BALANCING RIGOR AND RELEVANCE IN SCHOOLING:
A 1ST PERSON EDUCATION ENDEAVOR

Asghar Iran-Nejad1 and Shelly Anderton Cain2

1The University of Alabama - 309 Carmichael Hall, Box 870231, Tuscaloosa, AL 35487
2The University of Alabama - 306 Carmichael Hall, Box 870231, Tuscaloosa, AL 35487

ABSTRACT

For several decades, the quality of educational research and practice has been the object of criticism so much so that the status of the colleges of education at research universities is being reexamined as the principal source of relevant and rigorous scientific knowledge for educational practice. This paper defines educational relevance through the lens of 1st person education and combines theoretical and experimental rigor to investigate the influence of varying embodiment levels on student understanding and interest in a school setting. A Latin Square design is employed to achieve rigor through experimental control, a mind-body cycle of revelation/reflection is used to build relevance into educational practice, and a three-phase model of teaching is used to implement these innovations in today’s classroom.

KEYWORDS

First-person education, understanding, interest, mind-body cycle of revelation/reflection, biofunctional embodiment

1. INTRODUCTION

In 1993, Iran-Nejad and Marsh published an article entitled Discovering the future of education (Iran-Nejad & Marsh, 1993) stating that one challenging problem facing education was figuring out how “to prepare individuals to serve rapidly-changing modern societies several decades into the future” (p. 249). This kind of preparation, they suggested, cannot be based on the educational infrastructure of the past. Education for the future is going to require a future-oriented infrastructure. Almost two decades later, the future Iran-Nejad & Marsh referred to is now here and the idea that educational infrastructures must be about two decades ahead of the time is currently a growing realization. For example, Heffernan (2011) cites Cathy N. Davidson, co-director of the annual MacArthur Foundation Digital Media and Learning Competitions, as estimating that 65 percent of today’s school children will eventually be working on jobs that have not yet been invented. What is wrong with past century’s educational infrastructure as illustrated in such standard operational procedures for education as Bloom’s (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956) taxonomy and what kind of educational infrastructure promises to correct this wrong (Iran-Nejad & Stewart, 2007)?

To solve the problem, Iran-Nejad and Marsh argued that educators must discover a way of thinking clearly about two radically different educational infrastructures at the same time. This is because to educate today’s children for careers invented in the future, we must (a) first discover and neutralize any archaic assumptions that sustain today’s education and (b) invent a new set of futuristic assumptions for a radically different kind of education (Iran-Nejad & Pearson, 1999). Therefore, for several decades, Iran-Nejad and his colleagues have been working on laying bare the outdated assumptions of what they consider to be the old-fashioned 2nd/3rd-person education (Bloom, 1984) and inventing an alternative kind of education that they have called 1st-person education (Iran-Nejad & Houser, 2011; Iran-Nejad & Stewart, 2011). This article reports on the progress that has been made since early 1990s in these areas.

We argue that today’s education must abandon its narrow focus on the 2nd/3rd-person science and practice of requiring learners to commit to memory someone else’s disembodied knowledge for the purpose of returning that same knowledge back on tests under the threat of accountability for both educators and learners (Iran-Nejad & Stewart, 2010). Rather, education must broaden its mission to take advantage of the powerful capacity of learners for insightful understanding (Iran-Nejad, McKeachie, & Berliner, 1990b). Unfortunately, today’s 2nd/3rd-person education runs counter to the very natural direction of this capacity.
Children come to this world with a biofunctional body-mind cycle of revelation/reflection for 1st-person understanding that enables them to intuit their own knowledge of the world. Today’s 2nd/3rd-person education leaves out the biofunctional body, the 1st-person of the learner, and the full picture by which personal pronouns (i.e., I, we, you, she, etc.) define human interpersonal relations. The broader mission of education must keep its 2nd/3rd-person education resources, put them behind the biofunctional body-mind capacity of children, base its science and practice on this capacity, and take wise advantage of digital-age multimedia to make all of these possible. But most importantly, today’s education must recognize where it is before it can better understand where to go. Rather than seeking and making educational science and practice out of disembodied taxonomies like Bloom’s (Krathwohl, 2002; Shulman, 2002), the broader mission of education must nurture the capacity of learners to seek revelations and reflect on them. Using the expanded pronominal infrastructure of interpersonal relations, this paper first explores (a) some of the inherent shortcomings of today’s narrow focus on 2nd/3rd-person knowledge internalization and (b) some of the powerful virtues of the 1st-person education perspective. Then, we report a study to illustrate how the broader mission of education can be used to illustrate the rigor and relevance of science in a naturalistic school setting.

