Warren's Question

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ABSTRACT

In this paper, we present an extended examination of a specific, single, instance of transfer of teaching practice. The investigation uses a combination of interpretative analytic techniques from critical literary studies, and grounded theory. From this analysis we make conjectures about some of the ways in which educators change their teaching practice and suggest that these natural practices hold a challenge both for computing education research and educational development.

Categories and Subject Descriptors

K.3.2 Computer and Information Science Education

General Terms

Theory

1. SCENE SETTING

This paper examines a question, sent by email to a group of colleagues on a private email list.

Warren, a computing educator, asks if he can visit a colleague's lab classes. As computing educators we recognize the setting: the rows of monitors, students typing, surfing the Internet, looking at one another's screens, their side conversations, our irrelevancy. And in its familiarity it looks like one of the mundane emails that we read—and ignore—daily. Indeed, none of the 17 recipients respond to the list.

It is Warren's second question, three days later, that produces the short series of responses we analyse here.

In this paper, we look at Warren's questions and the responses they elicit, from our perspective as computing education researchers. We have several purposes in doing so.

First, the exchange explores and illuminates individual and collective practices emerging from the *Disciplinary Commons* project [1, 2] and our analysis of the exchange frames our discussion of the project. The *Disciplinary Commons* was constituted from practitioners sharing the same disciplinary background – sometimes teaching on the same course in different institutions – coming together for monthly meetings over the course of an academic year. During these meetings, aspects of teaching practice were shared, peer-reviewed and ultimately documented in course portfolios.

We highlight two particular implications of our research focus. One is that changes in computing education must require change in the specific practices of CS educators. Hence if CS Ed researchers are to impact student learning we, as researchers, must investigate the practices of CS educators. Secondly, we present a set of conjectures about some of the ways in which change of practice occurs, grounded in interview and survey data collected from participants in the *Disciplinary Commons* project. Our main conjecture, grounded in observation and post-project interviews, is that teaching practitioners adopt new practices by adapting practices directly from other practitioners via discussion and observation. Teaching practitioners do not primarily use educational workshops or papers (whether theoretically or empirically based) as an inspiration for change. An implication of this conjecture for computing education researchers is that dissemination of research through standard publication venues is unlikely to influence practitioners to change their practice.

Our second purpose is methodological. In particular, examining a single exchange on a private email list involves an *elaboration* of complete text far different from the extraction and *condensation* of text typical of interview studies; the micro illuminates the macro, rather than the reverse. This sort of textual analysis is a hermeneutical treatment that requires an understanding of the context of the interchange, informed by existing theoretical understandings, and informing new understandings.

We triangulate the textual analysis with a grounded theory investigation of a body of collected data – interviews, and responses to open-ended survey questions – to approach analytic generalizations concerning change of practice. Our intent here is to open the space of analytic methods available to CS Ed research by borrowing from existing methods in critical literary studies and the social sciences.

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Warren's First Question

Date: Fri, 15 Dec
From: Warren
To: Mailing List
Subject: Help

I have had an awful Semester and need some help and advice urgently!

Some of you lecture interactively in lab classes, i.e. the students are expected to work while you teach. If you are one of those can you let me know when I can come to watch a session? I don't mind if it can't be until next year although I would prefer it to be as soon as possible. In the meantime, merry Christmas.

Warren

2. THE POLITICAL CONTEXT OF SELF-DISCLOSURE

Superficially, this seems to be an innocuous message. We understand Warren's question as a speech act [3]: that is, a request for help with a problem. However, when examined more closely, all is not what it seems. The first point is contextual: Warren has not sent this message to an individual, nor to a hand-picked group of friends. He has sent it to a mailing list of 17 teachers of introductory programming courses, people who teach in different institutions, in different types of institutions, geographically distributed across the UK.

Why would anyone send a message like this to a mailing list? The fact that he does exposes something about the character of Warren and the character of the group to whom he is writing.

Teaching is an inevitably situated practice [4, 5]. It exists within a set of requirements and forces that characterise it within different contexts. Institutions have quality assurance procedures, internal and external examiners, accreditation boards. Departments have intake standards, student feedback, peer observation and review. Courses have syllabi and are expected to deliver "learning outcomes" as preparation for advanced learning in subsequent courses. At any of these levels it is possible to say "things are not going well", but there is a cost. Costs might range from colleagues' raised eyebrows to (in extreme cases) loss of employment, but within every institutional context there are disincentives for self-disclosure.

