Teacher Gone... The Marginalization of PSI In Engineering Education

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Abstract

In 1968 Fred Keller published his description of the Personalized System of Instruction (PSI), in the first issue of the Journal of Applied Behavior and Analysis. Over the next 9 years, this particular journal published 21 additional PSI articles, but then virtually stopped, with only a small handful of papers appearing over the following two decades. Between 1970 and 1978, the American Journal of Physics published 35 PSI papers and notes and then abruptly stopped, publishing only three additional PSI papers in 1981, 1982, and 1984. In 1970, Billy Koen published the first Engineering PSI journal article in ASEE's Engineering Education. Over the next 9 years, Engineering Education published 23 additional PSI journal articles and notes, again trailing off into a handful of papers during the 1980's. Similar patterns can be found in other engineering education journals such as IEEE Transactions on Education, and Chemical Engineering Education.

The PSI literature presents an overwhelmingly positive picture of a transformational teaching method. And yet the attention of educators faded in a few short years. Bits and pieces of this enigma can be teased from the literature itself. But for a more complete understanding, we need to look at the larger picture of higher education in America, within the context of changing perceptions and consistent social objectives. This paper will discuss the author's interpretation of why PSI is under-utilized in engineering education, including conflicting views of the learning process, the university research paradigm, isolation and pettiness within the professoriate, and political pressure to maintain class privilege.

Introduction: PSI and the Valley of Dry Bones

Sometimes, when looking at the literature of higher education from a historical perspective, I am impressed by the ethereal nature of what we do as a professoriate. The PSI literature from the early 1970's, like Daniel's vision of the valley of dry bones, holds only the faintest reminder of something that once had flesh and passion. During the initial phase of the literature, no one embraced PSI more enthusiastically than the community of engineering educators. Massive amounts of space were devoted to PSI in engineering education journals and conference proceedings. And yet, by the 1980's and 90's, when I managed to progress through my own engineering education, I failed to encounter even the least reminder that PSI had ever existed. Today when I mention PSI to engineering educators, they are either totally unaware of the method, or they clap their hands over aging ears and run screaming from the room. How could anything that was such a focus of our attention 25 years ago disappear so quickly and completely?

Why was PSI *initially* grasped by the engineering community? It may have been epistemological—engineering scientists may have been attracted to the objectivity of PSI. On the other hand, PSI may have been a practical response to the National Defense Education Act of 1958, and the Higher Education Acts of 1965 and 1968 [1], which flooded our universities with scantily prepared baby-boomers in need of a structured educational experience. As a third possible alternative, *I* would like to think that our attraction to PSI revealed an expanded sense of social justice—the desire to create a non-elitist playing field with room for the personal success of all students. None of these notions, however, would account for why PSI was *dismissed*. Engineers are still objectivist, many of our students are still under-prepared, and as a body of Engineers, I believe we are at least as committed to social equality as we were three decades ago.

After having reviewed the literature, and having spent the past six years designing and teaching PSI courses in engineering mechanics and structural analysis, I would like to discuss what I consider to be the forces behind the marginalization of PSI. Initially, I believe that PSI became an unnecessary victim of the conflict between Behaviorist and Cognitivist learning model constructs. In the final analysis, however, the demise of PSI was quickened by the ascendancy of the university research paradigm, pettiness and isolation within the professoriate, and an unwillingness to commit minimal resources for a non-elitist system of higher education. While PSI is appropriate for only a small portion of the engineering classes we teach, the marginalization of PSI articulates a much deeper problem concerning our ability to implement effective educational reform.

Conflict between Learning Models

PSI emerged at a time when educational psychologists were drawing lines in the dirt and firing off salvoes. Behaviorism had been dominant since the 1930's, but was seen as excessively manipulative. Humanist like Carl Rogers had already begun to call for a more convivial alternative, and Cognitivism (based on Information Processing Theory) was soon to replace Behaviorism as the dominant learning construct. Skinner was quick to see the writing on the wall, and took a narrow view:

“Regardless of how much we stand to gain from supposing that human behavior is the proper subject of science, no one who is a product of Western civilization can do so without a struggle. We simply do not want such a science.” [2, pp. 7]

Skinner was misrepresented as the prototypical, detached technician—antiseptic and careless with the fragile essence of human dignity. He considered science and empiricism to be synonymous, and wanted to use what he knew about observable behavior to improve the human condition. Of course he went about gaining insight into the human condition with pigeons and rats, but then he was an empiricist (a scientist), and he was starting at the ground floor.