2. 2ND/3RD-PERSON EDUCATION AND KNOWLEDGE AS THE EDUCATIONAL OBJECTIVE

By in-depth infrastructure, today’s education is a 2nd/3rd-person institution. Its mission is, by definition, imparting someone else’s knowledge to the learner through an adult>children one-way process. Viewed through the eyes of the learner, 2nd-person (pronominally defined as “you,” singular and plural) represents the classroom teacher and other school personnel; and 3rd-person (pronominally defined as “he/him,” “she/her,” or “they/them”) refers to adult educators in general. On the surface, this kind of educator>learner relationship makes sense. Human knowledge is a valuable commodity; and, like other valued commodities such as physical wealth, is subject to the laws of growth, inheritance, and continuity. Figure 1 shows the one-way borrow-return cycle of knowledge acquisition in the information-processing architecture for the 2nd-3rd-person education. Two features of this architecture are notable here. First, the medium of exchange is, at least in principle, high ground/level (e.g., scientific knowledge, which exists mostly in external knowledge bases trickling down into school curricula in the form of text in educational taxonomies, textbooks, lectures, and the like. Second, according to the infrastructure of the 2nd-3rd-person education, this outside knowledge must travel the one-way borrow-return cycle of teaching-testing as shown in Figure 1. This means the relevance of this knowledge to the person of the learner must somehow be defined, if at all, externally by someone else like the teacher in the form of grades, money, and other forms of external value or property.

![Figure 1. The one-way borrow-return cycle of disembodied information in 2nd/3rd-person education](image)

2.1 Pronominal Scope, Nature, and Role of Personal Dependencies

As Figure 1 suggests, borrowing and returning someone else’s knowledge cannot possibly be a productive source of 1st-person relevance to the learner. As already suggested, several related considerations support the thesis that a revaluation of the 2nd/3rd-person education infrastructure is likely to prove promising, especially if it is carried out along with an examination of the 1st-person education infrastructure defined pronominally as I/me and we/us. Through the lens of pronominalization, 1st-person, 2nd-person, and 3rd-person dependences may be assumed to play the primary, secondary, and tertiary causal roles in learning. In particular, the major
The one-way adult→children process of instruction underestimates the fact that children are highly self-reliant and, therefore, very proficient learners (Iran-Nejad, 1990). This is why young learners often find what adults teach them irrelevant to their lived day-to-day experiences (Merleau-Ponty, 1962). For the more critical learners, who rely on their own 1st-person capacities, the one-way process of teaching is patronizing and a source of adversarial relations between the educator and the learner. In fact, adversarial relations are not confined to school settings. They are an unacknowledged global fact of life between many parents and their children and increasingly between governments and citizens.

By what mechanism does the 2nd/3rd-person infrastructure play its causal role? The answer is not as mysterious as the question implies. The 2nd/3rd-person infrastructure is a highly prolific producer of intergroup dependencies of the divide-and-conquer type that are more likely to be adversarial than mutual in nature. Harmless examples of this occur when the teachers in a teachers’ lounge might poke fun at a student; or students in a class chuckle at the inexperience of their teacher; or a satirist pleases the audience by poking fun at the president. However, not all adversarial intergroup dependences—or us-versus-them interdependencies (Cikara, Botvinick, & Fiske, 2011)—are so harmless. In fact, some of them turn out to be even deadly. The most extreme form of adversarial interdependencies occurs when members of an ingroup target the destruction of the members of an outgroup by means of suicide bombing. In the course of the daily lived experiences of a less extreme kind, adversarial intergroup dependencies are at work when we secretly feel pleasure in the suffering of the members of an outgroup (Cikara, Botvinick et al., 2011; Cikara, Bruneau, & Saxe, 2011). There are, of course, what might appear to be mutual, rather than adversarial, 2nd/3rd-person interactions (e.g., feeling admiration for authoritativeness of a teacher (Iran-Nejad et al., 1995); but these examples might be traceable to the sources of 1st-person (or ingroup) dependencies.

### 2.2 The Broader Mission of Education and Bloom’s Dilemma

An already implied consideration is that the mission of education is much broader than imparting 2nd/3rd-person knowledge. Capacities such as motivation, affect, interest, understanding, and self-regulation have proven more difficult to promote in the 2nd/3rd-person infrastructure. Bloom’s unfulfilled campaign in the United States to establish educational objectives is an apt example. His approach originally included cognitive, affective, and psychomotor objectives (Bloom, 1956). However, history bears witness that educational research and practice has focused almost exclusively on cognitive objectives (Bolin, Khramtsova, & Saarnio, 2005). Moreover, the cognitive taxonomy was meant to be a classification tool for the content of educational curricula at increasingly higher levels of organization in order to facilitate for both teachers and learners the engagement of higher ground/order thinking skills. Nevertheless, when Bloom (1984) himself re-examined how effectively this tool had played its role decades later, he lamented that educational practice had failed to keep up with the taxonomy (Iran-Nejad, 1990). What prevented Bloom’s approach from fulfilling its comprehensive mission? The infrastructure of the 2nd/3rd-person education is a likely candidate.