Thus, the disclosure in Warren's question marks this venue as one in which the gains he hopes to achieve (in self-improvement and subsequent improvement of student learning) exceed the costs associated with his seeking help and advice. This suggests that he has a high trust in the group that is receiving the message (and reciprocal low fear of disclosure) and that he is (relatively) unconcerned that they will think ill of him for the content of this message. We can conjecture as well that Warren believes that the people to whom he sends his email will not respond with disparagement or scorn, but that they will cooperate. Although it is worth note that cooperation would not be without cost to the respondent: Warren wants not only to observe a colleague within their classroom, but wants "help and advice" as well, suggesting that the observation will be preceded and/or followed by discussion.

Who is *not* subscribed to the email list is as important as who is. The members of the list do not include administrators or supervisors; all are practicing teachers and all are teaching the same subject matter at the same place in the curriculum. Thus there are no power differentials between members. In short, this email list is a safe place in which to make such requests.

2.1 An uncommon request

On further consideration, though, Warren's question does not appear to be so ordinary. It is *not* a common practice among tertiary educators to observe teaching in someone else's institution. Although peer observation is becoming more common within departments (sometimes within institutions) [6] it is essentially unheard of between institutions. And when the motivations for peer observation are examined, this is not surprising. They are, in general, linked to the quality assurance and staff development of the observed teacher. From that perspective there is simply no point in observing practice to ensure the quality of teaching in some other institution, nor any incentive to develop their staff. Warren's request is, in fact, an inversion of this "normal" purpose for peer observations. The observation is not for quality assurance or for staff development for the observed, nor is it externally imposed. It is instead requested by the observer for his own professional development. Warren's first question thus presents in a perfectly straightforward manner a request to traverse institutional boundaries to watch what happens behind a normally closed classroom door. In both the fact and the nature of this request, the *Disciplinary Commons,* the collective practices of its community—and Warren's participation in it— has normalized an extraordinary practice.

2.2 The *Disciplinary Commons*

The *Disciplinary Commons* project had two primary objectives: to *document* and *share* knowledge about teaching and student learning in Computer Science (CS) classrooms, and to establish practices for the scholarship of teaching by making it *public*, *peer-reviewed*, and amenable for *future use and development* by other educators. The mechanism for achieving these goals was through a series of monthly meetings during the 2005-6 academic year involving Computer Science faculty, one cohort of ten CS faculty in the US and one cohort of twenty in the UK. Meetings were focused on the teaching and learning within participants' classrooms, with each person documenting their teaching in a *course portfolio*. Twenty-eight of the thirty participants concentrated on the introduction to programming (itp) course at their institutions. The email list on which Warren's question appeared was among the UK participants following the year of monthly meetings.

This project was *disciplinary*, in that it traded on the shared disciplinary knowledge among teachers who teach the same things.

> [Samuel] Yes, there's a teaching and learning group that has meetings roughly every other week, and I've attended a few. Several of my colleagues (on the Math side of the department) have done presentations, but many of the topics

> don't seem immediately relevant to CS. That was the beauty of the *Commons* group—all CS, all the time!

And the project created a *commons* in the common knowledge that was developed about one another's courses, contexts, and teaching during the monthly meetings. This commonplace familiarity is aptly displayed in the matter-of-fact statement "Some of you lecture interactively in lab classes" in Warren's first question.

2.3 The practice of peer observation

One of the features of the *Disciplinary Commons* was that each member observed the classroom teaching of another and was, in their turn, observed. Each observation followed the same form. The pair first met and the observee described the context of the teaching event to be observed, the material covered, its place in the course and in the curriculum, etc. Then the practice was observed during one of the observee's regular class sessions, situated in the observee's classroom. Following this, the observer and observee discussed and debriefed the session.

> [Elizabeth] The most influential thing for me was the observation visits where I went to University N and observed Emma, and also George from University E, he came to visit me … And what it did was it forced me to reconsider the whole approach I take to my lectures.

The power of this practice rested precisely on the fact that there was no purpose in doing it except to exchange ideas and to be of help to each other. No judgments were passed, no quality mechanisms engaged. Additionally, because the participants were in the same discipline, teaching the same course, observers easily understood the significance of what was taught.

> [Frank] That was very interesting. I mean we do peer observation in this department as part of our quality process, but it's rare that you actually get to go and see someone teaching what you teach, so it's certainly offered a completely new experience in that respect.