There were two basic problems. First, the language of Behaviorism didn't sit well with people; “terms like consequence, control, reinforcement, and punishment” [3, p. 31] were seen as coercive. Second, Behaviorism tends to over simplify ($S^D \Rightarrow R \Rightarrow S^R$) and is prone to ignore

any potentially insightful, internal process that might be underlying the observed behavior. While Behaviorism works well with fairly simple learning tasks, it loses predictive power as the tasks (and the learners) become more cerebral. This is not the same thing as saying that Behaviorism doesn't work. It's just saying that *if* the internal process could be adequately understood, it *might* fill in some of the aspects of human behavior that are difficult to explain with Radical Behaviorism.

In regards to the first problem, Skinner (and fellow Behaviorists) never adequately dealt with the public fear that they might allow human behavior to be manipulated by covert agendas (Watson's defection to Madison Avenue was no help here). Like true Behaviorists, upon failing to adequately communicate their intent, they were left with nothing to do but repeat themselves with smaller, more salient chunks of the same argument (empiricism = science). To the Cognitivists, this seemed to prove the inefficacy of any theory that required discrimination but ignored perception.

The second problem was really an issue of scale, like estimating the response of a 1000-foot bridge from the behavior of a 5-foot model. Where the Behaviorists were working (pigeons pecking and rats pressing levers), the scale appeared linear with regard to increasing levels of learner and learning task complexity (complex tasks were accomplished by chaining simple tasks). The Behaviorists therefore insisted that they didn't *need* to understand the internal process (which they considered unknowable), while the Cognitivists felt that it was far too early to abandon any hope of knowing the internal process, and that knowledge of this process was an essential pre-requisite for generalization. Because Keller was a Behaviorist, PSI inherited the assumption of linearity, and so was open to the accusation of being a shallow technical fix. We sometimes confuse learning theory paradigms (Constructivism/Social Cognitivism/Cognitivism/Behaviorism) with educational philosophies (Self-Actualization/Social Transformation/Cultivation of the Intellect/Organizational Effectiveness). Each of these perspectives might be seen to exist on a continuum (see figure 1) from convivial to manipulative [4]. However PSI, while highly Behavioral (emphasizing such things as mastery, behavioral

learning objectives, and criterion referenced tests) is also largely concerned with self-actualization, (emphasizing such features as student-pacing, peer tutoring, a tacit belief in the ability of nearly everyone to learn at a high level, and confirmatory discussion as part of the mastery exam process). As a consequence, PSI might be unfairly dismissed as manipulative because of its learning theory paradigm, while it is actually convivial from the point of view of its philosophical paradigm.

Dale Brethower has made the interesting observation:

“The vision of innovators is directed toward mega-level ends, and not clouded by specific examples of micro level means used to reach the ends. What followers see, however, is not the ethereal vision but the concrete efforts to move toward it” [5, p. 40].

While the explicit ends of PSI (meeting the defined criteria) are closed and definite, the implicit ends (developing self-regulatory competence), as well as the means (self-directed discussion, consultation, reading and problem solving) remain open. Keller used Behaviorism as a micro-level means to achieve the mega-level ends of self-regulatory competence in his students. Unfortunately, many of his followers and most of his detractors failed to grasp the larger picture of his intent. His selling point to educators was improved performance with specific course objectives, but his *goal* (“Good-bye Teacher”) was turning the lecturer into a facilitator, and changing passive students into the active shapers of their own intellectual destiny.

It might have been understandably difficult to keep the ends of PSI (self-regulatory competence) in mind, when the obvious industrial comparison was factory piecework. With piecework, the ends are profit for the company, achieved through long hours and high rates of responding by labor (something that Skinner noted as inherently unhealthy). From a Behavioral perspective, both piecework and PSI improve short-term performance through a fixed-ratio schedule of extrinsic reinforcement. Industrial piecework relies on a monetary reinforcer (so many dollars for so many units of work). While the extrinsic feedback of module exams could be seen as fixed-ratio, PSI relies more on the intrinsic motivation of enactive mastery [6]. The *intrinsic* feedback associated with mastery is actually more-or-less continuous, because mastery, once appropriately established, sets an expectancy for continued mastery. In other words, the extrinsic feedback on module exams establishes an expectancy for mastery which enables continued intrinsic reinforcement. The student works a problem in the absence of extrinsic reinforcement, perceives that the solution is correct and is *intrinsically* reinforced.