Bloom (1984) made a trenchant analysis of the problem and a valiant attempt at remedy. He showed that the extreme one-to-one (1-1) tutoring fostered two SDs more learning than group (1-30 or so) classroom instruction. He reasoned that we must gather our resources behind making 1-30 group instruction as effective as 1-1 tutoring. More than three decades later, no evidence exists that a significant step has been taken in this direction. The highly disembodied nature of this abstract may be responsible for lack of progress in this area.

### 2.3 The Tension between Rigor and Relevance

The failure of the 2nd/3rd-person education to serve the broader mission of education, inclusive of everything that has had something to do with fundamental 1st-person relations, may have been the real cause of what
Schön (1987) identified as the crisis of confidence in education. He argued, metaphorically, that the existing territory of educational practice encompasses a high ground of rational knowledge and technical know-how (see Figure 1) overlooking a swamp. He stated that the “irony of the situation is that the problems of the high ground tend to be relatively unimportant to individuals or society at large, however great their technical interest may be, whereas in the swamp lie the problems of the greatest human concern” (p. 3). He suggested that the high rational-technical ground of 2nd/3rd-person knowledge is a predetermined zone of practice characterizable by the presence of prior scientific knowledge. Problem solving in this zone takes rigorous declarative knowledge and procedural know-how, both of which have their source in the predetermined high ground of scientific research and abstract logic. By comparison, the swampy lowland is an indeterminate zone of relevant practice that takes knowledge and know-how of a qualitatively different kind, namely, knowledge-in-action that results from the art of reflection-in-action. Schön claimed that the kind of research that is conducted in the colleges of education in today’s universities is inapplicable to the swamp of educational practice because it focuses exclusively on the high rational-technical ground of predetermined scientific knowledge, divorced from the indeterminacy of the swampy lowland of educational practice.

Schön’s (1987) analysis of the relation between rigor and relevance was compelling; but his rigor-versus-relevance contrast raises a fundamental question: Are rigorous scientific problem solving and relevant problem solving in action/practice incompatible? On the other hand, incompatibility may be a symptom of the causes entrenched in 2nd/3rd-person education infrastructure, which Schön’s alternative leaves untouched. For him, the rigor-versus-relevance contrast means merely a shift in the origin of the 2nd/3rd-person knowledge that teaching interns are expected to internalize via the same borrow-return cycle shown in Figure 1. In other words, the someone else who lends the teaching intern the relevant knowledge must be the practitioner with the natural proclivity for knowing/reflecting in action rather than the university researcher who possesses the expertise for rigorous scientific research. Whether the source of teacher knowledge is scientific research or educational practice, relevance is still determined externally by someone else other than the person of the learner relying first and foremost, as in 1st-person education, on the sources from within.

In philosophy, the high ground of rigorous rational knowledge is often contrasted with the lowland of irrational passion. If so, Schön’s portrayal of the problem applies to but is by no means confined to the world of educational practice. The following excerpt from Neumann (2006) suggests that the academy in general, including Schön’s rigor-versus-relevance dichotomy, downplays (private) 1st-person education relevance in favor of (public) 2nd/3rd-person rigor. According to Neumann:

Some professors strive to teach in ways that awaken love for the learning of particular subjects in their students (see, for example, Palmer, 1998), but they rarely talk in public of their own intellectual loves, including how passion (or its absence) shapes their scholarship. Doing so risks personalizing intellectual work, painting it as a less than serious endeavor—even as biased and unscientific—and thus as irrelevant, unimportant, or frivolous. It also risks painting academic workers and academe generally, as questionable contributors to the larger social good, a serious concern in an era of declining faith in the social value of higher education. (p.381)

Like Neumann’s work, 1st-person education suggests that it is the 2nd/3rd-person infrastructure that may be behind the declining social value of education, in particular, and social conduct, in general. In the introduction to an edited volume on the ethical integrity of the academy (Gallant, 2010), Gallant and Goodchild (2010) stated, a “quick review of two of the most prominent higher education press publicans in the United States, Inside Higher Education and The Chronicle of Higher Education, reveal numerous stories of unethical conduct on the part of professors, administrators, researchers, and students” (p. 3).

