

Making Learning Visible

BY TOM DRUMMOND & KALYN SHEA OWENS

The documentation of a learning group makes learning visible for the learners, the faculty, and leaders in institutional development.

An understanding of learning groups and the power of meta-cognition (learning to learn) can alter practices in the classroom, in faculty conversations, and between institutions. Our contribution to the scholarship of teaching and learning is to provide an example of a learning group in first year general college chemistry where a post-modern examination of teaching and learning becomes irreducible: without isolated parts. This examination seeks living well (Nicomachean Ethics of Aristotle), continuous unfolding interpretation (Hans-Georg Gadamer) and practical experience as education (John Dewey).

Learning groups of students, of faculty, and of institutional development experts — enabled by documentation and dialogue — offer an opportunity for self-sufficient and continuous improvement in teaching and learning in a democratic way. We show how documentation of a learning group can be a provocation to insitutional learning groups, which, when viewed simultaneously, can alter the culture of pedagogical practice.

MULTI-LEVEL PROJECT

Our story offers an expanded view of assessment that involves structured and collaborative methods for both observing learners as they are engaged in their work and looking carefully at the work they create. We began by videotaping students working in small groups on problems in chemistry, transcribing their conversations, and examining representations of their understanding. We then brought these traces of learning to faculty who work in small groups, in a parallel universe, to confront problems of pedagogy.

Documentation opens the possibility of a scholarship of teaching and learning that alters the cultural expectations faculty and students bring to their participation in classrooms and conference rooms. The concrete experience of a learning group of students brings faculty in touch with their own experience as learners working as groups of faculty, which exposes the limitations of traditional expectations and isolation. Documentation allows people at all levels of education to cooperatively examine what we as learners do, how we think, and how we think about our thinking.

METHOD

We videotaped students working in small groups on a single problem in chemistry, transcribed their conversations, and examined representations of their understanding. We converted the recording into slides and text to create what we call a **capture**, a slowed-down view of interdependent learning. We brought our capture to faculty, to participants in the classroom, and to state leaders in institutional development to co-construct an evolved level understanding with nuance, depth, and positive regard. We recorded these subsequent conversations, converted them into captures also, and examined the results.

QUICK OVERVIEW

Below is a image of the large poster we created to show the levels of investigation. The original event, **The Dissociation Capture**, became a provocation for the construction of meaning by different audiences represented by the six documentation blocks with arrows pointing to what each were examining.

Documentation Creates Space to Reflect upon Teaching, Learning, and Assessment

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science | hermeneutics | praxis

Philosophy | Theory | Application

Our contribution to the scholarship of teaching and learning is to provide an example of understanding, interpretation and application as one irreducible whole.

Method

We videotape students working in small groups on problems in chemistry, transcribe their conversations, and examine representations of their understanding. We bring these traces of learning to faculty, to participants in the classroom, and to state leaders in institutional development to co-construct an understanding in nuance and depth. We record their subsequent conversations and examine them, too.

Results

In listening to these dialogues we become able to see school not as a place for transmission but as a place for a continual series of changes in understanding for everyone involved.

It becomes strikingly apparent that both learners and teachers face the problem of working cooperatively together, of solving problems, of examining habitual practices, and of facing and embracing, with self-critical awareness, one's own own knowing.

Discussion

Documentation offers the possibility of creating spaces for participants in schools — faculty, students, administrators, staff, parents, and politicians — to make meaning together, to create shared values and to transform culture towards an ethical ideal.

The examination of traces of events in the classroom creates a space for dialogue and disagreement with the possibility to create — through our participation and willingness to risk — a sense of public freedom and a rediscovery of the solidarity we share in being human.

Chemistry Faculty Discuss Dissociation

Program faculty talk about the problem of teaching a difficult concept

INQUIRY: What meaning do program faculty see?

METHOD: Read the capture; discuss together.

DOCUMENTATION: Videotape; create a capture and EPV.