The “procrastination” scallop inappropriately referenced by many of the early researchers as a defining characteristic of PSI (see figure 2) is actually an artifact of fixed-*interval* reinforcement [7], not continuous or fixed-*ratio* reinforcement. Its manifestation in PSI courses has nothing to do with PSI. The single scallop “procrastination” curve is an indication that the final semester grade (an *extrinsic* reinforcer) is such a strong motivator that interim, module reinforcers (also extrinsic) are virtually ignored. The loss of extrinsic reinforcement value from module exams may be predicted by the fact that poor performance on individual mastery exams is not held against the student. Up to a certain number, midterm exams in non-PSI courses are perceived to “count” and therefore may have retained at least part of their value as secondary (extrinsic)

reinforcers. However, *extrinsic* reinforcement has a minor and sometimes negative effect on long-term performance, and is nothing that we should go out of our way to cultivate. The frequent *intrinsic* reinforcement experienced in PSI courses is independent of extrinsic motivation, once an expectancy is developed to the point where the prompt of external (extrinsic) feedback can be eliminated (what Behaviorists call fading the prompt). PSI works, not as a Behaviorist “trick” due to a schedule of extrinsic reinforcement, but because intrinsic reinforcement is allowed to develop. This is enhanced when the course content is valued, the student recognizes her control, and anticipates future success [8].

Educators should be concerned with abulia or burnout caused by fixed-*interval* reinforcement. This is particularly a problem with high ratios, or a large amount of unreinforced behavior punctuated by a brief episode of reinforced behavior (a lot of study and a final semester grade). Given a long interval, the extrinsic reward appears so distal that the individual despairs of ever reaching it. However, the fact that this scallop coincides with a semester of work and a final grade (rather than a unit of work and the feedback on a module exam), indicates that it’s not a function of PSI, but of the semester academic term. If the procrastination scallop represents a fixation on extrinsic reinforcement (pacing responds to a final grade, rather than continuous intrinsic reinforcement), it is as easily attributed to companion non-PSI courses, with a heavier

emphasis on extrinsic reinforcement, than PSI courses with an emphasis on intrinsic reinforcement.

Although student pacing is not tracked in lecture courses and instructor pacing is usually linear, it would be foolish to assume that the procrastination scallop does not also exist with instructor pacing, being camouflaged by norm referenced exams (this shouldn't surprise anyone who ever crammed for their final). However, while abulia may be the predictable response to a long, fixed-interval reinforcement schedule, susceptibility to burnout is a function of personality and prior history. Different individuals will have a different threshold of tolerance, and our educational system ends up sorting individuals by learning style rather than academic capacity.

The Behaviorist/Cognitivist debate seems to be dying down, with the recognition that the Behaviorist construct works well for some learning objectives while the Cognitivist construct works well for others. Both constructs are objectivist, and they are not mutually exclusive, at least from an application perspective. Sadly, PSI was caught up in the conflict and suffered needlessly from a negative association.

Ascendancy of the University Research Paradigm

PSI came along at a time when the university research paradigm was taking control of higher education in America. Since the 1960's, most colleges and universities have increased their emphasis on research and grantsmanship. While there have always been publish-or-perish institutions, the emphasis on funding is a more recent development. Historically, this had been restricted to larger universities, which were balanced by a number of smaller "teaching" institutions. With swelling enrollments from the baby boom, post-war prosperity and changing employment patterns, "teaching" institutions became larger, and started to see their mission as shifting automatically toward the types of research that had traditionally been the province of larger schools. The enormous (even by governmental standards) administration fees associated with research grants (which would be called profit and overhead in the private sector) provide a forceful Siren call. With the end of the cold war, research schools have had to scramble after fewer dollars, which reduces the amount of time available to institute educational innovation such as PSI, and also devalues the teaching function in general [9]. Together these trends amount to a hijacking of what had been educational facilities.

There is, of course, grant funding available for educational research, some of which was used to promote PSI during its development phase. However, under the research paradigm, academics need to make contributions that are visible to other academics within their disciplines. This limits the viability of educational research for engineering educators. Additionally, when an academic agrees with the majority opinion, she has a tendency to disappear within the crowd. Our desire to avoid this promotes what Parker Palmer [10] refers to as our capacity for disconnectedness. Instead of basing our teaching/research goals on moral decisions, we look for the promise of visibility. Rather than looking for accomplishments that *are* worthy, we merely look for accomplishments that *appear* worthy. As a result, we tend toward teaching methods that emphasize ourselves, we chase after educational fads in a never-ending search for novelty [11], or we abandon the quest for effective teaching altogether. While PSI remained novel, it

attracted research funding to support the Center for Personalized Instruction, a journal dedicated to publishing PSI research, and numerous research designs. However, because the center was not quite self-supporting by the end of its grant period, it was allowed to disappear [12]. Without a source to disseminate research and provide visibility, PSI was doomed.