3. FIRST-PERSON EDUCATION AND UNDERSTANDING AS THE EDUCATIONAL OBJECTIVE

What if we begin to entertain, in favor of a radically different educational infrastructure, the idea that knowledge is not the kind of prerequisite and gateway to understanding that Figure 1 implies (e.g., Bransford & Johnson, 1972)? This would make it easier to understand Schön’s (1987) claim that high ground knowledge is impractical because educational practice is an indeterminate zone characterized by the absence of predictable knowledge. Another implication is that knowing and understanding are different human...
capacities and, therefore, understanding processes must be set apart from knowledge acquisition processes implied by Figure 1.

### 3.1 Understanding as Integration and Knowing as Differentiation

The processes by which the new 1st-person infrastructure plays its causal role are different. Whereas the 2nd/3rd-person infrastructure is a lenient ground, e.g., for intergroup differentiation, the 1st-person infrastructure thrives on intragroup union (Iran-Nejad & Gregg, in press). In other words, the 2nd/3rd-person dependences separate groups for adversarial (e.g., jealousy or animosity) or mutual (e.g., flattering) interaction of the “I versus you” or the “I/us versus her/him/they” kind; but 1st-person education combines groups for integration, as opposed to interaction, of the “I/me and we/us” type. The critical difference between, for example, mutual interaction (e.g. flattering) and integration (e.g., admiration) is that the decision to engage in the former is made knowingly—the person is aware of the decision and related attributions being made to the someone else (e.g., the teacher) who is the object of interaction. By contrast, mutual integration (e.g., admiration, empathy, or understanding) happens spontaneously without experiencing awareness of the someone else who may happen to be, in part or whole, the external source or object of learning (Johnson, Hashtroudi, & Lindsay, 1993).

When it comes to knowledge acquisition per se, 1st-person education identifies the process as knowing by revelation or insight (Iran-Nejad & Stewart, 2011). However, it is noteworthy that, in 1st-person learning, knowledge acquisition never happens in isolation contrary to the high ground knowledge base that Schön criticized for being inapplicable to educational practice. Rather, the emergence of knowledge by insight encompasses understanding, interest, and affect.

A major assumption in 1st-person education is that knowing and understanding are fundamentally different but complementary human capacities. First, understanding is a biofunctional capacity in that it is the special biological function of the nervous system just as breathing is a special biological function of the respiratory system. In this sense, the subjective experience of the click of understanding is an indication that the whole nervous system has engaged in a single unified act of understanding just as the click of respiration that we sometimes experience in the concluding moment of a deep breath is an indication that the whole respiratory system has engaged in a single unified act of breathing. The implication is that knowing begins and ends with intuitive self-awareness of some content (e.g., the subjective awareness of the cognitive content of an insight and the good affective feeling that comes with it or the subjective awareness of the good affective feeling that comes with a deep breath); whereas understanding occurs without awareness.

### 3.2 Knowing by Revelation and Understanding by Reflection

Defining understanding as integration without awareness and knowing as differentiation by means of intuitive self-awareness leads naturally to an intriguing set of ideas (see Figure 2). First, far from being the prerequisite or the gateway to understanding (Bramford & Johnson, 1972), (a) knowledge is, first and foremost, the outcome of understanding. Second, knowledge acquisition cannot possibly originate in the maintenance or elaborative rehearsal of the external input per se in the absence, that is, of the prior understanding that ought to serve as the origin of knowing, contrary to the implications of the 2nd/3rd-person education shown in Figure 1. Third, as shown in Figure 2, knowing as differentiation and understanding as integration are fundamentally different capacities. Finally, knowing and understanding are complementary human capacities, the likely reason why knowledge acquisition by insight happens with a click of understanding and the louder the click of understanding, the more striking the knowledge in the revelations.

Figure 2 shows, by the movement of the arrows in the form of the figure 8, the complementary integration/differentiation roles understanding and knowing capacities play to make the body-mind cycle of revelation/reflection possible. In the bottom part of the figure 8, clockwise arrows represent the biofunctional process of ongoing biological activity (OBA) in the nervous and bodily systems. In the top part the of figure 8, the counterclockwise movement of the arrows represents cognitive functioning made possible by a continuous sequence of momentary constellation firing (MCF) of the neurons in the nervous system. The clockwise arrows leaving the bottom portion of the figure 8 for the top portion represent the revelation process. The clockwise movement of the arrows in the top portion turning counterclockwise shows how revelation (or understanding) turns into reflection (or knowing). Finally, the counterclockwise movement of
the arrows turning clockwise shows how knowing reintegrates with a new twist into understanding (Iran-Nejad, 2000; Iran-Nejad, 1978, Iran-Nejad & Gregg, 2001; Prawat, 2000).