Unexpectedly, whether because observers were observing outside their home institutions, or whether because they were highly sensitised to the curriculum and material being delivered, observers were especially struck by aspects of context that are normally invisible. These observations included the physical setting of the university, the material and technological objects within the classroom, the student interactions with one another. The shared disciplinary background meant that, for the observer, the observation began not when entering the classroom, but when leaving their own.

> [Daniel] I have never had any externality on teaching – the peer review process, the exposure of ideas, you present ideas and get them hammered down, that's all part of what I do on a day-to-day basis in the research, whereas teaching's something I keep in my pocket, you know? … the thing that kept me going was the fact that I'm getting this externality on the process … This peer review. Those things that characterize good research projects … keeping up in the field, being aware of what other people are doing. I didn't do any of that for my teaching. I do now.
>
> [Elizabeth] that's very, very different, a marked difference, and I wouldn't have known about that if I hadn't been and visited and seen it happening. So the peer observation visit was a great revelation for me.

2.4 Pull transfer

We can only hypothesize about Warren's intention in asking if he can observe someone, but we believe that it relates to a phenomenon we call *pull transfer*.

The normal mechanisms employed for transfer of ideas in teaching and learning are in the mode of *disseminator push*: that is that something is identified (a teaching method, a "best practice", a theory) and it is packaged and promoted to interested parties by a staff developer or a researcher, via mechanisms such as papers, books, websites and workshops. This is the trajectory that is often assumed for educational research—that "dissemination" to practitioners occurs simply by virtue of publication in a research venue. However, evidence from empirical studies suggests that transfer of practice and knowledge to practitioners is rarely occasioned by these research-to-practice, top-down methods [7, 8].

Teachers change their practices, adopting (transferring) ideas and materials from direct, personal contact with other practitioners as and when they need – often in very small, partial, pieces ("piecemeal accretion") or by virtue of having experienced it in another institution and, with a change of employment, importing it to a new context ("charismatic embedding"). Thus these transfers are achieved directly from practitioner to practitioner, from one specific setting to another, mediated neither by theory, researcher, or staff developer.

Survey results from the *Commons* participants support the conjecture that knowledge transfer rarely happens top-down, from researcher to practitioner. When asked "*What published material do you read with regard to your teaching?*", seven participants mention reading technical publications related to disciplinary knowledge, five mention textbooks, five mention CS Ed practitioner conference proceedings (with all five mentioning the SIGCSE Symposium by name). Only one of the thirty people surveyed, (a CS Ed researcher), mentioned reading the CS Education research literature; and none mentioned reading research in the learning sciences, in the behavioural or social sciences, or disciplinary education research in cognate disciplines (such as mathematics or physics).

And pull-transfer seems to be what is happening in Warren's case, reproducing the practices normalized during the *Commons*. Warren wants to "pull down" the bits of practice that he needs. No one is selling these ideas to him; no-one is holding a workshop or promoting lectures-in-labs as a "best practice". And Warren is not asking for references to the literature. Rather, Warren has identified both his own need and a source of solutions. He wants to expose himself to practices "in the wild", to see how someone else does it, and to see what he can use from it – not wholesale, not as a piece, but adapted and adopted to his local context with specific constraints [9].

Warren's Second Question

Date: Mon, 18 Dec
From: Warren
To: Mailing List
Subject: Help again?

Oh dear, a bad year just got worse. I have had some replies to my email of last week so please keep them coming, especially if you are planning to give a lab-class style lecture some time soon. In the meantime, most, if not all of you, will be aware of how my taskbook system works. The question is how do I avoid the possibility of forgery? At the moment the postgrads at each lab class sign off the tasks and are supposed to fill in the appropriate box on a spreadsheet. Sometimes they forget so when I get all the books at the end of the year I check those that haven't been filled in on the spreadsheet. Most of them are OK but this year it is clear that the student has blatantly forged the signatures, so how do I minimize the chances of this in future? The best solution we have so far is a signature plus a stamp. Has anybody got any better ideas?

Warren

3. A DIFFERENT REQUEST

No responses had been registered on the mailing list to Warren's first question three days prior. The first thing that Warren does with his second question is to send thanks to the people who have *privately* responded to his earlier request. This acknowledgement lets everyone know that the group is still functioning, that interest and help are available, even though group members have ceased to meet formally. At the same time, this message serves to reconstitute and reproduce the group, its internal relationships, and its shared practices of assistance and reciprocation.

He then prepares to ask a second question, by making an assertion about knowledge other group members have concerning his own practice and its use in context (that is, what he does, what it is for, and why he uses it in the way he does): "*In the meantime, most, if not all of you, will be aware of how my taskbook system works*."

