

THEORETICAL ABUSE: An interpersonal problem in required math courses

There has been a recent resurgence in improving the quality of teaching in US universities, even at the elite schools. Various institutions have pledged a new commitment to balance teaching with research and to express this commitment in the reward system, i.e., through promotion, tenure, and salary increases.

They are attempting to meet this need largely through technology and expertise. The latter refers to instructional delivery and presentation skills, and the former refers mainly to the use of the computer in the classroom, as a learning aid (including distance learning, use of the Internet in class, etc.). What has been less of a focal point is the interpersonal dimension of teaching, in terms of dealing with various aspects of the relationship between instructors and students.

This article is particularly concerned with negative psychological consequences for students resulting from ignoring one significant aspect of this relationship, namely, the potential to abuse the power to create meanings, i.e., interpretations of events. A new concept, labeled “theoretical abuse,” was introduced by Michael Basseches in a psychotherapeutic context. I suggest that it applies to the realm of teaching as well. I believe that such abuse of power is far more prevalent and insidious than might be thought because so often it is inadvertent and subtle. The focus here is on teaching introductory required quantitative methods courses, where the interpersonal relationships would be expected to play only a minor role.

POWER AND ABUSE: General Perspectives and Specific Application

Power can be defined as the capacity for one social unit, e.g., a leader, to determine the behavior of another, e.g., followers. In the classroom, one might think of the instructor as having that capacity with respect to students. A *type* of power is defined by its source, its context, venue, and leader responsibility with respect to it. For example, in an organization, “reward power” is based on control over physical and financial resources in the context of allocation and compensation processes – which carry with it the responsibility to be equitable. “Grading power” is one version of this translated to the classroom.

Abuse is broadly defined as the leader’s attempt to satisfy his or her needs at the expense of a follower’s: in a given context, this means shirking leader responsibility, either intentionally and manipulatively or inadvertently, for personal gain or seemingly more benignly, to uphold a belief system. For any given type of power, there is an associated abuse potential. For example, with respect to reward power, overt favoritism for one group would be considered

abuse; in the classroom, grading biased toward certain individuals would be seen as abuse of (that) power.

The power context here is the process of meaning-making. *Meaning-making schema* consist of first, beliefs, perceptions, feelings, assumptions, evaluations, attributions, or interpretations, and second, their disposition – whether or not they are acknowledged, shared, advocated, illustrated, or tested. They are ineffective when they are unnecessarily binding and/or when they are held conclusively or tacitly.

Binding means that options are ruled out, resources dismissed, and caveats imposed. Tacitly held caveats result in missed opportunities or that the attendant assumptions, evaluations, and interpretations are often erroneous. Some students – and their instructors – inadvertently rule out possibly effective avenues of learning because they hold rigid beliefs about what a concept should mean or how it should be presented; about how to approach the task of problem-solving; and about what to expect in terms of performance.

Holding an assumption conclusively means that it is taken for granted and with any alternative notion instantly rejected. The belief may or may not be acknowledged, but is never questioned. With a tacit assumption on the other hand, it does not even occur to the individual to acknowledge it; if it is made explicit, then he or she would become conclusive about it, considering it obvious.

Meaning-making takes place on perceptual, affective, cognitive, and behavioral levels. This is a context that has as its source of power various aspects of the leader's personality and interpersonal skills, bringing with it the responsibility to be sensitive to the views of others and to encourage a process that allows for their emergence.

Thus, the central theme of this article is that process of student meaning-making and instructor management of this process function as additional variables for learning performance. Ineffective schema and mismanagement of the process tend to act as *concealed contributors* to poor performance. Further, the concealment itself plays a role in the creation of anxiety as well as in magnifying its contribution. Finally, once revealed, these variables point us toward a set of performance improving *interventions*.

