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Evaluating Classroom Practices Using Qualitative Research Methods: Defining and Refining the Process

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Abstract: We describe the evolution of qualitative research practices across several years of field testing the Learning by Design curriculum. A variety of methods have been employed for the purpose of developing a deeper understanding of learning and the learner. Our approach to qualitative research has changed over time as our evaluation goals have evolved, as no one practice is appropriate at every stage in a development project. Rather, what we've needed for comprehensive understanding of the ins and outs of learning environments has been a melding of several well-known methodologies along with development of strategies and tactics for data collection and analysis that allow us to identify essential features of a learning environment without spending all of our resources on evaluation.

Keywords: qualitative methods, middle school, assessment

Setting the Context

Formative evaluation of a curriculum development project is a complex undertaking. Understanding the success and potential of a curriculum unit requires more than documentation of what students have learned (or not learned) and how well they can use what they've learned. In order to refine a curriculum unit appropriately, we also need to understand what was responsible for those results. This requires making a mapping between intentions of the curriculum design, the ways those intentions were enacted, and the results that accrued. It requires, as well, understanding the affordances intended by the designed learning environment, and investigating, for each, whether it was present, how easy it was to recognize, how easy it was to use, and if it was not used, why not. We need to know how a teacher taught the material – her/his style, approach, methods, and rapport with students. We need to know how receptive the students were and what was going on in the classroom besides those things we expected. Such understanding is essential both to refinement of individual curriculum units and to development of principles for the design of effective learning environments.

Prolonged engagement and extensive observation are central to gaining an in-depth understanding of a classroom. This task calls for qualitative methodology. While it is labor intensive and requires patience as the emergent design and its results unfold (Fasse, 1993), documentation of a classroom's context is invaluable to the progress and success of implementing a curriculum design in real-world classrooms. But this kind of analysis requires methods that go beyond the tools of any one methodological approach. Ethnographic methods, for example, can be used to help us understand the social interactions in the environment and the affordances made available and ignored or made use of. But an orthodox ethnographic report-- i.e., "written cultural description" (Spradley, 1980 -- is time-consuming and inappropriate for focused analysis of the intentions built into design of an environment at this stage of development. Needed for comprehensive understanding of the ins and outs of learning environments we develop is a melding of several well-known methodologies along with development of strategies and tactics for data collection and analysis that allow us to identify essential features of a learning environment without spending all of our resources on evaluation.

We present our methodology-in-progress and how we got to it. Our evaluation is of several Learning by Design units. In Learning by Design (Hmelo et al, 2000, Kolodner et al., 1998), middle-school students learn science through a design approach. A posed design challenge (e.g., design a propulsion system for a miniature vehicle that will allow it to go over two hills, design a way of managing the erosion on a coastal island) provides students with motivation for inquiry. Attempts to address the design challenge are interleaved with investigative activities, allowing students to refine their understanding of key concepts, their ability to carry out important science process, their ability to be planful, communicative, collaborative, and reflective, and their solutions to the design

challenge, all at the same time. A system of classroom activities, informed by case-based reasoning (Kolodner, 1993), problem-based learning (Barrows, 1985), communities of learners (Brown & Palinscar, 1989), and cognitive apprenticeship (Collins, Brown & Newman, 1989), is designed to promote learning and acculturate students into an environment that values sharing of ideas, investigating for the purpose of informing a community, informed decision making, justifying based on evidence, building on what others have done, and critical evaluation.

During fall, 1999, and winter, 2000, Learning By Design is up and running in seven schools in several geographically and demographically diverse counties in the Atlanta area. We are running a field test of two physical science units and piloting a series of earth science units. The physical science and earth science units are at different levels of development. The field test for the physical science materials is at the polishing level. Although interested in the specifics of what's working, we are focusing on learning issues in these classrooms. The earth science materials are being newly piloted. Our evaluations in those classrooms are aimed at determining what does and doesn't work and how we could make materials. In both efforts, we put attention into teacher development issues – what allows teachers to be successful LBD implementers.

Current Qualitative Evaluation Methodology

Our evaluation methodology is quite intricate, though in the aggregate, we are using case study design to answer our how and why questions (Fasse, 1993; Merriam, 1988; Yin, 1984). Since case study design does not lay claim to methodology unique to itself, we are drawing from standard qualitative methods such as participant observation, interview, and video taped accounts (Fasse, 1993). They are being used in separate though intersecting components of the research project. In one of the case study components, for example, two student ethnographers are visiting physical science classrooms twice a week to understand the experience of LBD through the eyes of two groups of students. What do they experience as students? What kind of help from the teacher (and from peers) contributes to their success? What confuses them? How does their understanding progress? How well are they working together, and what kinds of extra help do they need to work together well? We carry this out in two classrooms where teachers are using our well-developed units – one teacher is quite proficient, and one is still learning. We want to understand the affordances provided by our materials and by the teacher for the students. We are learning from this, as well, some of the affordances our materials provide and don't provide for teachers.