However, the nature of PSI research in general, particularly within the engineering community, made it difficult for newly interested educators to gain any semblance of visibility with their own PSI-related scholarly activities. Most of the early PSI literature was non-comparative. While this literature was of *great* value, it was principally written by engineering educators with a limited background in educational research design. As a result, these papers consisted of positive self-report from doctrinally oriented teachers and their students, and tended to be very similar. After the first few articles, the contributions lost their distinctiveness and the authors therefore lost their visibility. The general lack of quantitative rigor in these papers leaves the impression that the visibility of a quickly written publication was used to justify the extra work involved in converting a course to PSI. When their efforts were no longer publishable, the incentive to establish PSI courses disappeared.

Given the general prejudice against qualitative research (particularly in the engineering community, so heavily dependent on the quantitative research paradigm), and the amorphous qualities of published PSI research, engineering educators began to call for a more systematic analysis of the components of PSI. This could only be accomplished by engineering educators thoroughly engrained in the method, and new “converts” were therefore systematically excluded from publishable research. Also, because of the search for novelty, PSI researchers fragmented instructional components and failed to develop complete systems [13]. This gave them limited visibility, but failed to provide a workable, integrated instructional design.

Our narrow definition of scholarly activity has a tendency to constrain it to meaninglessness. Typically, the only publications that count are those that are addressed toward our “peers,” which in some perverse taxonomy automatically excludes our students (clearly we have much to learn here from traditional apprenticeship and social learning theory). Therefore the creation of PSI course material (addressed to our students) is not considered as scholarly, while a journal article (addressed to other teachers) describing and analyzing these materials *is* acceptable. In addressing our scholarly activities so narrowly, we limit the extent to which that scholarship can have an impact on anyone other than ourselves. Scholarly writing is the process of clarifying and organizing our perceptions to the point where they are defensible—primarily to ourselves. Certainly the creation of new instructional materials—which clarify and organize the perceptions of our students—has at least as much value as what we write for ourselves. To the extent that we fail to recognize this, we isolate both the products of our scholarship, and ourselves.

Isolation and Pettiness within the Professoriate

Most changes follow fairly predictable patterns—early innovators, general acceptance and laggards. Change, however, is frequently constrained by conflicting impressions of self-interest. Sherman made the interesting observation:

“The barriers to educational reform are formidable, even awesome. The power, the money, the investment in keeping things as they are may be impossible to overcome. Recommendations may be acceptable only if they don’t change things very much. Improving instruction is the goal, but only in the context of not changing anything that is important to any vested interest. We may be stuck with the system we have, always seeking some modifications to solve the problem without disturbing anything.” [12, p. 61].

The early PSI cheerleaders demonstrated a lot of missionary zeal, and were particularly vehement against the lecture method. Reacting perhaps from a sense of what Brookfield [14] calls the imposter syndrome, opposition to PSI became relatively intense. The sense of affront, however, was ill placed, since most engineering professors don’t really lecture anyway (at least in the same manner that lectures occur in the social and life sciences), but engage in masterly modeling of behavioral competencies [6], more commonly known as chalk-n-talk. The discursive nature [15] of engineering education gives us a distinct advantage over other disciplines, but also makes it hard for us to put much credence in the typical “mass” application of education.

Deep down, I believe we all recognize that rigid group instruction is ineffective. However, from the perspective of managing our own time, we feel constrained to group methods. The PSI promise of individualized instruction, accomplishable within the constraints of our existing time commitments, was a powerful lure for many educators. However, while the time commitments for PSI are doable, they are significantly greater than that required for group methods. Faced with a university research paradigm that required increased scholarly visibility, many educators were concerned about any general movement that might require more time being devoted to teaching. Because many aspects of PSI courses are not individualized (the curriculum, exams and contingencies are typically the same for all students), educators who wished to oppose PSI could claim that PSI wasn’t individualized and merely “spoon-fed” students [16]. This impression may have been enhanced by several PSI researchers who, obsessed with the procrastination scallop mentioned earlier, made PSI even less individualized by imposing as many as 26 target deadlines [17].