[Image 235x539 to 398x714]

3.3 Knowing, Knower, and Understanding Processes

If knowing and understanding are fundamentally different, albeit complementary, capacities, they must involve different kinds of processes. To illustrate, consider the following statements: (1) I drive but I do not know how I drive; I reflect on ideas but I do not know how to reflect; I understand but I do not know how I understand. Each of these statements has two parts: A declarative part that makes an assertion (i.e., I drive/reflect/understand) and a procedural part that negates the declarative assertion (i.e., I do not know how I drive/reflect/understand). Even though these statements are identical in format, they represent different processes: knowing, knower, and understanding processes. Knowing processes involve the explicit or implicit content representing external objects or events. Driving is a popular example for illustrating declarative and procedural knowledge (Anderson, 1996) even though it is one of the myriad of others that people use to act on the external world. Knower processes have to do with 1st person cognitive and metacognitive processes the knower uses to act on knowledge. Examples are reflection, application, elaboration, evaluation. The third type is understanding processes. Examples are revelation, realization, and recognition. There are biofunctional processes we attribute to the body as in My body aches all over even though we might also say, rather more awkwardly, I ache all over. In both cases, we do not know how to ache, hence the awkwardness of attributing the process to our persons (or ourselves). With certain abilities like riding the bicycle, we must word the capability just right to separate the biofunctional from the self-awareness of the content that defines knowing. Our bodies keep our balance on the bicycle even though we are not knowingly aware of the content of how we balance ourselves on a bicycle. What we have about these (learned) biofunctional capabilities is an understanding that we do them without knowing how, explicitly or implicitly.

Even though the three types of statement are identical in format, the statement types point to a fundamental difference between understanding processes and the two types of knowing processes. Note that the two knowing statements are intuitively unacceptable because the declarative and procedural knowledge in them contradict one another. Also note that the knowledge implicit in procedural knowledge is still cognitive knowledge even though we are not aware of the content of the knowing at the moment it occurs. By contrast, the understanding statement is acceptable (Prawat, 2000) because it is devoid of procedural content for us to know and, therefore, there is nothing to contradict the declarative knowledge that we do understand. In other words, unlike knowing, understanding is not a cognitive process. It is a biofunctional process (e.g., OBA or

Figure 2. Dark arrows moving in the shape of the number 8 represent the body-mind cycle of revelation/reflection. Clockwise arrows represent understanding (U). Counterclockwise arrows represent knowing or cognition (C). Clockwise arrows turning counterclockwise at the top right hand represent revelation; and counterclockwise arrows turning clockwise at the top left represent reflection.
MCF), runs without 1st-person knowledge (i.e. without 1st-person intuitive self-awareness), and 1st-person awareness of its content outcome occurs only after the clockwise direction, so to speak, has already turned counterclockwise. Another difference between knowing and understanding has to do with their duration. Unlike biofunctional understanding, cognitive knowing, or rather its cognitive content, is prone to forgetting in the sense that, for such content to be remembered, it must frequent the mind.

Iran-Nejad and Stewart (2011) reported three experiments that supported these differences between knowing, defined as the awareness of the content, knower, defined as the person who is aware of the content, and biofunctional understanding, that is devoid of any known content. In addition, they presented evidence for the prediction that, being biofunctional in nature, understanding processes would behave more like affective processes than knowing or knower processes. In one experiment, a total of 30 statements were used to measure participants’ reflective intuitions about knower (10), understanding (10), and affective (10) statement. An example of a knower statement is: I can apply what I know to real life, but I do not know how to apply; only my brain and body somehow do. An example of an understanding statement is: I can apply what I know to real life, but I do not know how to apply; only my brain and body somehow do. An example of an affect statement is: I can be filled with joy; but I do not know how to fill with joy; only my brain and body somehow do.


Participants were asked to rate the degree of internal consistency of the content of each statement—that is, the consistency across the different parts within the same sentence—on a scale ranging from very inconsistent (1), inconsistent (2), somewhat inconsistent (3), consistent (4), very consistent (5). Specifically, if a participant rated, roughly speaking, the statement “I can use what I know to evaluate things, but I do not know how to evaluate; only my brain and body somehow do” less than 3 this would mean that the participant felt it is intuitively inconsistent to be able to evaluate things without knowing how to evaluate things, in the cognitive sense of the term. Conversely, if a participant rated the statement “I can understand the things I know; but I do not know how to understand; only my brain and body somehow do” more than 3, this would mean that the participant felt it is intuitively consistent to understand without knowing cognitively how to understand. Since the above two statements are identical in format, the fact that the ratings of the internal consistency of any known content in them diverge in opposite directions—one toward less and one toward more acceptable—may be used as evidence that knowing and understanding are different human capacities.