3.1 An unusual claim

This is an unusual claim, because it references a very detailed aspect of his practice, and asserts that this knowledge is shared. How have other members of the group come to be aware of this? This sort of knowledge is not on the surface, it is not available from a webpage, and not contained in a syllabus. Thus this claim is not only unusual in its specificity; it is also unusual in the casual manner in which Warren takes common knowledge for granted. He does not re-describe his system—considerable in its complexity— but provides just enough detail for the group to index into shared memory.

He knows, as well, that "the taskbook" is not a common practice used by others in the group. This is because he knows their practice as closely as they do his.

> [Elizabeth] … we know more about each other's courses — and our views and attitudes—than we know perhaps about our colleagues that we work with day in and day out.
>
> [Albert] … to get that many people to share that kind of information in that amount of time was unreal. This is in huge contrast to what happens on the job.

Where Warren *does* provide considerable detail is about the specific, individual, problem he has encountered. This is something that has happened outside of the group's lifecycle and so no-one can know about it.

He then closes with a request for better ideas. This time, he is asking for a fix. He is not doing "pull transfer", he does not want to come and watch. He is drawing on the collective expertise of this group: "Here is my problem: do any of you have any solutions".

Later that same day … Chester's Response

Date: Mon, 18 Dec
From: Chester
To: Warren
cc: Mailing List

Hi Warren,

I used a system loosely based on your scheme this year - there's nothing like plagiarism, eh? The students have 24 exercises to complete this term, gaining a tick for each one.

The ticks were recorded by the tutor on a sheet of paper in the tutor's, not the student's, possession. The student has no ability to change/doctor the recording of the ticks.

Our tech folk built a web system so that the tutors could record the ticks after the lab, for easy access by the admin folk, for when warning letters etc needed to be sent, and to check on the course completion criterion. After requests by students, this was extended, so the students could check on their progress on-line too. Ostensibly, it is a secure system - so students cannot change the records!

So can you not resolve the problem by

(a) removing the "double entry" - of both tutor's spreadsheet and taskbook. make the tutor's copy the only and definitive version

(b) share responsibility between student and tutor for ensuring the recording takes place

(c) provide some on-line page showing the student's record (probably need to let a student see ONLY their own record)

Lots more to say, but aware of e-mail drowning being a potential problem...

Chester

Chester starts his response with a confession, a confounding factor that challenges the basis of shared knowledge "*I used a system loosely based on your scheme this year*". It turns out that, unbeknownst to Warren (or, we may guess, to anyone else on the list) there has already been "pull transfer" of this practice. Chester has seen Warren's taskbook in enough detail that he knows which parts he wants to use, which will work for him, and he appropriates them. It is important to note that this is not straight imitation; he does not take the "taskbook" wholesale, but adapts it to local circumstance. Rather than imitation, this is an example of an adaptation of practice involving a change of ownership, a case of transfer leading to transformation [9] and where borrowing a practice promoted its change [8].

We know that this is adapted practice, as Chester gives a detailed description, not only of what his new practice is, but also of a technical implementation.

3.2 Loss of provenance

Chester's acknowledgement of this cycle of adoption and adaptation comes with the slightly shamefaced "*there's nothing like plagiarism, eh?*" This token symbolises one of the fundamental features that differentiate the activities of teaching and research. "Plagiarism" is about public attribution of the source of ideas, a basic requirement of research-based activity but one that is more-or-less unknown in teaching. It suggests that it is not important—to Chester, to the colleagues within his institution, or to his disciplinary peers— to acknowledge sources of teaching knowledge in the same way as in research. This would also imply that there is no incentive or reward for giving such acknowledgement, and that there are no evolved norms that require it. Part of the reason for this is that teaching practice is often ephemeral, enacted but not documented. And those parts of teaching that *are* documented are rarely referenced with sources as would be ordinary in the documentation of research. As a result, provenance is easily lost in teaching practice.

> [Samuel] There were certainly times when I stole stuff from other people.

> [Henry] The great benefit for me with the *Commons* is I was reflecting as I was in the process of delivering. And so I was making fairly quick changes to what I was doing in the light of my reflection. Which goes back to what I was saying before, which is that I then put things into practice, so then documenting them afterwards wasn't something I saw as being terribly useful.