Faculty talk more clearly because they have a discussable referent.

Faculty devise a way to assess the development of the concept of dissociation across the program over two years.

Faculty share values of an aesthetic of thinking they wish to develop across their courses.

Faculty share a teaching culture: becoming a unified, reflective pedagogical team...

State Leaders View the Dissociation Capture

Experts in institutional development reflect upon the learning group at work

INQUIRY: What meaning do state assessment liaisons see?

METHOD: Read the capture; discuss in small groups.

DOCUMENTATION: Videotape a group; create a capture.

Leaders see the thinking processes of the students as evidence of critical thinking as an institutional outcome.

Leaders see discussions of documentation such as this could lead faculty to more clarity about developing those outcomes in their courses and programs.

Leaders find rapid communication among themselves even though they come from different colleges with different approaches and structures.

The beginning: The Dissociation Capture

Encountering a difficult concept — both to learn and to teach

INQUIRY: Why is the concept of dissociation so problematic in first year chemistry?

METHOD: Videotape one group's first encounter.

DOCUMENTATION: Convert to text and pictures.

The entire capture (all slides) shows the students approaching the problem with their existing frameworks of understanding, posing task-focused questions, offering conjectures and partial understandings for others to consider, disagreeing, and supporting each other's contributions.

They continue to work for their own understanding as instructor listens. She reflects back to them their own thinking and poses meta-level questions.

State Leaders View the Faculty Capture

Experts in institutional development reflect upon faculty perspectives

INQUIRY: What meaning do state assessment liaisons see?

METHOD: Read the capture; discuss in small groups.

DOCUMENTATION: Videotape a group; create a capture.

Leaders see the way reflections on documentation shifts the focus from defending habits of practice to listening and valuing student competence.

Leaders note that distractions in the dominant discourse (teaching, learning and assessment) disappear when we create communities of practice through reflective conversation around documentation.

Students Reflect on the Documentation

The members of the class discuss the Dissociation Capture and its effects

INQUIRY: What do the students see in this encounter?

METHOD: Participants read their own statements as the entire class views the slide show.

DOCUMENTATION: Videotape interview; create a capture.

Learners see different meanings, contributing to a deeper, more complex understanding.

Learners want to talk about how they relate to each other as they encounter the content to be learned.

Learners come to understand themselves in a social context of comfort, risk, and interdependence.

Learners participate more powerfully — taking more risks, being thoughtful, posing theories and conjectures, building on other's ideas.

Faculty View the Dissociation Capture

Faculty in other disciplines reflect upon group work and their own teaching

INQUIRY: What meaning do non-chemistry faculty see?

METHOD: Read the capture; discuss in small groups.

DOCUMENTATION: Videotape a group; create a capture.

Faculty who viewed their discussion begin meeting informally to discuss their further investigation of classroom practices and share stories.

Discussions among faculty across disciplines focus on educational practices (group dynamics, courage, problem posing) more than content.

Faculty become more aware of their own teaching style and assumptions.

Faculty find they let students struggle with problems more and help less.

1. **The beginning: The Dissociation Capture** was a recording of one group in the first quarter of a year-long general chemistry sequence. Two weeks after videotaping the group, the entire class viewed the slide show capture. Together they discussed what they observed.
2. Our first level of expansion was to show this capture to the faculty in the chemistry department at our college. The upper left **Chemistry Faculty Discuss Dissociation** was a recording of their discussion after watching the dissociation capture.
3. Since the results were so intriguing, we took the dissociation capture to Cascadia College where faculty from many disciplines discussed the capture, and we recorded one group's reactions. This is the lower right block of the poster, **Faculty View the Dissociation Capture**.
4. The next logical step was to present this faculty capture and the original student capture to a gathering of the state leaders in teaching, learning, and assessment. These Assessment Liaisons, one from each campus in the

community college system, first watched and discussed the dissociation capture, **State Leaders View the Dissociation Capture**, and then watched and discussed the Cascadia College faculty capture, the lower middle block, **State Leaders View the Faculty Capture**.

