often overly ideological) assumptions about appropriate educational practices. And exploring the effects demonstrated by Type 1 research and the moral demands of schooling shown by Type 3 researchers might provide Type 2 inquiry with a better compass to discern the connections between the micro- and macro-tasks that comprise practice.

Currently, education research traditions seem to generate mutually exclusive paths of inquiry. Without a common context for inquiry, we are left with a fragmented, suspicious

discourse in which disagreement often devolves into acrimonious questioning of legitimacy. The divergence of traditions leaves each approach unable to address its own deficiencies. The methodological focus of Type 1 research, for example, can produce carefully measured effects of artifacts irrelevant to actual contexts of practice, and the post hoc focus on measurement of existing artifacts leaves Type 1 researchers unable to generate the next generation of education innovations. Type 2 researchers can get lost in the intricate everyday processes of work, and lose sight of the connection to system effectiveness or the moral context of practice. Type 3 inquiry can result in self-referential communities concerned with incessant critique without opportunities to directly apply findings to new forms of practice. We suggest that linking divergent approaches to inquiry may not only correct the deficiencies of each Type, but might lead to a wider discourse in which the extraordinary fertility of education research can be generated, implemented, tested, and critiqued at scale.

We have proposed that putting artifacts at the center of methodologies for education research suggests how the three types of inquiry can contribute to a common whole. Currently, creators and consumers of the three types of research we describe tend to see their efforts as competing. If education can be defined as the design for learning, then the active, constructive aspects of the design process can motivate all education researchers to seek better ways to generate and test insights in the contexts of everyday practice. The artifact analysis model can be used to frame which aspects of the "design for learning" researchers need to investigate. Rather than lead with methods (for example, hierarchical linear modeling, case-studies or ideological critique), we propose that researchers use design to situate their work within a common context of design for learning. We do not seek to change the way researchers do their work, or even to get them to abandon the "type" of research they do. Instead, we hope this model can begin to

build a conversation about shared enterprises and to identify what makes education research its own field of inquiry. The struggle to produce beneficial effects, to improve teaching and learning within and outside of schools, distinguishes education research from the social sciences and the humanities. Education researchers would do well to draw upon the work of peers across traditions to build the systems and practices that will be able to approach our national (and global) aspirations for education.

Notes

1. 1996: 79,981; 2007: 136,048. Source: U.S. Dept of Education, 2008, *Degrees in education conferred by degree-granting institutions, by level of degree and sex of student: Selected years, 1949–50 through 2006–07* (Table 303). Available at http://www.nces.ed.gov/programs/digest/d08/tables/dt08_303.asp

2. Traditions of education inquiry have evolved into movements in education research. Inquiry and research are used here as related, but not interchangeable, terms. *Inquiry* here refers to an individual or collaborative process of investigating answers to certain compelling questions. Inquiry can be conducted by both practitioners and researchers. (For details on the practices of practitioner inquiry, see Cochrane-Smith & Lytle, 2009). At a certain scale, however, most inquiry efforts coalesce first into research trajectories (aggregated inquiry efforts that result in more general insights), and then (sometimes) into research traditions (composed of regular methodological and rhetorical practices). In turn, prior research trajectories and traditions frame the range of legitimate exploration for subsequent inquiry. In this chapter, *inquiry* will refer to small-scale pursuit of specific questions, and *research* will refer to the large-scale traditions that guide institutional educational inquiry.

3. Available at http://ies.ed.gov/ncee/wwc/references/idocviewer/Doc.aspx?docId=19&tocId=4

4. Several students from the course have used the artifact analysis model to explain their own disciplinary work. See, for example, Karch (2009), Bass (2009) and Gnesdilow and Curwood (2009).

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