Attribution in research has two primary functions. The first pertains to the way in which authorship, reputation, and material rewards are linked, part of the *credit economy* that Latour and Woolgar theorize operates within research communities [10]. The second function is not credit driven, but is epistemologically motivated: attribution provides an audit trail. This audit trail can be followed and independently validated or challenged in subsequent investigations. Each link in the chain can be tested and judged for its own worth and for whether it was appropriately applied. This chain also gives practitioners additional information about the practices they are interested in, and provides rationale for their adoption. Attribution, the practice of acknowledgement, identifies an idea with a specific expression, most usually a named person at a given point in time. Provenance records the history, or pedigree, of a thing from origin through the hands of various owners.

This loss of provenance in teaching, this rootlessness and reinvention of practice, paradoxically places *more* emphasis on practitioner-to-practitioner transfer, unmediated by documentary evidence. As Mary Huber comments about the winner of a prestigious national teaching award: "what he himself had learned from teaching remained his own craft knowledge: … under documented, and subject to loss … Aside from his syllabi and fading memories, he had no real record of what happened in those award winning courses" [11].

3.3 Hall of mirrors: reflecting back

Chester has not only adapted Warren's practice, but he now reflects this adapted practice back to Warren, giving specific advice as to how Warren might re-import the improvements into its originating context. The practice has come full circle, pulled from Warren to another practitioner who alters it and then "pushes" this altered version back to Warren. The very solution that Warren seeks may lie in this adaptation, whether by Chester's conscious design or by accident of its embedding within Chester's context we cannot tell.

Donald Schon [12] discusses this mutual reflection of practice as a *hall of mirrors,* (although he was primarily concerned with the dyadic master-apprentice relationship). What we see here is a *hall of mirrors* reflecting the exchange within a group of engaged peers. This exchange follows the tradition of the design school, the fine arts "crit", and the reflective practicum of the studio. In that tradition, practitioners expose their work to a "coach" and their peers. Each individual sees their practice reflected in others – and others in theirs – and inside this "hall of mirrors" practitioners learn their way to their own expertise.

Just the facts … Sidney's Response

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Date:     Mon, 18 Dec
Subject:  Re: Help again?
From:     Sidney
To:       Chester, Warren
cc:       Mailing List

As ever looking for a simple system
... WE keep the piece of paper, not
the students and it is THEIR
responsibility to make sure we get
it right - obviously we give them
the opportunity to do this.
For any student we are not happy
with, e.g. Someone who 'produces' 5
questions having been off for 3
weeks, we query them on the code
etc. This combined with a couple of
(short) class tests seems to keep
things in check.
Sid
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As we can see, Sidney is completely operational. No salutation, no signoff —just the facts. Although his style is sparse, he nevertheless reveals that he, too, has a similar "taskbook" mechanism, which he describes. It is unclear from this contribution whether this practice was in place before the *Commons* or whether it is a piece of practice adapted from it, but it is sufficiently different to warrant description.

Sidney then also points out how his form of the taskbook deals with a separate problem that can arise—not the original problem that Warren raised. Throughout this message, he does not give an answer, he does not specifically respond to Warren's second question. Rather, he says what he does in his context, and assumes that Warren knows how to map this to his own context. He gives the solution (within his own context) in the first paragraph. In the second paragraph, he provides a lagniappe with additional detail that answers a problem that Warren may or may not have.

Ending the Exchange: Archie's Response

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Date:     Tue, 19 Dec
From:     Archie
To:       Sidney, Chester, Warren
cc:       Mailing List

Nice to see the list active again

Bits of paper get lost - maybe a
scan of the sheet each week – jpegs
never lie

Archie

PS Since I started scanning my
inevitably vulnerable bits of paper
my life has got easier
PPS happy Christmas
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Archie starts with a meta-comment about the list, neither about the question nor the responses so far. He is talking about the group as a group that functions in a particular way. Even though the message is addressed to the three respondents and cc'd to the list, the comment nonetheless addresses the entire group.

Archie provides a completely orthogonal solution, with rationale, in 16 words and then signs off. Perhaps on re-reading, this feels abrupt. In any case, he adds a postscript saying that this solution has made his work easier, providing a personal endorsement to the factual details. In this way, not only is his solution orthogonal, but so is his method of making it: he provides a direct suggestion, but accompanies it with a personal testimonial: "This is my practice: I actually do this".

Do we count testimonials as evidence for changes to our practice? Perhaps. But the strength of this *as* a testimonial will depend on Archie's standing within the group. With Archie's response, the email exchange ends.

4. CLAIMS

There are a number of claims implicit in our exposition centred on change of practice among educators. We first make these separate claims explicit, and then combine them to suggest the outlines of a theory of transfer of practice.