Theoretical abuse

In describing abuse, we need to reference the type of power, defined by source, context, and responsibility. Our focus here will be “theoretical abuse,” the abuse associated with the context (and power of) meaning-making. Originally defined in the venue of psychotherapy by Michael Basseches, it recognizes that

psychotherapists have the capacity to significantly control a client's meaning-making and along with that power, the responsibility to do so in the interest of the client. In particular, Basseches focused on conflicts in meaning-making, with respect to the content of the client's discourse (commentary on his or her life events), the interaction between them (e.g., is the therapist providing the proper level of support and understanding), and client progress in treatment (one party feeling a good deal of work being done while the other being largely unsatisfied). He suggested that therapists often imposed their views, sometimes in an arena of open conflict, but more typically by simply failing to adequately explore, elicit, and elucidate client meaning-making – despite the fact that doing so would be considered the essence of therapy!

Applying the concept of theoretical abuse to teaching can be justified. There are parallels between teaching and psychotherapy: (1) in both cases, leaders are considered authorities in their discipline, with the kind of knowledge superiority so that they presumably know what's best for the followers in terms of directions to pursue; (2) in both cases, leaders and followers often react emotionally to the differences between them; and (3) students, like clients, often have maladaptive and restrictive assumptions about the content, the (learning) process, and expectations of self and of the instructor/therapist.

Continuing with a comparison between psychotherapy and teaching, and to make the case that theoretical abuse is even more of a concern in the latter venue, we note some important distinctions: Therapists are directly trained to deal with meaning-making issues and conflicts while instructors typically are not. Therapists typically have training in monitoring their own reactions to clients (labeled the "counter transference") while instructors do not. Therapists often bring meaning-making conflicts to the fore, addressing what might be dismissed or ignored or not noticed by both them and their clients, while instructors generally do not, considering that to be a diversion from the learning task. It would appear then that theoretical abuse would be even more common in the educational realm than in the psychotherapeutic.

There does not need to be conflict for theoretical abuse to occur. It does so when instructors act out of their own needs rather than the students'. What does this entail? In some cases, this might mean averting anxiety or seeking, even generously, to encourage collegiality. The primary marker for abuse is "at the expense of the follower": in meaning-making, this means the curtailment of students' processes and failure to acknowledge and validate them as meaning-makers.

Very often, this may happen quite inadvertently and with the best of intentions: the instructor believes strongly in his or her interpretation of the relevant issues.

The instructor has his or her own needs in the classroom, some of which are psychologically based, such as the need for control, for attention, for collegiality. (Others are epistemologically based, such as the way to teach and the structure of the discipline). In addition, instructors may be untrained in teaching per se, having had no education courses in their background and generally not having attended seminars on instructional delivery. Explaining concepts and events, he or she may simply fail to properly explore the students' meaning-making and not engage in a process of constructing this sense-making with students. This is a passive version of theoretical abuse.

Theoretical abuse can take several forms, including the passive version just cited: arguing for an interpretation of events, prematurely imposing a point of view, quashing a student's point of view when it conflicts with one's own, dismissing a student meaning as simply inaccurate or naïve, paying lip service to a student's position, and (too quickly) correcting (technical) errors. It has the potential to occur whenever a concept is being presented or a task enacted, whenever an interaction between instructors and students takes place, and whenever a student is evaluated or given feedback. The likelihood is enhanced when there are either conflicts or simply tacit differences between instructors and students.

MEANING-MAKING DIMENSIONS: A Model

Meaning-making takes place on perceptual, affective, cognitive, and behavioral levels, triggered by events along the following dimensions:

- the concepts and tasks a student attempts to master;
- his or her interactions with instructors; and
- assessments made of his or her performance.

These will be referred to as the dimensions of meaning-making. These parallel client content or discourse, interaction between client and therapist, and assessment of progress. In the psychotherapy venue, the focus has typically been on conflicts in interpretation. In both venues, even more insidiously, theoretical abuse may reflect so dominant an instructor/therapist influence that followers almost instantly abdicate their own meaning-making schema when they may have initially conflicted. They then effectively *collude* with the abuse, seeing only the leader position and even amplifying it.