Table 1. Pair-wise Pearson correlations among knower, understanding, and affective processes (N = 76, see Table 1). Understanding processes correlated significantly, 0.31 (p.<.001) with knower processes and affective processes 0.82 (p.<.001). Understanding and affect correlated highly and their relationship did not change after controlling for knower processes (0.80); but the correlation between understanding and knower processes dropped from a significant 0.31 to a nonsignificant 0.09 after controlling for affective processes.

<table>
<thead>
<tr>
<th>Statement Type</th>
<th>Knower Processes</th>
<th>Understanding Processes</th>
<th>Affective Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knower Processes</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding Processes</td>
<td>0.31* (.09)</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Affective Processes</td>
<td>0.32* (.09)</td>
<td>0.82* (.08)</td>
<td>1.00</td>
</tr>
</tbody>
</table>
4. OVERALL METHOD

4.1 Multiple-source Embodiment

What can 2nd/3rd- or 1st-person education offer learners/educators? The purpose of the experiment described here is to illustrate how 1st-person education with a focus on understanding and affect may contribute to the broader—that is, beyond knowledge acquisition—mission of education. We have already discussed the different kinds of processes involved beyond knowing in the development of human understanding. However, an obvious difference portrayed by Figures 1 and 2 is in the levels of embodiment they each exploit. Embodiment, of course, is a multiple-source phenomenon (Iran-Nejad et al., 1990b). According to Iran-Nejad and colleagues, three inherently separate sets of sources impact human development and learning: external/passive/connectionist, cognitive/active/mindful, and biofunctional/dynamic, where dynamic means neither passively connectionist nor automatically procedural but biofunctionally mindless (Iran-Nejad, 1990). The borrow-return cycle of learning in Figure 1 deals mainly with external sources and is equivalent to what is commonly described as teacher-centered instruction (Baumann, 1984). The learner is a receiver, internalizer, and producer of external input. Figure 1 does not, as shown, encompass the set of cognitive sources; but it can be easily modified to include them by adding knowledge of active cognitive and metacognitive strategies to long-term memory. The learner knowingly retrieves and uses them to consciously search, select, differentiate, classify, elaborate, and reflect, among others. Perhaps the best representation of the cognitive set of sources in education is captured by what is commonly known as learner-centered constructivism (McCombs & Vakili, 2005; Polly & Hannafin, 2010). As far as we know (see Figure 1), 1st-person education is the only attempt at exploiting the set of biofunctional sources to learning and development using the mind-body cycle of revelation/reflection shown in Figure 2 (Iran-Nejad & Gregg, 2001; Iran-Nejad & Stewart, 2011).

The impact on learning and development of each of these three sets of embodiment sources may be optimized up to some inherent limit. In other words, each one of the three sources of embodiment types each has its own set of limitations. To illustrate, external sources are inherently reactive responses to external stimuli in the manner, perhaps claimed by behaviorists. Therefore nothing new is learned in the absence of external stimuli. Similarly, nothing new is learned in the absence of cognitive decision making and monitoring. Cognitive researchers, for example, assume that human learning is intensely capacity-limited and the original learning of declarative knowledge takes time-intensive maintenance or elaborative rehearsal to change to automatic procedural knowledge. In education, e.g., whether or not learner-centered constructivism can solve the Bloom dilemma discussed earlier is currently an unanswered question. A major advantage of including the set of biofunctional sources is that they continue to happen, unknown to the learner, even in the more or less absence of external and cognitive sources, e.g., during sleep. On the other hand, the fact that the person is blind to the when, why, what, and how of the operation of the biofunctional sources is an inherent limitation on their direct application.

4.2 First-Person Embodiment in the 2nd/3rd-Person Infrastructure

Because we are living in the era of the 2nd/3rd-person education, the infrastructure for 1st-person education is yet to be invented, tailor-made for body-mind cycle of revelation/reflection. For example, when 1st-person education is being discussed in today’s college classrooms, even those students who enthusiastically embrace it are quick to turn to the insurmountable barriers presented by the 2nd/3rd-person infrastructure for any attempt at implementing new alternative. We have learned from experience, however, that 1st-person education is far from being impossible in today’s educational settings such as the classroom.