But such detailed evaluation is inappropriate for our under-development earth science units and too time-consuming to use across all of our physical science classrooms. On the other hand, we have a need to understand how different teachers with different styles make the affordances of LBD available to students, how students are responding, student levels of engagement, what's difficult for students, what teachers do to make those difficult things doable in some classes, and so on. For this, we are following four strategies. First, we've developed two observation instruments to help observers focus their observations in all of the classrooms. While this flies in the face of qualitative methodology, we do have a practical need to make sure that our untrained observers include the taken-for-granted world in their notes. We visit each teacher at least once a week for observation. Some teachers, who we feel we can learn specific things from, we observe more frequently. Second, we interleave thick description (Geertz, 1983) from our observations with description derived from video documentary. We don't have enough of us to send two people at a time to classrooms, and we learned last year that when observers are charged with the task of simultaneously taking field notes and video recording, one suffers at the hand of the other. As we have a need for extensive thick description and video evidence of what we are observing, we video in our classrooms once every three weeks in place of field notes. Third, we meet every two weeks for the purpose of triangulation (Goetz & LeCompte, 1984; Lincoln & Guba, 1985; Measor, 1985; Merriam, 1988; Spradley, 1980, that is, to review what we are, draw out what we are learning, provide advice for curriculum developers, and refine our observational. Fourth, we meet with our teachers in focus groups every six weeks to learn what works and doesn't work in their classrooms and to allow them to share their experiences with each other.

Classroom Observations

Our observation team includes trained ethnographers, practiced observers, student researchers, and a teacher liaison all doing passive to moderate participant observation and interviews—both formal and informal (Goetz & LeCompte, 1984; Measor, 1985; Merriam, 1988; Spradley, 1980). The students are undertaking in-depth microgenetic analysis in two classrooms. One of our ethnography team visits each classroom about once a month to understand its culture, but most of her time is going into twice-weekly observations of two of our most promising physical science teachers. Our other ethnographer does the same in the classroom of one more of our promising

physical science teachers. These three teachers exemplify, for us, the best-intentioned novice LBD teacher. Each has a different kind of intuitive understanding of what LBD is, and each is a strong teacher, but all are beginning LBD practitioners, and the expertise among the three teachers is quite varied. Some know science better than the others do, some have experience focusing on science process, and so on. They get things mostly right, but in different ways. We've learned many things from these teachers about teacher development and about making LBD work. For example, the "rules of thumb charts" that we added to LBD recently are working well to draw connections between the design challenge students are working on and the science they are learning. These teachers show us how to make those charts work. We've learned, as well, that we need to help teachers be more deliberate in stressing the planful aspects of design and that we need to figure out a way of managing planning so that it combines hands-on work with materials with the cognitive work of designing. The other observers on the project are making once a week or once every two week visits to the remaining physical science classes and to the earth science classes, getting periodic "snapshots" of those classes and understanding what works and doesn't work in the earth science units. Our teacher liaison visits our classrooms periodically and interacts with teachers on the phone or by email to find out what is working and what isn't in their classrooms.

The data's audit trail includes field notes from observations and interviews, the two observational instruments (IIT and OPT), expanded written accounts, transcriptions of audiotapes, and written summations of the videotapes (Lincoln & Guba, 1985; Spradley, 1980). We have experimented with and plan to continue using NUD*ST, a specialized database for qualitative research organization and analysis, as an aid to managing the assortment of data from multiple sources.

Observation Instruments

The two instruments we've developed have different functions. The Immediate Indicators Tool (ITT) (Fasse, Holbrook, Gray, 1999) is designed to help observers record a quick "snapshot" of the modality of the classroom environment. Observers make a judgement and place an 'X" along a continuum between discreet items we've identified as indicators of classroom environment. (e.g., "Displays in the classroom are: All student made vs. All purchased"; "Materials are dispensed by: Teacher on request only vs. Self-serve, student managed"). All items are checklist-type, and the user is instructed to briefly justify, explain, or describe their notations after leaving the classroom. The purpose of this document is to remind our observers that everything in the classroom/school environment is data not to be dismissed as minutia. It takes observers fewer than five minutes to fill this form out – some of it as they enter the classroom, some of it just before they leave, and it provides us with easy-to-digest documentation about the ongoing development of our LBD teachers as facilitators in a learner-centered classroom and the differences in culture between our LBD classrooms and our more traditional comparison classrooms.