4.1 Self-Disclosure

"Common knowledge" among disciplinary peers who are not involved in relations of power or formal roles of quality assurance can lead to disclosure and shared pedagogical problem solving. Common disciplinary knowledge when combined with a close understanding of its specific situated instantiations in a variety of classroom settings (as found in the *Disciplinary Commons*) favours exchange which is characterised by an unusual depth of enquiry. By removing political concerns the costs of disclosing are reduced, which affords a focus on improvement rather than accountability.

4.2 Peer Observations

Observation by disciplinary peers across institutions can be a powerful practice for facilitating change, for both the observer and observed. For the observer in particular, seeing new practices in situated contexts allows for spontaneous pull-transfer.

4.3 Pull-Transfer

Pull-transfer is a general phenomenon that results from interaction between practitioners. Practitioners directly perceive practices situated elsewhere, and understand the ways in which these practices can be adapted to their own contexts. Pull-transfer contrasts sharply with "in-service" days, staff developer workshops, and researcher theorizing. Rather than a top-down mode of dissemination, it is a peer-to-peer process of diffusion.

4.4 Loss of provenance in teaching

Teaching remains rooted in practice, and not in its documentation. When teaching is documented, it is often in response to formal quality assurance requirements, or promotion procedures, not as part of a process of individual reflection and peer critique: these explicitly internal audiences ensure that such documentation, even when it exists, remains private. At the same time, the values and norms of educational institutions do not require or reward attribution in regard of teaching practice, rendering loss of provenance almost inevitable. Such loss of provenance may in turn result in a loss of status of teachers amongst researchers sensitised to a research credit economy.

"Provenance" in its originating contexts – following the history of paintings or other specific, archival, artefacts – records and notes ownership at every point a picture changes hands. In this way, confidence in the authenticity of the work can be assured. What is guaranteed is that the work is the same as was received; despite changes in ownership it is unchanged, persisting in its original form. In teaching, "provenance" takes on a different character. If we do not know the history of the practice we examine, then we take it as if new. We cannot tell whether this is long-established and well-evolved, worked on by respected educators over time, or whether it was fresh-minted yesterday. Not only that, but we cannot know *why* any adaptations, or changes, have been made. So "provenance" in teaching, rather than attributing a chain of ownership to assure authenticity, should preserve a record of who the practice was taken from, and what changes were made to fit the new circumstance. In this way a new recipient may understand what changes have been made over time, and why. We call this sort of evidence *rationale-preserving transformations*.

4.5 "Hall of Mirrors" magnifies transformation

Within a practitioner community, practices are not only "pulled", but reflected back at their originators. What the originators see in this reflection is not only their original practice, but its adaptation by others within new contexts.

5. OUTLINES TO A GENERAL MODEL OF TRANSFER OF PRACTICE

We have identified above a number of elements that we believe begin to characterise transfer of practice. We offer here a more integrated reflection on what this combination of elements implies. We take these comments as preliminary and incomplete, but believe they are sufficiently well supported by our data and related theory to merit discussion.

Our central principle is *pull-transfer*. We believe this to be central because, if it is the predominant mode of practitioner transfer, it stands in contradiction to accepted forms of top-down professional development. Likewise, it challenges implicit beliefs by educational researchers that research to practice is a simple matter of "dissemination", achieved primarily by publication in research venues. It challenges the notion that teaching knowledge diffuses in the same way as research knowledge.

Staff development workshops and research publications share not only the top-down mode of distribution, but also the type of knowledge that is pushed. Both focus on knowledge that has already been through a deliberate process of generalization and abstraction. This form of knowledge is taken by some as the very *definition* of research e.g. "the term 'research' designates an activity designed to test an hypothesis, permit conclusions to be drawn, and thereby to develop or contribute to generalizable knowledge (expressed, for example, in theories, principles, and statements of relationships)" [13].

How would a practitioner access the research literature when faced with a particular problem? How would Warren, faced with his particular problem?

First, he would have to know what kind of a problem he is facing. We should not underestimate the difficulty of this task, especially when "problems" can often be a result of complex configurations of contextual variables, student characteristics, and characteristics of teaching intervention. Second, he would have to generalize the problem, and match its characteristics to the abstract linguistic categories of the relevant researcher community. Should he examine theories of plagiarism? Or motivation? Or classroom efficacy? Third, he would need to seek out and select the identified research literature. Once read, he would need to understand not only what is communicated within the article, but also what it is built on: the cumulative body of work assumed by this researcher community, and hence not explicitly repeated within the article. And finally, he would have to understand how to apply this abstracted knowledge within his particular setting. The situation with staff development workshops is similar, except that Warren would need to attend a workshop *in anticipation* of having particular problems, in essence banking this knowledge [14] for later use.