Educational researchers assume that complex learning occurs in three phases (Anderson, 1982). In the first declarative phase, isolated facts are internalized in the form of individual propositions via rote...
memorization. In the second compilation phase, facts are linked and organized elaboratively into knowledge schemas or patterns of interactivity. In the third procedural phase, interactivity patterns are rehearsed into automatic procedural schemas that can be retrieved and run on automatic pilot. Cognitive researchers assume that deeper and more elaborate understanding takes place in these same phases of knowledge internalization (Paas, Renkl, & Sweller, 2003). Educators build these three phases into their classroom lessons.

The phases implied by the 1st-person education are different. In the first communication phase, the educator and the student engage one another in an informing and being informed process. The goal here is not to teach knowledge or understanding to the learner. Rather, it is to match the teaching material to the existing level of understanding of the learner. In the next two body-mind rehearsal phases, learners engage their informed level of understanding of the material in body-mind cycle of revelation/reflection portrayed in Figure 2. The learner’s goal in the first of these two phases is to uncover ideas out of their own understanding in the form of revelations or insights. Therefore, this is a knowledge acquisition by revelation phase. In the final leg of the journey through the body-mind cycle of revelation/reflection, the learner engages in understanding by reflection on the content of their newly-acquired insight.

4.3 Integrating Relevance with Rigor

Are rigor and relevance necessarily incompatible as Schön (1987) suggested? We may now reconsider Schön’s objection to the colleges-of-education science in the new light of 1st-person education. Schön shared the belief with the colleges of education researchers that we must isolate tasks to achieve rigor even when it is at the expense of relevance to the person of the learner. However, rigor and relevance may not be incompatible. This belief in incompatibility may be an outcome of the infrastructure shown in Figure 1. To be sure, if we believe that complex learning or problem solving may be made manageable only by isolating simpler pieces of what is complex learning, then such simplifying by isolation may go against relevance. However, Figure 2 suggests that an equally, if not more, effective way of making tasks manageable may be through problem solving by integration. In fact, the biofunctional process of knowledge acquisition by revelation is a splendid illustration of simplifying complex problems by integration. (Iran-Nejad, McKeachie, & Berliner, 1990a). In fact, Figure 2 is an attempt at integration of the external, cognitive, and biofunctional sources of human learning and development. If so, the incompatibility between rigor and relevance goes away if we show that the predictions of Figure 2 can be investigated rigorously.

Figure 2 predicts that (a) the more embodied human learning the deeper the level of understanding and (b) the deeper the level of understanding the more intense the interest experienced by the learner (see Iran-Nejad & Cecil, 1992). This prediction amounts to a significant correlation between rated understanding and rated interest. In other words, the hypothesis to be tested in this paper is that the higher the subjects rate their understanding, the higher they shall rate their level of interest. The present study illustrates that a relatively rigorous method of investigating these hypotheses is achievable in today’s classroom setting, even though the problems of conducting rigorous research in such naturalistic settings are well known. For instance, rigorous quantitative research requires random assignment, which is not always practical in the naturalistic setting of classroom teaching.

5. AN EXAMPLE: A STUDY IN CLASSROOM LEARNING

5.1 Participants, Setting, and Design

Nine 9th grade classes were randomly assigned to the 9 cells in a 3x3 Latin square (see Cain, 2011 for detail). The purpose of the Latin Square was to counterbalance 3 levels of lesson sequence (1st, 2nd, 3rd) and 3 levels of material content as two between-subjects extraneous variables. The learning material were three scene selections from Shakespeare each of which was taught in a lesson that came first, second, or third in the classroom setting.

---

1 The data for this study was collected as part of the dissertation for the second author: Cain, S. A. (2011). Levels of biofunctional embodiment of authentic understanding in the classroom: Shakespeare in secondary English classroom. Doctoral dissertation, University of Alabama, Tuscaloosa, Alabama.
sequence. Then, this 3x3 Latin square was replicated 3 times to manipulate 3 levels of biofunctional embodiment—low, medium, or high biofunctional embodiment (LBE, MBE, HBE, respectively)—as a within-subjects experimental variable. The three LBE, MBE, HBE were assigned to classrooms in a counterbalanced order as a between-subject factor across the three Latin squares. This 3x3x3 design allowed analyzing the data for the effects of the two extraneous variables of material and lesson within the three squares and then collapse the data for the effects of order and embodiment.