The other observational tool, the Observational Prompt Tool (OPT) (Holbrook, Gray, Fasse, 1999), is an exhaustive, detailed list of LBD elements that can be used as a reminder of or tutorial to help the observer focus his/her field notes. It prompts for what to look for during individual, small-group, and whole-class activities, what to look for during particular kinds of activities (e.g., gallery walks, messing about, whiteboarding), and what to look for when certain goals are active (e.g., generating questions for inquiry, investigation). Table 1 shows two selections from the Observation Handbook, a selection of guidelines about what to look for in teachers' interactions with students and a selection about gallery walks (fancy show and tell). An observer would use both sets of guidelines while observing a gallery walk – focusing both on the mechanics of the gallery walk and on the teacher's use of questioning to help students learn from their own and peer's presentations. As scaffolding for our observers, this tool provides guidelines for what to look for in the classroom and structure for their individual field notes. As tools for documentation, they help us ensure that our multiple observers are focusing on similar issues and they provide for us a first pass at organizing our documentation.

Both instruments were developed as a direct response to previous implementations. We learned then how difficult it is for untrained observers to take useful field notes. We helped student observers learn what LBD was about, learn about observation, and learn what to look for. Nonetheless, their field notes were all over the place. Once told to profile engagement, for example, the description would read "engagement is good, the students are listening to the teacher." These new tools were created on the one hand, to help our observers focus, and on the other hand, to help them understand the kinds of things they ought to be documenting. Both instruments are used both in LBD and non-LBD classrooms (we need to analyze what's going on in non-LBD classes to understand what special affordances LBD provides).

Questioning	*Gallery Walks*
What are teacher questions about?	Who initiates the session?
What are student questions about?	Who displays the artifact?
What question types are being used?	Who asks question?
Purpose of teacher questions?	Who gives feedback?
How does teacher deal with off-topic questions? (each question has a menu of types and a set of examples associated with it)	In what ways is feedback constructive? Are comparisons made between groups or to previous work of the presenting group?

Table 1: Excerpts from the Observational Prompt Tool

Video Documentation

Video recording is important for three reasons. First, it provides an archive for substantiating and revisiting our findings. Second, the tape is useful for micro-ethnography. Third, as an added benefit, we can use video recordings of exemplary practices during later teacher professional development. As stated above, we are dedicating an element of our manpower exclusively to video taping a single identified group in one classroom on the north side of town and one on the south side of town twice weekly throughout the run of the program. While our focus right now in evaluating those tapes is to understand LBD from the students' point of view, we expect to be able to glean much more from those tapes – documentation of teacher development, documentation of conceptual change in students, and so on. The taping being done once every three weeks in other classrooms provides our archive – by focusing the taping where the action is, we collect a variety of examples of teachers and students in several different configurations.

Bi-Weekly Meetings

An invaluable element of our formative evaluation plan has been the triangulation that has occurred during regularly scheduled (bi-weekly, as much as possible) debriefing meetings that include observers and curriculum designers. This is where we put it all together. In the early stages of the pilot work, spring 1998, sessions were held weekly and served as a debriefing for the curriculum designers to learn about what was going on in the field and as an opportunity for the ethnographer to determine the next focus in the emergent design of the research itself. Later, during the first field test period, fall 1998, when we had multiple observers, meetings served as a venue for sharing observations among the larger group and for refining observation focus. This oral account of the observations proved to be of great value to the curriculum development staff (even though, as stated earlier, the field notes themselves were less useful than we would have liked).

Currently, we are observing in more classrooms than previously, and these meetings are serving several purposes: (i) observers are learning from each other, (ii) through comparisons of what we are seeing in different classrooms, we are able to draw hypotheses about the kinds of teacher qualities that make for successful LBD implementation, (iii) those same comparisons help us to understand what needs to be included in our teacher development materials and workshops, (iv) we glean understanding of refinements needed in the curriculum or in the way we've written pieces of it, (v) we are learning about teacher development, and (vi) we can refine our observation strategies as needed. The data being reported for discussion fall into two categories: learning issues and practical matters. As we develop lists of both, we devote later discussions specifically to each.

Participants in the meetings arrive armed with ideas and/or revelations from their sessions in the field. This can be in the form of the OPT, the ITT, field notes, or transcripts from video tapes—whichever form of data collection each individual participant has employed. Together, we collaborate on a search for patterns and/or anomalies. From this convergence, we establish a focus for subsequent observations. For example, from a recent general discussion of observations and field notes, we have begun an in-depth focus on the ways that teachers use

questioning to propel classroom discussions. We are particularly interested in watching the development over time of questioning skills. Preliminarily, it appears to be an acquired skill as teachers go from probing students for predictable answers ("The full shopping cart has more what?", students yell out answer "mass", teacher responds "Yes, mass.") to being able to use open-ended questions to allow the students to drive the discussion ("Does anybody have any ideas about the stopping qualities of a full versus an empty shopping cart?" followed by many student responses eventually leading to use of the word mass and an associated discussion.) By comparing selected sections of field notes from specifically-chosen classrooms (in this example, novice LBD teacher vs. expert) as well as with segments of video tape, and discussing it in depth for the purpose of adding context, we can develop a comprehensive knowledge not just for teacher development but also to learn more about the teacher as learner and students as teachers. In fact, it is from just these types of procedures that we arrived at the need to change our terminology from "student-centered" to "learner-centered". This serves our needs to inform what we are learning about learning and learners as well as what we need to provide in the way of teacher support and training for the LBD curriculum. It is interesting that we create our knowledge in the same collaborative fashion that we promote in our curriculum.