For each of these dimensions, there are not only (potentially) conflicting meanings, but underlying factors as well which we highlight: primary student concerns, charged events, inherent ambiguities in interpreting these events, default theoretical abuse positions with respect to these events, and underlying assumptions instructors make linked to justifications for the abuse position. We then offer a recommendation for at least avoiding default abuse. This will be elaborated along with a summary table.

Content dimension

A concept that seems totally clear after it has been grasped may present an inherent degree of ambiguity, even in mathematics: individuals have their own private landmarks – mental models – they enact to make sense of the concept. Lauren Resnick conceived of the notion of “naïve theories,” a general trend for math and science students to connect the new concept to familiar schema. When students do not “get it,” this does not indicate absence of thought – it may mean a different direction that leads them astray. Sometimes, this happens as the result of a prototypic example and overgeneralization, as for example, in the assumption that multiplication always “makes larger”; students holding this assumption, especially if tacitly, become confused when multiplying by a fraction (less than 1).

In general, a charged event or an emotional trigger within the content dimension is the perceived difficulty of concepts or tasks – especially since the instructor typically has no such difficulty. Instructors prone to theoretical abuse tend to ignore individual mental models and take the default position: “this is what the concept means; this is how you do the task,” justifying such a stance by the publicly accepted meaning for the concept or the standard procedure for the task. In the latter case, especially with “word” problems, instructors may **project** their own processes onto students – assuming that students have access to the same resources as they and proceed in roughly the same manner. And yet these processes diverge considerably in most instances, as students tend to make assumptions and enact behaviors as a result that seem intuitively valid, but often lead them astray. Consider the following table:

A COMPARISON BETWEEN EXPERTS AND NOVICES IN PROBLEM SOLVING

NOVICE TENDENCIES	EXPERT TENDENCIES
<i>Engaging in "high level" reasoning</i> (figuring out, starting at most advanced point possible)	<i>Keeping to fundamentals</i> (reasoning within a simple framework from most elementary point possible)
<i>Immediately processing information</i> (doing something, jumping to conclusions ASAP, but keeping things in one's head at the same time)	<i>Noting & storing information</i> (encouraging a process to become established, sharing things before they are fully formed)
<i>Acting mechanically</i> (writing symbols without a framework, following a format without meaning)	<i>Connecting to conceptual frames</i> (making sure that the format serves an underlying meaning)
<i>Prematurely computing</i> (using technical apparatus, e.g., equations, without clarifying symbols and meaning)	<i>Computing at the end of a process</i> (waiting until symbols and meaning are clarified before going technical)
<i>Moving forward</i> (assuming meanings in place and taking assumptions as absolutes; stopping and struggling when stuck)	<i>Using self as barometer</i> (cultivating a sense of when one has assumed too much, when meanings are equivocal; taking "stuck" as indicative as needing to clarify & ask 'what else?')
<i>Relying on action alone</i> (focusing solely on what to do and thinking of available resources in those terms)	<i>Incorporating prompts and queries</i> (seeing action as flowing from reflections – self queries – and various cues (prompts), and developing a repertoire of them)
<i>Doing one problem at a time</i> (proceeding vertically, from start to finish)	<i>Doing several problems at once</i> (seeing problems as a group, with cross-pollination; proceeding horizontally, with one aspect from problem to problem)

Interpersonal dimension

On the level of interpersonal processes, the primary concern is the tacit expectations each side has of the other. Daniel Goleman, who popularized the term "emotional intelligence," points out the tendency individuals have – in our context, instructors and students – to "act out" without awareness, their underlying emotional issues vis a vis support and understanding from others. This refers to the tendency to feel entitled to certain behaviors from others,

without inquiry into their positions or empathy for them and with little awareness of so doing (and apparently minimal self-control as well).

Specifically, instructors may need their students to be interested in the discipline and responsible for their work, while students may need their instructors to be interested in them and responsible for creating a pleasant learning environment. While these expectations as stated are reasonable, it is not always trivial to recognize when they are met. Often, the way one side expresses them threatens the other.