It would be reasonable to think that teaching and learning consultants, often centrally located in instructional development units, would be an obvious place to seek more specific information. However, no Commoner considered them a natural resource. When asked about institutional forums for talking about teaching the strongest positive response was:

> [Clarence] There is a person in curriculum development who is interested in improving instruction, and is available.

There is a vast chasm between research and practice, not easily bridged. We should not be surprised, then, that *Commons* participants when they do access literature do so almost exclusively from technical publications, textbooks, and teaching practitioner conferences of disciplinary colleagues.

By contrast, our pull-transfer principle assumes that practitioners operate within an everyday context in which tasks are carried out under pragmatic constraints. Practitioners recognize persistent and recurring problems: too much time marking programming assignments, too many students failing, too many students each term struggling with the semantics of while loops and reference variables. When problems are understood as such it is within the language of teaching within the discipline. Pull-transfer states that practitioners find what they need directly from other practitioners. Because the transfer is peer-to-peer, *adaptation from one setting to another* replaces what would be *abstraction and instantiation* in a top-down mode of transfer.

Of course, pull-transfer is not an inevitable consequence of practitioners meeting: it does not always occur. It is, however, facilitated by mutual disclosure by people with similar disciplinary knowledge, shared knowledge of one another's

classrooms, facing similar kinds of teaching challenges. Such disclosure is, in turn, facilitated by safety from political repercussions, enabling authentic dialogue between participants. Thus, improving educational quality assurance may have more to do with strengthening practitioner networks than with regimes of formal accountability and sanction.

How then, might useful CS Education research results enter a disciplinary network such as that formed by a *Disciplinary Commons*? How might new ideas "from above" find their way in? We conjecture, albeit tentatively, that a few individuals within such networks may serve as "brokers" between communities [15] in both accessing theoretical knowledge and translating it into terms and practical examples that make it meaningful for this particular practitioner community. Such community members who become enthused of particular practices or approaches from outside of their normal disciplinary sphere and enthusiastically promote them to their colleagues have been called "evangelists" elsewhere [9]. In CS, recent subjects of evangelism have been learning theories of constructivism[16] and co-operative learning [17].

Using the terms of social network theory [18], these evangelists serve as *weak ties* to external social networks, and knowledge moves from one network to another through these weak ties. But once this new knowledge has entered the practitioner network, the *strong ties* among its members (facilitated by mutual disclosure, pull transfer, etc.) enable such ideas to quickly diffuse, altered and adapted at each step. With strong practitioner networks, fewer brokers are required for new ideas to get to the point of practice.

> [Samuel] Assessment stuff in general I'm going to do differently this semester. I think I'm going to do … CATs [Angelo and Cross's *Classroom Assessment Techniques* [19]], which I haven't tried before (Interviewer: where did you get the idea for that?) Well, Ida at University Y has been doing that for a long time. I've heard her talk about it before, but it wasn't until we were in this group together that … I heard … more detail about the sorts of things that she does … she typically does them in labs and has some more elaborate tricks

In this case, Ida is the weak tie to another community (this time of experts in assessment in higher education), and Samuel does pull transfer within the *Commons* network when seeing how these have been instantiated within Ida's courses.

We thus posit pull-transfer as an important mechanism for change of practice among teaching practitioners. What our investigation does not (and cannot) tell us is the prevalence of this change mechanism relative to other mechanisms[1]; this will require additional research and a different set of research methods.

6. METHODOLOGICAL CODA

In this paper we have combined several methods. Centrally, we have provided a hermeneutical analysis of a verbatim email exchange on a mailing list. The exchange was taken from the mailing list from the UK *Commons*, which included all of the UK participants and one of the authors. E-mail is a fact of academic life and a familiar communication genre. However, by applying an hermeneutical analysis to naturalistic speech, what is revealed about the participants, their situation and attitudes is, we contend, more illuminating than might be obtained solely by more intrusive and researcher-driven methods (e.g. interviewing) [20, 21]. For us, the power of this approach is in the very prosaic nature of the data; no-one would take the trouble to invent something so banal, and its unguarded ordinariness reveals complexities and nuances which may be frightened away, or obscured, by more direct questioning. In focusing on everyday speech and the way in which mundane actions both constitute and construct social life, we share some of the goals—though not the methods—of ethnomethodologists [22].