5. Finally we revisited the original students at the end of their three-quarter sequence in general chemistry. We were curious to see if there was any long term effect of viewing that one dissociation capture. This second capture of students is depicted in the upper right corner, **Students Reflect on the Documentation**.

THE BEGINNING: THE DISSOCIATION CAPTURE

Over a period of four years we have been videotaping students working in small groups on problems in chemistry, problems where the learners are helping each other explore difficult concepts and representing together their emerging understandings. We transcribed their conversations and selected still images that related to each statement. These were put into a slide show that enabled not only ourselves as their instructors but also the students to revisit their experience.

The beginning: The Dissociation Capture

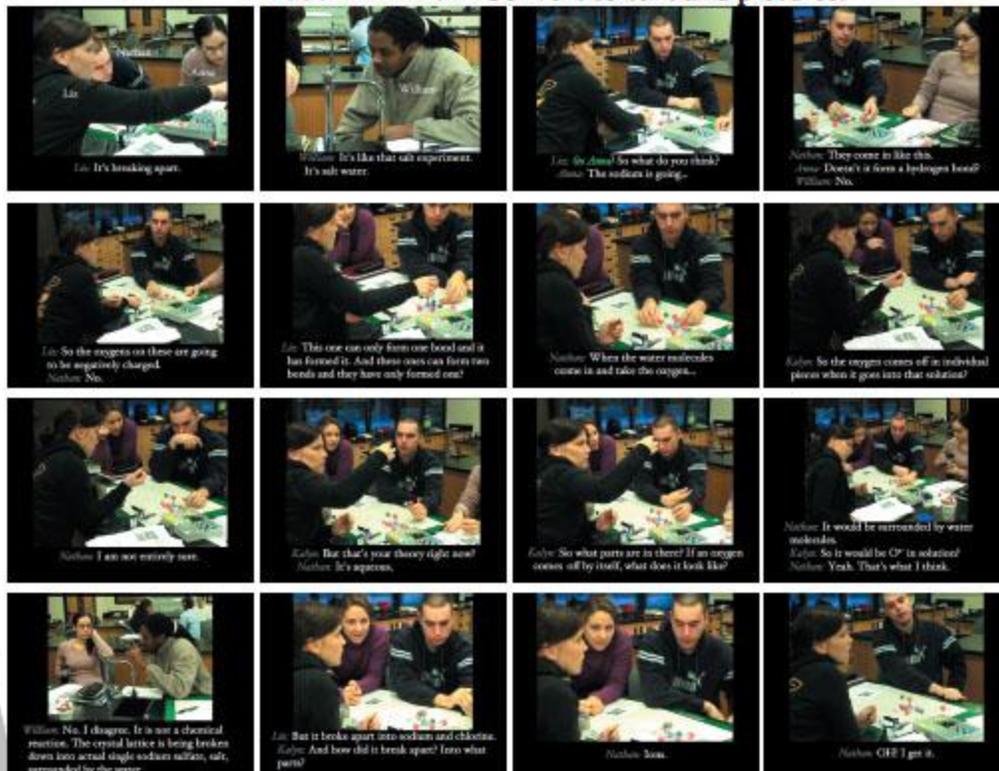
Encountering a difficult concept — both to learn and to teach



INQUIRY: Why is the concept of dissociation so problematic in first year chemistry?

METHOD: Videotape one group's first encounter.

DOCUMENTATION: Convert to text and pictures.



The entire capture (118 slides) shows the students approaching the problem with their existing frameworks of understanding, posing task-focusing questions, offering conjectures and partial understandings for others to consider, disagreeing, and supporting each other's contributions.

They continue to work for their own understanding as instructor listens. She reflects back to them their own thinking and poses maieutic questions.