For example, one charged event for students is the perception of the workload as too fast and the instructor as not focused enough on them as individuals. The inherent ambiguity implicit in all this is rooted in *boundary* and *punctuation*: who does what for whom – and when? When is giving assistance hand-holding and when does it promote learning and self-sufficiency? An instructor may have fixed beliefs about such issues, but unless he or she gets a sense of the meanings students attach to them, theoretical abuse is likely to occur – as the instructor advocates for these beliefs without real inquiry into theirs.

The theoretical abuse default position that can be taken is “this is what you need and this is what I can do for you; the rest is up to you,” expressed as a fixed boundary between instructor and student, justified by the instructor’s previous training (what he or she got in the way of help). Further, the instructor may simply assume that interpersonal issues are largely irrelevant in the learning process (or at least should be), especially in technical courses. To reverse this tendency, I recommend that instructors monitor their own needs from students and openly reflect on the boundary and punctuation issues.

Performance dimension

For the performance dimension, the primary concerns are the student’s aptitude, level of anxiety, and access to resources. In this dimension, the charged event is the commission of errors and/or lack of comprehension, coupled with a non supportive instructor response. The inherent ambiguity is responsibility: who/what’s to blame – the student, the instructor, the nature of the task, random factors? The default theoretical abuse position is “this is where you stand; some people just aren’t cut out for this,” justified by bell-shaped or bipolar distributions and the belief in the inevitability of a sizeable percentage of poor performers (particularly the case in technical courses).

Often students will blame the course or the instructor, but typically, this is psychologically defensive posturing as they are more likely to blame themselves on a deeper level – feeling inferior for not getting it when others do. It rarely occurs to them that they might not be accessing the same resources as their more

successful counterparts. The corrective strategy is (1) for instructors to get more in touch with their own contribution to student difficulties (2) to investigate student thinking (much like the antidote for the content dimension), (3) to make these issues discussable, and (4) to look for resources on a more customized basis.

The following table summarizes these connections:

LEVEL	ISSUE	TRIGGER	INH ambiguity	SOURCE OF TA	TA DOGMA	INSTR NEEDS TO
<i>Content</i> how they grasp new concepts and how they go about solving problems	Naïve theories and tacit strategies	Perceived difficulty	Mental models for sense-making and problem solving; prototypes	Accepted meanings, processes; instructor projection	This is what it means and what you do	Get in touch with their perception and their assumptions & strategies
<i>Process</i> how they interact about learning and tasking	Tacit IP expectations	Pace & workload too fast	Punctuation: who does what for whom, and when is it hand holding?	No need to delve into IP issues in this content area	This is what you need and what I can do for you	Get in touch with IP process
<i>Performance</i> how they progress in short & long term	Aptitude, effort the main variables?	Errors, lack of progress	Responsibility (who's to blame for student failure?) (student, instructor, discipline	Bell-shaped or bipolar distributions	This is where you stand; some just aren't cut out for this	Get in touch with your contribution and investigate their reasoning

EXAMPLES: Committing and avoiding theoretical abuse

To illustrate the extent to which theoretically abusive behavior can be present and seemingly pedagogically straightforward at the same time, the work of computer consultants Brown and Burton in the late 1970s with elementary school children learning arithmetic is exemplary. Typically, they found instructors considered errors in arithmetical procedures enacted by these children to be random misapplications of the rules. They further assumed that students were “blank” mentally because when queried as to their thinking, had no accounting for it (“I don’t know why I did that” was typical). These two researchers were able to demonstrate that the children invariably constructed algorithms, often quite ingenious, of which they were largely unaware. But they were quite consistent in their use of these “buggy” algorithms. Brown and Burton showed that like other computer bugs, errors were generated as a result.