Our understanding of the text was informed by our own situatedness within the *Disciplinary Commons*, by the fact that we share "vulgar competence" with the participants – that is, that we, too, are practicing CS educators [23]. Our role in the *Commons* was as project developers, jointly in the year preceding the monthly meetings and (separately but in parallel) as project leaders at two different sites during the year of meetings. Our primary role during the sessions was to structure critical engagement among the participants about the relationship between the teaching and learning that was occurring in participants' classrooms: in pairs, in small groups, and in plenary. We took reflective notes immediately following each of the monthly sessions, which we jointly debriefed by telephone shortly after. Thus, many of the themes discussed here began to emerge through our direct observation and participation in the *Commons* and our monthly discussions.

In this way our participation in the *Commons* was unlike that of the other participants because of our leadership roles. To get further insight into the effect of the *Commons* on participants' understanding of their own teaching practices, we undertook two surveys of all participants and conducted semi-structured interviews with 4 participants from the US *Commons* and 5 participants from the UK *Commons*.

The first survey was administered during the last of the monthly meeting, and all responses were anonymous. All participants of both *Commons* completed this survey. Questions were primarily constrained choice (Likert scale) ratings of evaluative questions, e.g. "I would recommend the *Commons* to a colleague", and "The three most valuable parts of the *Commons* were". Results from this survey are reported in [2]. The second survey was administered via a web form one month after the final monthly meeting; responses were automatically pseudonymized (though we had access to the pseudonymization table). All participants of both *Commons* completed this survey. The questions were open-ended and focussed on the identity of the participants within practitioner communities, e.g. "who do you talk to about teaching?", "What published material do you read with regard to your teaching?" Finally, we undertook semi-structured interviews with approximately one third of the participants four months after the final monthly meeting. Each of us had a separate telephone interview with three participants from the *Commons* that the other person led, and three additional participants were interviewed by telephone by Jessica Yellin, a researcher at the Center for Engineering Learning and Teaching at the University of Washington. Interviews were digitally recorded and transcribed verbatim, using a commercial service. At this stage, questions were focussed on participant perception of the course portfolio they produced, of the *Commons* project as a whole, and of any changes to practice that resulted from their participation. Quotes

[1] We thank an anonymous reviewer for making this point and for suggesting that pull transfer may also apply to research.

from this data are included in this paper, identified by pseudonym. Pseudonyms preserve gender.

We undertook a grounded theory analysis on this data [24]. By grounded theory, Strauss and Corbin "mean theory that was derived from data, systematically gathered and analyzed through the research process." Theory is taken as a set of relationships between concepts which provide a coherent account for the data encountered and can be used for explanation or prediction. The grounded theory procedures that we used included *open coding,* which identifies conceptual categories within transcripts of interviews and naturalistic speech, *axial coding,* which relates categories to subcategories, and *selective coding,* which integrates and refines the different categories. We also undertook *memoing,* in maintaining an ongoing record of the analysis as it evolves through interaction with the data, and *constant comparison* which involves alternation between the development of theoretical ideas and their validation in the data.

We open coded two surveys together to develop initial categories and to calibrate coding practices. We then separately coded surveys of the participants in our respective *Commons* and of the interviews that we each carried out, discussing coding categories as they emerged. We were sometimes aided, sometimes thwarted in our analysis by our use of Nvivo software. Following open coding, we did axial and selective coding together, merging, splitting, and grouping categories. We maintained reflective memos and debriefing notes throughout the coding process.

We differed from a strict "Strauss and Corbin" regime in that we had a number of theoretical conjectures prior to commencing the data analysis, developed primarily from our direct involvement in the project. We sought validation for these conjectures from the data, and abandoned or changed those that were not supported. But equally, strictly grounded theoretical conjectures emerged that we had not understood prior to interacting with the data. We iterated frequently between developing theoretical propositions and validating these propositions from the data.

What we have not done is to consider whether the transfer practices we observe here share features with transfer in other domains; this must be regarded as "future work".

7. SUMMARY

In bringing an ethnomethodologically-inspired approach, we capitalise on our closeness (as researchers) to the practices and practitioners we study. In taking as primary data naturally-occurring texts (rather than researcher-instigated investigations) we hope to open the space of research methods considered by CS Ed research. By coupling this situated investigation with additional grounded theory analysis, we suggest that general observations with respect to how teaching practices transfer may be drawn from a close examination of a single situation.

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