5.2 Levels of Biofunctional Embodiment (BE)

The experimental variable of interest in the study consisted of 3 levels of biofunctional embodiment (BE). The lowest (LBE) condition involved minimal sensory biofunctional embodiment. Students were directed to rehearse the material by listening to an audio presentation of the scene and actively engage in silent reading individually. The second level involved more biofunctional embodiment (MBE). The teacher directed students to rehearse the scene material with a traditional film presentation. Actors in the film delivered a more embodied presentation with gestures, voice, and emotion. Students were directed to follow along more or less cognitively these dynamic engagements along with some bodily involvement of voice or verbal role rehearsal. For the high level of biofunctional embodiment (HBE), students were directed to a modern film presentation and enacted bodily rehearsals of the scene. In the modern presentation, professional actors enact the scene with body, emotion, gesture, and voice. There was music and other interpretive qualities such as detailed ambiance, colorful wardrobes, and close-ups of facial features. Student enactments were quite involved including group role assignments by gender. Students were given props that included labels for individual roles, caps for male character roles, and scarves for female roles. Students were provided suggested gestures to act out with each line of their script. Students were encouraged to be creative with their own insightful initiatives, gesture, voice, emotions and roles (Cain, 2011).

5.3 Procedure

Each lesson consisted of three phases: communication, biofunctional embodiment rehearsal (see 5.3 above), and testing. The first and last phases were identical for all lessons, which differed in the middle phase as just described. In the communication phase, the teacher and students engaged only in informing and being informed conversation for the purpose of matching character, setting, and plot information in the scene with the current understanding of the students. In the testing phase rated the degree of the interest and understanding they experienced.

5.4 Results

A 3x3 ANOVA was conducted on each of the low, medium, and high embodiment Latin squares to examine the influence of the two extraneous variables of material and lesson within each of the three embodiment squares on the dependent measure of interest and understanding. No main effect was found for differentiating the three types of material used in the study. Lesson, by contrast, showed a significant effect for all of the six with-Latin-square ANOVAs. Whether a lesson came first, second, or third made a difference. Only two of the six material x lesson interaction were interest involving the interest dependent measure.

The purpose of the within-Latin-square analyses on the extraneous variables of material and lesson was not to search for their effects on the dependent measures but to add counterbalancing controls within each square. Therefore, the data for the dependent measures of interest and understanding were collapsed across the extraneous variables of material and lesson in preparation for testing the within-subject effects of the biofunctional embodiment effect across the three Latin squares. Then, a 3x3 ANOVA was conducted on the combined data for the two dependent measures of interest and understanding with 3 levels of order as a between-subjects factor and three levels of biofunctional embodiment as a within-subjects factor. Order produced no significant interactions with embodiment. Therefore, a final one-way repeated measures ANOVA was run on each set of interest and understanding ratings. Interest showed a highly significant effect, F(2, 234) = 24.82, p.<.01, partial Eta-squared = .18. As the level of biofunctional embodiment increased, subjects experienced more interest (means: 2.14, 2.39, 3.04, for LBE, MBE, and HBE, respectively (see Table 2). Understanding ratings also showed a significant effect, F (2, 234) = 22.90, p. <
Once again, level of biofunctional embodiment produced a significant increase in the degree of rated interest (means: 3.04, 3.28, 3.65).

Table 2. Interest and understanding means (standard deviations) for low, medium, and high biofunctional embodiment conditions (LBE, MBE, and HBE).

<table>
<thead>
<tr>
<th>Measure</th>
<th>LBE</th>
<th>MBE</th>
<th>HBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest</td>
<td>2.15 (1.26)</td>
<td>2.39 (1.21)</td>
<td>3.07 (1.26)**</td>
</tr>
<tr>
<td>Understanding</td>
<td>3.04 (1.19)</td>
<td>3.28 (1.02)</td>
<td>3.65 (0.96)**</td>
</tr>
</tbody>
</table>

* **p < .001; Mean is significantly different from the other two means.

6. SUMMARY AND DISCUSSION

This article extended previous work on 1st-person education and outlined a theory of scientific control by integration, rather than isolation, as a way of addressing some of the persistent problems such as the crisis of confidence in education and the problem of the relation between rigor and relevance in educational research. Multiple-source biofunctional embodiment was used to integrate—for the purpose of exploiting educational relevance—external, cognitive, and biofunctional sources of human knowledge, understanding, and interest with a mind-body cycle of revelation/reflection in the service of promoting biofunctional understanding, on the one hand, and knowledge acquisition by revelation and understanding by reflection, on the other.

This study applied some of the new developments in biofunctional science, experimental design, and teaching methodology to the traditional school setting. Future theory, research, and practice is likely to invent educational settings more uniquely in tune with the tenets of the 1st-person education infrastructure. In the era of the growing digital multimedia and enhanced communication tools, it is reasonable to think that this expectation is well within the grasp of educational science.

REFERENCES