The implications here are vast. By not having a mechanism to explore their students’ thinking, the instructors effectively misdiagnosed them. Some students did, to be sure, “respond” to the medicine they received – the correct answer or repeated swallowing of the appropriate arithmetical algorithm. But this is indeed an instance of theoretical abuse: perhaps in a hurry, perhaps so locked into the acceptable procedures, instructors were often frustrated by these errors, or just wrote them off as random without a second thought. Students were not in a position to challenge them and ask for validation of their thinking! Even if they had, if that were possible, (had they been older, for example), it is unlikely that they would have received it. Here is an example of theoretical abuse that is likely to afflict most instructors of such material. This is a sobering example of just how insidious and underlying – and also undermining – such lack of meaning-making exploration can be on all three dimensions: content and task, interpersonal in the expression of frustration, and performance, through the assumption that adequate resources had been provided for all.

For an example of validation of student meaning-making even when it is incorrect, I asked my graduate students to express the simple expression in a linear programming problem: there are at least twice as many tons of corn as tons of barley. Most of the students produced the equation

$$2C \geq B$$

instead of the correct $C \geq 2B$. What could account for this? I attempted to engage the students in a discussion about their reasoning. After some time, I was able to elicit that many had visualized corn and barley as two “piles,” with the corn one twice as high; they then copied that picture by juxtaposing the 2 and the corn, to express what they were seeing. I was able to validate this meaning-making in the sense of “seeing where the student was coming from,” and then went on to discuss the nature of equations and what they were designed to do. I followed that with a direct translation from English into symbols in addition to requesting that they create numerical examples and then substitute symbols to

indicate the mathematical process. Thus I learned more about their mental processing and helped them get in touch with their reasoning. They did not feel bad about themselves because they now saw where they had gotten off track, learning on a content level what an equation really is all about.

Students at all levels of mathematics often express discomfort and confusion over the idea that the 0th power of a number is 1. Instructors who just assume that it is inevitable for a percentage of students to flounder may not look any further. One way they could help these students would be to self-study and work at articulating their own reasoning – not a mathematical derivation or formal proof, but fundamental thinking processes. In the case of the 0th power, they would then be able to articulate that its definition is motivated by the goal of preserving the contiguity relationship between powers: $10^{n+1} = (10^n) \cdot 10$. So with $n=0$ and the first power of 10 = 10, ten to the zero power must be one.

Two transitions have taken place: (1) from visualizing and verbalizing (3 10's multiplied together: $10 \cdot 10 \cdot 10$) to conceptualizing (the next higher power has “one more ten”) and (2) from focusing on individual powers to focusing on relationships between powers, i.e., patterns. On a content level, theoretical abuse takes place when instructors fail to help students articulate some version of a student extension principle: most students tacitly assume that visualizing worked until now, so it still should. On a performance level, they need to help students avoid the comparisons with those who get it, coupled with the assumptions that such students are still visualizing and are simply more talented.

Instructors who become impatient or frustrated with students may have just cause to feel this way, but they may be committing theoretical abuse in the process. Focusing on the interpersonal dimension, they may assume such transitions to be obvious, embedded in the structure of the discipline. They may become critical or impatient. Students sensing this may choose to make war, not learning, and engage in such backlash as labeling the instructor a “nerd” for his or her interest in these concepts, doing so with the safety of numbers and distance, from the back of the room. Rarely is any of this frustration and ridicule openly expressed, making the whole process fester beneath the surface. Some students buy into this interpersonal instructor position – that they shouldn't need any more he or she is providing in the way of explanations, colluding with that meaning-making and remaining deprived of possibly helpful resources.

Conclusion

Although the interpersonal aspects in teaching required introductory quantitative courses would seem to be of minimal import, students are in fact quite susceptible to instructor attitude and action. We have seen that instructors have similar powers over students as therapists have over clients, in terms of

influencing their meaning-making processes along several dimensions. The concern expressed here is that such power to influence can be (and often is) readily and inadvertently abused. Educators need to appreciate the prevalence of this theoretical abuse and take steps to both prevent and correct it, should it occur.