Educators who wished to oppose PSI were also able to point (if somewhat irrationally) to its roots in programmed instruction. Because of individualized student pacing, PSI was associated with other mainstay Behaviorist methods. Programmed instruction and teaching machines were resisted because they typically lacked the social element (we want to be taught by people, not machines). They also were geared to a very low common denominator and so were deathly boring. However, there was a definite implication that programmed instruction (and to a lesser extent, PSI, given the title of Keller’s initial paper [18] was intended to *replace* educators. While this may or may not have been terribly realistic [19], it was at least an implicit threat that might mobilize educators against PSI in their own self-interest. Paradoxically, Computer-Based Instruction (CBI) which is actually more like programmed instruction (especially when you consider the presence or lack of a human element) has managed to survive. Sherman [12] attributes this to the fact that CBI is seen largely as a supplement to other teaching activities and does not pose as much of a threat to the entrenched activities of teachers.

The significant contextual differences between PSI and programmed instruction were never fully appreciated. While the *individualized* nature of PSI was a welcome change from the fiercely

competitive education rampant during the 1960's and early 1970's (when PSI was being developed), higher education has more recently moved toward the third alternative of *cooperative* education. While PSI eliminates much of the competition associated with formal education, it is seen as not going far enough in the direction of collaborative learning. In fact, the individualist nature of PSI is seen as a hindrance to collaborative learning. This however, is not necessarily the case and PSI, by using Internal Student Proctors and collaborative learning models [20] can function as an acceptable platform for collaborative learning. However, because it emphasizes individual as opposed to collaborative work, it appears less desirable to many educators.

Perhaps as teachers we assume an unwarranted amount of credit for the learning that takes place under our supervision. I think we recognize this, but we also expend a great deal of effort and want our work to count for something. Early in the literature, there was a marked attempt to relabel the method so that we could claim it as our own (like Pharaohs overstriking the cartouche of a deceased monarch). Sometimes the changes were so minor that they seemed almost transparent, in a dyslexic sort of a way (PSI, SPI, PPSI). At the bottom of the problem was perhaps the need for recognition. As mentioned earlier, much of the extrinsic reward available to the professoriate derives from scholarly visibility. And yet the effort of teaching is often invisible in the final product, and so goes unrewarded (extrinsically). This is particularly true of PSI, where the teacher facilitates, drawing the student into the center of the process and sharpening the student's self-regulatory competence. The proper role (and reward) of the PSI facilitator might be best expressed in a paraphrase of Lao Tzu's The Way of Life.

A teacher is best
When students barely know that she exists,
Not so good when they obey and acclaim her,
Worst when they despise her.
“Fail to honor students,
They fail to honor you;”
But of a good teacher, who talks little,
When her work is done, her aim fulfilled,
They will all say, “We did this ourselves.”

Teachers (no one) should have to exert their best efforts against their own self-interest. However, in the lack of institutional support, we should still be willing to do the right thing. As educators, we have a responsibility to support the educational process. While this will mean many things to many different educators, and includes research and service as well as teaching, if we allow ourselves to become distracted by self-interest and extrinsic reward systems, then we have failed in our primary function. To be effective, we need to be self-directed. To the extent that we are not, we perform a disservice to our students, our research, our institutions and the educational process itself. From my own limited perspective of higher education, I see far too much activity directed by reward structures which originate beyond the periphery of the educational process.

Denial of Non-Elitist Education

The justification for a free market economy is the efficient and equitable distribution of goods. While this may sound quite reasonable on paper, free competition for resources is only equitable on a level playing field. I suppose it is just human nature to seek an edge in our competition for material possessions, but when that edge becomes institutionalized, the sense of unfairness can be demoralizing—unless the advantage is seen as something fairly earned. For example, the intent of professionalism is not (as many of our professional societies would have us believe) to fulfill some noble service in the interest of mankind, but rather to use clearly defined expertise as a tool to claim authority. Once authority has been established, it in turn is quickly used to demand exclusivity. Often, the claims of expertise are exaggerated. However, because expertise is considered to be developed at personal expense, privilege through expertise is generally accepted. Privilege as a consequence of birth, seems much less acceptable to those on the outside.

Higher education is perhaps the classic example of a vehicle used to justify privilege by referencing the exertion of personal effort. Extended formal education has traditionally been invoked by the ruling class to justify the absorption of more than their fair share of the world's product. Yet, as more of us actually achieve higher education, the use of education to justify privilege seems more and more contrived. The insidious nature of class privilege in this country is accentuated by the *claim* that anyone can become educated and gain access to privilege. While at face value the statement is quite true, the playing field is obviously tilted in favor of the class of privilege, of which, as professors, we are all a part. There is little moral distinction between privilege based on inheritance, and privilege based on alleged intellectual capacity (either one of which might be considered as “winning” the natural lottery). Sadly, we as a professoriate have apparently bought into the justification of our position, and as a group, we have a perverse identification with the upper quartile of students. Some of the evidence [21,22] indicated that PSI was more beneficial to lower achieving students (who perhaps needed remedial work or greater structure). Any method of teaching that primarily benefits anyone other than the upper quartile is seen as degrading the lofty purpose of formal education.