One of these difficult concepts we investigated was dissociation, something as simple as table salt dissolving in water, but very confusing at first to understand. In this case the students were shown a glass jar containing sodium sulfate, a salt, and water and asked to represent what happened with Lewis dot diagrams. What is confusing is that in dissociation the salt breaks apart into ions not separate

molecules of sodium and sulfur. The students realize that if one puts sodium into water it dances and sizzles and, obviously, that is not happening here.

LEVEL 1 — IMMEDIATE PARTICIPANT REFLECTION

After showing the slides to that same class, all of whom had participated in the representation of sodium sulfate in water task two weeks previously, we asked them to write responses.

WHAT DID YOU NOTICE IN THIS EXCHANGE?

- Problem solving works better in groups. One person might speak her opinion on what is happening and then the other group members would agree or disagree eventually forming a collective consciousness.
- The group worked together by asking each other questions. They would reflect on ideas and try to prove why and how something would or wouldn't work. The group filtered through their knowledge to come to a conclusion.
- Good communication between them. Everyone participated.
- From talking to one another people change their minds and their thoughts sort of evolve together. A lot of feedback was exchanged with each individual stating their understanding of the work problem they have been given.
- It was a rotational conversation within the group, with everyone's idea changing the course of thinking and the conversation.
- It's a learning process. Instead of stagnant thoughts, the group provides and acceleration process for the topic.
- Everyone was involved. They used different analogies to try and explain what was going on.
- There was equal exchange of ideas, clearly a group evaluation of thought to reach conclusions with each supporting or questioning arguments to strengthen overall learning.
- There wasn't any negatives or denial of ideas.
- I also noticed that these discussions were a lot more productive than what happened in my group. Working in a group makes learning more interesting because it involves inputs from different perspectives. Sharing ideas improves the learning experience.
- Some group members talked more and others less, but all were participating. Also, some drew more, while others appeared to use hand motions. These are different learning styles.

WHAT COMES TO MIND ABOUT YOUR OWN LEARNING AND PARTICIPATION?

- I can learn when people are dogmatic, but I enjoy learning more when they are nice. I can be dogmatic, but I can also learn not to be. It may take a lot of practice.
- I feel that I both learn from and teach others. Discussion makes you think about things differently. You can memorize information from the text, or pay attention in lecture, but you don't really grasp the information in the same way as when you have to actually organize what you know or think into a way that you can explain to someone else
- When I understand and explain how I understand, my own understanding grows again.
- I need equal amounts of quiet contemplation and conversation. Extemporaneous conversation throws me off in concentration. Conversation on the mark about what is going on is what seals the deal for actually getting it.
- Our thoughts were not as well organized; more conflict than support. Questioning and supporting in following other's ideas is an avenue, which I feel I should work harder at using.
- I feel that I need to speak my mind more often, even though my thoughts are occasionally erroneous. Discussion opens the door to new ideas.
- The more vocal the individuals are, whether they understand the concept or not, the better for the group as a whole. It gets the ball going.
- I think groups help me, too, but I think they help me more if I understand the topic. Explaining it to others seems to solidify my thinking and understanding. If I start feeling lost in a group, I tend to be sidelined, less involved, and contributing and learning less.
- How participation is so very important. Working in groups provides an opportunity to be exposed to other ideas that I wouldn't have thought of on my own. It also allows a chance for me to get additional opinions or ideas on things that aren't quite clear.

WHAT CAN YOU SAY ABOUT HOW WE THINK IN CHEMISTRY?

- Chemistry is definitely a conceptual science and not a regurgitation of formulas and facts.
- We ask, "Based on these observations, what is happening?"
- We take what we know, ask questions, and try to filter through the facts to find logical solutions.
- Drawings help communicate our ideas about how molecules are arranged and how they interact.