How We Got to Where We Are

From the earliest days of the LBD project, a qualitative component has been included to provide contextual understanding of the classroom for curriculum development team members. But the role of the qualitative component has changed over the course of the project. Early in the development of LBD, predating most of today's staff, an ethnographer was on board to provide a thick description of the culture (Gertzman & Kolodner, 1996). At that time, the program was morphing from Problem-based Learning (Barrows, 1985) into something more like its current LBD configuration. There were ideas and projects and mini-units for teachers to incorporate into their curriculum, but it had yet to become the comprehensive, freestanding curriculum it is today. A couple of pioneering classroom teachers were experimenting with adapting these projects to their settings (Hmelo et al, 2000). It was the ethnographer's task to educate the curriculum design team on the affordances and limitations of the classroom so that the project could be tailored to fit the real world. The ethnographic reports kept the design team's ideas and good intentions grounded in the reality of the classroom. Analysis of ethnographic reports allowed us to identify the ways in which teacher enactments fulfilled our expectations and didn't and what was easy and difficult for our teachers, and provided evidence that allowed us to identify what would become LBD's essential components. Hmelo et al (2000) presents an analysis that led us to understand how important it was for students to be building and designing something with working parts and for us to help teachers learn the affordances of design, especially its iterative component. This analysis helped us differentiate our design-based approach from other inquiry approaches and to better define the sequence of events we wanted in the classrooms and the ways we wanted students to be interacting with each other.

In spring of 1998, when we moved toward piloting our first LBD units, the focus of the qualitative component shifted away from an ethnographic account to a case-study design. Four brave teachers were trying out units that we had designed based on experiences in those pioneering classrooms. Ethnography of schools and classrooms was no longer our highest priority. Now the project called for the use of qualitative methods to monitor the day-to-day progress of the students and teachers as they put theory into practice. The ethnographer traveled the circuit between the four schools gathering the "what's happening here" story and reporting it back to the design team in extensive field notes and oral narrative on a weekly—and sometimes daily—basis. Occasionally, members of the curriculum development team were also in the field taking their baby's pulse. There were two areas of focus: the practical and the theoretical. The data informed our knowledge of curriculum development, learning theory, teacher training, and teacher support. There was a need to know which ideas were working and which were flops and under what circumstances each occurred. There was a need to know practical things like how the design of the j-hook impeded the trajectory of the vehicles and the role of wheel size on the success of the trials. There was a need to find out if and how LBD encouraged or enhanced learning. And then there emerged another, unpredicted though central, focus of observation: the role of the teacher in establishing the culture of the LBD classroom. It is from the ethnographer's observations during this first full-scale implementation that we began to develop a real understanding of the pedagogy required for the success of LBD in the classroom. Observable characteristics of teaching style and classroom management techniques were identified as predictors of success. These notions were then incorporated into the summer workshop for teachers and into the publication of the first LBD teacher and student texts as well as being used to provide teacher support during the implementation.

By the fall of 1998, the LBD project advanced to the field test level as more teachers (8) joined. At this point, we provided textbooks for students and teacher handbooks for teachers. Our goals were to continue using the qualitative data to inform our growing knowledge of the practical, theoretical, and pedagogical aspects of LBD in the classrooms. However, there was an additional desire to record actual evidence of occurrences of students and teachers experiencing the ah-ha moments that LBD is designed to encourage (i.e., engagement, reflection, science talk, case-based reasoning, etc.).

This is where we are today, though with more teachers (12) and with more units. Our current observations are targeted towards both piloting and field-testing. In our earth science classes, we are aiming to answer the questions we asked of our physical science units during spring, 1998. In our physical science classes, we focus on understanding LBD's affordances and on documenting learning as it occurs.

We are, of course, integrating qualitative methodology with traditional quantitative assessments of what students know, performance assessments showing us what they are able to do, and analysis of embedded assessments – the documentation students create as they engage in LBD's activities. At each stage in our need to know, the qualitative component of research has been restructured to fit the new needs, whether with a ethnographic narrative of the classroom culture or field notes from participant observation or videotape. The development continues.

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