My personal recollection of the period during which PSI developed and flourished (which coincides with my first undergraduate degree), is of an academic community intensely interested in non-elitist education. Perhaps the flood of college students from working class homes (some of whom may have been us) gave us a sense that our ability to compete for grades was no justification for invoking privilege. But perhaps it was that very flood that made the development of non-elitist education unlikely. Bandura has noted that “prosperity breeds complacency, dampens interest in innovative renewal, and fuels the internal social dramas that impede change” [6, p. 448]. PSI may have come along at precisely the *wrong* time. Because of baby boomer enrollment, the cold war, improved access, and employer demands, higher education was experiencing extreme and unprecedented prosperity. Under these circumstances, it would be unlikely that we as a professoriate would respond to the voiced desire for a non-elitist application of higher education.

Perhaps we could never seem to bring ourselves to accept self-pacing for students (including those who take too long), because the claim of our expertise was always open to potential embarrassment if someone were to finish our course too quickly (like Jack London, and his agreement with the Oakland school district). However, the efficacy of self-regulation is also an important goal in many PSI courses and in our undergraduate curriculum in general. This, however, carries an associated cost. There were experiences with failure, because PSI was not as easily adapted to the large lecture, amphitheater format classroom, to which universities gravitated as a result of downgrading the teaching function. PSI (individualized instruction) is not consistent with group learning and so is potentially more expensive. There is a general reluctance on the part of higher education to keep class sizes small enough to enable significant individualized instruction. However, if there is a bright spot for individualized instruction, it is with distance education. The very nature of asynchronous communication limits potential class sizes to the point where individualized instruction becomes possible.

There is also a cost with PSI that the innovator professor has to bare personally (in the absence of institutional support). The instructional design component (creating PSI instructional materials) requires significantly more time than a new prep for a non-PSI course. In addition, the consultation time with students is also significantly more. But there is also a carry-over to this consultation time outside of PSI courses. Students become so used to coming into my office for consultation that they continue to do so for their other classes (including those that I'm not teaching) even after the PSI course is completed. While this is flattering in many ways, it amounts to approximately as much consultation time as in my other non-PSI, non-Capstone courses. I continue to maintain an open door policy with my students (and past students) because I believe that it is the most important thing that I do, outside my own home. It has, however, contributed to the difficulties I experience as a result of decreased visibility among those whom my college has determined to be my peers.

Conclusions: The Effective Implementation of Educational Reform

We teach the way we learned and we learned in a manipulative, competitive environment. Failure is inevitable if we can not expand our pedagogy beyond what we have learned in the classroom of our youth. As a faculty, we lead insular lives. There is little cross-fertilization within departments (as far as teaching methods go), let alone between departments. PSI flourished during the liberalism of the 1960s and 1970s and seemed to die during the Reagan Era. Keller noted in retrospect:

“It has failed as yet to overthrow the 17th century practices of 20th century education not because it ‘didn’t work’ but because of its implications. Fred Skinner’s dream of an effective, non-elitist, non-competitive, positively reinforcing system for students of all ages and in all walks of life was not to be made real within his lifetime, to his oft-expressed regret.” [23, p. 407]

Non-elitist education was more than those in control wanted. In their shortsightedness, truly educating all citizens was less important than the maintenance of privilege. The resulting undereducated populace may have dire political ramifications as the majority of available jobs move into the knowledge sector [19].

Perhaps the full utilization of PSI is a non-issue. The *reason* for the under-utilization of PSI is much more significant. We need to fully utilize *any* learning theory constructs that prove effective. We need to value our teaching and not abandon our efforts in this area for more extrinsically rewarded pursuits in visible research. We need to overcome our pettiness and isolation, supporting each other and developing integrated instructional materials and methods. We desperately need a non-elitist system of higher (and lower) education in this country and in the world, where the potential and significance of all individuals, and all contributions are valued. While PSI is an appropriate tool, it isn't essential. However, as Levin [24] has noted, education doesn't suffer from a shortage of good ideas, but from a shortage of effective implementation.

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