- Scientific thinking is logic, using what we know to piece together a concise understandable idea.
- Relating chemistry to things we are familiar with, like electron charges with magnets, helps to better understand chemistry.
- We don't come up with the right answer right away (if ever). We are continually moving from one possibility to the next, looking for the best or maybe just another option.
- It is a lot of abstract ideas which can be difficult to understand without help.
- It is a process that is benefited by group discussion.

Background History

In our four years of work on documentation in first year general chemistry, we were exploring the three essential ideas presented in Gems of Pedagogy: **co-construction of understanding**, which is so clearly pictured in the Dissociation Capture; **representing to learn**, which became more both more skillful and more relied upon as the year progressed; **the reciprocal relationship between documentation and meta-cognition**, which is hinted at in these students responses above.

We gathered plenty of anecdotal evidence that viewing and discussing the captures had a significant effect on the efficacy of later learning group behavior.

- *Learning groups took more responsibility for their own success.*
- *During the work time members of one group would visit other learning groups to hear their ideas and look at their drawings.*
- *Groups relied on other groups for help rather than wait for the instructor to visit on her rounds.*
- *The members of the recorded learning group were treated as experts in group functioning and were often called upon by others.*
- *As a result, regular videotape capture became a regular addition to the first class in the general chemistry sequence.*

We decided to expand our inquiry. We wondered what impact a capture would have on other faculty and teaching and learning at all levels of education.

LEVEL 2 — CHEMISTRY DEPARTMENT FACULTY

Unfortunately, not all of the chemistry faculty at North Seattle were able to attend. Like many colleges the adjunct and evening faculty missed out, a profound loss to the institution and the students.

Chemistry Faculty Discuss Dissociation

Program faculty talk about the problem of teaching a difficult concept



INQUIRY: What meaning do program faculty see?

METHOD: Read the capture; discuss together.

DOCUMENTATION: Videotape; create a capture and DVD.



Faculty talk more clearly because they have a discussable referent.

Faculty devise a way to assess the development of the concept of dissociation across the program over two years.

Faculty share values of an aesthetic of thinking they wish to develop across their courses.

Faculty share a teaching culture: becoming a unified, reflective pedagogical team.

We brought the dissociation slide show to our own chemistry faculty and videotaped that as well. The first reactions addressed the amount of time the students struggled without the instructor helping out. This was unusual for them to see, and they thought it would like to stop being so quick to help in the future. It is a natural reaction to step in and correct, but probably not the most effective pedagogical practice.

Dissociation has always been a problem for students. The faculty discussed the point in their own lives when they felt they actually understood dissociation; all of them agreed it was in graduate school. This led to a discussion of how the texts used for general chemistry and organic chemistry addressed the development of difficult concepts like dissociation. They seemed to be able to talk more clearly about the way one concept, dissociation, traced through the department's

offerings. The conversation was more cohesive because they had a shared referent in the words and images of the student's learning group.

This led to a discussion of the possibility for the entire department to undertake an investigation into dissociation as a program outcome. Assessment within courses is constant; assessment of institutional outcomes is addressed by the college-wide learning outcomes work. Program outcomes are difficult to grasp and confusing to address. It seemed possible to them to check on a developing concept such as dissociation both in first year general chemistry and second year organic chemistry and meet again to share those results.

Finally the faculty discussed the importance of meta-cognitive understanding of how one attends to how chemists think as another dimension for study. The major result of the faculty viewing one captured learning group was the recognition of the importance of the faculty developing a common teaching culture in the sciences at North Seattle College. The faculty took a concrete step toward becoming a unified, reflective pedagogical team.

LEVEL 3 — FACULTY IN VARIED DISCIPLINES AT ANOTHER COLLEGE

We were invited to show our Making Learning Visible work to a faculty development day at Cascadia College, another community college in the Seattle area.

Faculty View the Dissociation Capture

Faculty in other disciplines reflect upon group work and their own teaching



INQUIRY: What meaning do non-chemistry faculty see?

METHOD: Read the capture; discuss in small groups.

DOCUMENTATION: Videotape a group; create a capture.



Faculty who viewed their discussion begin meeting informally to discuss their further investigations of classroom practices and share stories.

Discussions among faculty across disciplines focus on educational practices (group dynamics, courage, problem posing) more than content.

Faculty become more aware of their own teaching style and assumptions.

Faculty find they let students struggle with problems more and help less.

Here is one of the small group discussions. This group consisted of faculty who taught biology, English, philosophy, and library science.

In sum, their discussion focused on educational practices (assigning group work, managing group dynamics, posing problems) more than covering content. Because of such a pervasive external demand, covering content usually dominates conversations among faculty. *How do I take the time to let students work in groups when I have so much to cover?* Most faculty who teach in sequenced courses feel they have to push along in order to prepare the students for the next course in the sequence or to have the understanding needed for success in their baccalaureate degree. It is unusual to be able to stop that worry for a moment and reconsider how learning to learn and meta-cognition are more essential intentions.

In later individual follow-up interviews these faculty said they were letting students struggle more helping them less. Three of them began meeting informally to discuss their teaching and share their classroom experiences throughout the rest of the year. Faculty may attend professional development opportunities for years and never make significant changes in their practice. However, the opportunity to watch a learning group, and be in a learning group with other faculty, just may be an effective form of professional development.

LEVEL 4 — STATE ASSESSMENT LIAISONS

The faculty and administrators who were leaders in institutional development at each community college in the State of Washington meet annually to promote innovation in teaching, learning, and assessment statewide. At one of these gatherings, Kalyn Owens and I were invited to share our work in Making Learning Visible. The first step was to show them the original dissociation capture of the student learning group.

State Leaders View the Dissociation Capture

Experts in institutional development reflect upon the learning group at work



INQUIRY: What meaning do state assessment liaisons see?

METHOD: Read the capture; discuss in small groups.

DOCUMENTATION: Videotape a group; create a capture.



Leaders see the thinking processes of the students as evidence of critical thinking as an institutional outcome.

Leaders see discussions of documentation such as this could lead faculty to more clarity about developing those outcomes in their courses and programs.

Leaders find rapid communication among themselves even though they come from different colleges with different approaches and structures.

Here is one of the small group discussions in response to that capture.

These state leaders in assessment and institutional development are the people who can offer the possibility of creating spaces for faculty at institutions across the state to participate in new kinds of conversations. After watching the documentation of the students at work, these leaders discussed the way reflection on documentation shifts the focus from defending habits of practice to listening and valuing student competence. Leaders noted that distinctions made in the dominant discourse (teaching, learning and assessment) disappeared when people create communities of practice through reflective conversations around documentation.

Then they watched the slide show of the Cascadia College faculty discussion of the dissociation learning group. This is what they said.

In looking at the faculty discussion, they noted how both the thinking processes of the students and the thinking processes of the faculty were tangible evidence of critical thinking as an institutional outcome. They saw how discussions of documentation such as these could lead faculty to more clarity about developing those outcomes in their courses and programs. Leaders agreed that the documentation enabled a new, more rapid communication among themselves at their meeting, even though they came from different colleges with different approaches and structures.

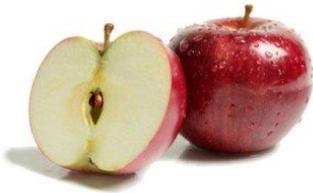
LEVEL 5 — STUDENTS REVISIT THE CAPTURE AT THE END OF THE YEAR

We gathered volunteers to review the initial dissociation capture at the end of the third quarter of general chemistry. We asked them to share their thoughts with us.

The students said they saw how each learner brought different meanings, contributing to a deeper, more complex understanding. Learners found it vital to relate to each other as they encounter the content to be learned. Learners came to understand themselves in a social context of comfort, risk, and interdependence. Learners said that as a result of this close observation of another group they participated more powerfully in the classroom — taking more risks, being thoughtful, posing theories and conjectures, and building on other's ideas. They agreed that learning “dissociation” was not the point; it was learning how to learn.

CONCLUSION

Documentation lies at the heart of the pedagogy of listening and relationships for it allows us uncover learner's thinking so it can be discussed, reflected upon, and pushed further. Documentation is the active accumulation of all traces of learner's work, including not only the obvious ones of notes, drawings, assignments and examinations but also photographs, transcriptions of discussions, video recordings of the learners in action, and reflections upon any or all of these. Documentation allows both learners and teachers an opportunity to revisit the often-fleeting experiences and interactions to reflect upon their meaning.



Our story slices open the apple of pedagogical theory and practice. We can see the ultimate ethical good described by Aristotle in the *Nicomachean Ethics*, which, in the final analysis, all human actions ultimately aim, a good that is complete, final, self-sufficient and continuous. This good toward which all human actions implicitly or explicitly aim is happiness□, in Greek, *eudaemonia*, which can also be translated as blessedness or living well, and which is not a static state of being but a type of activity, our activity as educators, doing well for others, in this moment, applying our heritage of wisdom and beneficence.

The idea of *phronesis* (practical wisdom) that appears in Book VI was essential to Martin Heidegger, too, not only as a means of giving emphasis to our practical being-in-the world but also as constituting a mode of insight into our own concrete situation. Further, Hans-Georg Gadamer described the unity of understanding and interpretation as a practically oriented mode of insight—a mode of insight that has its own rationality irreducible to any simple rule or set of rules, that cannot be directly taught, and that is always oriented to the particular case at hand: this chemistry class, these five students, these four faculty, this college system, and so on — the daily core of responsibility for ethical educators.

A primary responsibility of educators is that they not only be aware of the general principle of the shaping of actual experience by envioning conditions, but that they also recognize in the concrete what surroundings are conducive to having experiences that lead to growth. Above all they should know how to utilize the surroundings, physical and social, that exist so as to extract from them all that they have to contribute to building up experiences that are worthwhile. — John Dewey, Experience and Education, p. 40.

WHAT WE SAW

In listening to these dialogues we became able to see school not as a place for transmission of content but as a place for a gradual series of changes in understanding for everyone involved. The documentation showed that both learners and teachers face the problems of working cooperatively together, solving problems, examining habitual practices, and facing and embracing, with self-critical awareness, one's own not-knowing. In a natural, engaging way, documentation offers the opportunity of creating spaces for all the participants in schools — faculty, students, administrators, staff, regents, and politicians — to

make meaning together, to create shared values, and to transform culture towards an ethical ideal.

A DEMOCRATIC CHOICE

Our work is a departure from the dominant discourse of accountability-driven assessment, where a delineation of agreed-upon outcomes guides a subsequent effort to gather information about learners' performance on those outcomes. Along with the coercion of bearing the burden of proof, the process is assumed to lead to improvement of teaching and learning. On its face, the thought of a circular assessment loop seems logical to many good people: gather knowledge of what learners know and are able to do, aggregate that knowledge, attach meaning to it, subsequently alter something in the black box of instructional practice, and then show how that altered practice naturally improves subsequent aggregations. Holes abound in this logic with the yawning cavern being the avoidance of human beings — human perception, interpersonal relationships, and open reciprocity. The dominance of the accountability-driven assessment and its imposed coercion by accreditation is missing ethical ideals, the nature of knowing itself, the practicalities of envioning conditions, and people.

We have demonstrated in how dialogue based on that documentation enables educators to move beyond objectivism and relativism into a new kind of rational endeavor, a conversation grounded in our caring. The examination of traces of events in the classroom creates the space for dialogue, disagreement, and the emergence of complexities, so it can grow our schools — through participation and willingness to risk — into amiable spaces where we create a community of equals, a sense of public freedom, and a rediscovery of the solidarities we share in being human.

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