

Curriculum of the Redeemed

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LET ME TELL YOU HOW IT BEGAN,
They said I needed a “Christian” name
To proclaim to the world that I was indeed saved
What I did learn was that I needed an English name
To distinguish me from my damned, heathen, and savage race
So, when you happen to stand on my grave
The epithet will proudly read
The name that covered my shame

Then they taught me their language
To ease our communication
But I learned to forget the “uncultured” and “unsophisticated” gibberish I call my native tongue
To exemplify the “civilized” African, successfully molded in their image
But not quite in their intelligence and privilege
So, when you hear me rant and rave fluently in your language
And wonder how I came to speak it to such “perfection”
I will proudly proclaim that I learned it from my masters
And it has given me immeasurable advantage

Next, they taught me colors
To awaken my creative spirit (wonders)
But I learned that there are good colors
And black is certainly not one of them
So, when you see me aspire to whiteness
And wonder why I see color even in a blank(ness)
I will apprehensively query
Why do I not deserve a shot at “rightness”

They taught me texture
To help me appreciate the variety and diversity of touch
But when I saw your straight hair
And touched my “nappy,” “unkempt” wool
I learned that the only beauty worth beholding
Lay in the eyes of the straight-haired beholder
So, when you wonder why I endure the pain of the hot comb and relaxers
And you scold my self-indulgence in the beauty shop
Remember, that my life goal is to be created in the image of Barbie

They taught me to look up to the Metropole
For whence “salvation” abides
And we can be made whole
So, if you wonder why I squander my life savings
And even sacrifice my life
To cross the Mediterranean
I should let you know
That all my life, my only wish
Has been to taste a sandwich
And to lay on the land, where God has saved the Queen

But now I know
When schools teach us
We learn everything...
The explicit theory, the implicit systems
I know that education is more than the teacher
And curriculum, more than the lesson plan
I have learned that the world is our classroom
And its curriculum, ours to critique



Personalized Learning

A History of the Present

Jory Brass

Independent Scholar

Tom Liam Lynch

The New School

A SERIES OF 21ST CENTURY EDUCATION REFORMS laid the groundwork for personalized learning to supplement and supplant face-to-face teaching in the United States (Duncan, 2010). Personalized learning includes a range of web-based learning and assessment technologies, including those that use data analytics to “personalize” online instruction, much like Facebook, Pandora, Amazon, and Netflix mine personal data and use algorithms to tailor advertisements, musical playlists, and product recommendations. Not surprisingly, technology companies and tech industry billionaires have played key roles in developing personalized learning, including Bill Gates (Microsoft), Mark Zuckerberg (Facebook), and Reed Hastings (Netflix). Over the last decade, a network of corporations, philanthropies, venture capital firms, and governments have funneled billions of dollars into personalized learning platforms, such as Summit Learning, K12, Khan Academy, Pearson’s MyLab, McGraw Hill’s ALEKS, DreamBox Learning, Altschool, IXL Learning, and Teach to One. In 2020, these non-profit and for-profit providers are well positioned to capitalize on the surge in online education brought about by the COVID-19 pandemic.

Popular critiques of personalized learning have emphasized how it ironically “de-personalizes” learning with technology and serves the interests of corporate education reform. This article opens up additional lines of critique by problematizing personalized learning through “a history of the present” (Foucault, 1977).

Foucault’s historiography aimed to interrupt assumptions of historical progress and to make the present seem less neutral, natural, or inevitable (Foucault, 1991b). Histories of the present often start with “questions posed in the present and seek to make the terms through which those problems are currently understood an object of inquiry” (Meredyth & Tyler, 1993, p. 2). Accordingly, our first section has outlined language and practices that constitute “personalized learning” in the present. Our subsequent analysis then historicizes these terms and practices by tracing conditions of emergence and lines of descent that made them possible. This archival work has worn away at the self-evidence of personalized learning by documenting its “lowly beginnings” and “questionable ancestry” (Foucault, 1984) and unearthing “the accidents, the minute deviations—or conversely, the complete reversals—the errors, the false appraisals, and the

faulty calculations that gave birth to those things that continue to exist and have value for us” (Foucault, 1984, p. 81). This mode of historical problematization may have the effect that personalized learning “can no longer be spoken so lightly . . . no longer so unhesitatingly performed” (Foucault, 1991b, p. 83). In this sense, Nikolas Rose notes, histories may be more unsettling and provocative than empirical critiques or ideological critiques, which dominate educational research:

Foucault’s own work shows us that we can question our present certainties—about what we know, who we are, and how we should act—by confronting them with their histories: this experience can prove more unsettling and provocative than either the exposure of empirical errors or the formulation of conceptual critiques. (Rose, 1999, p. x)

In this instance, personalized learning might confront its strange and dubious lineage, including its ironic debts to the 20th century industrial model of education and its unsettling links to rat psychology, pigeon-guided missiles, and a line of technologies that were largely panned as educational and commercial failures. At the same time, our curriculum history has also linked the (re-)emergence of personalized learning to new policy networks and novel technologies of government adapted from “big data” and social media that enable programmers, businesses, and philanthropies to assume educational roles that previously were considered anti-democratic, if not dystopian.

What is “Personalized Learning”?

“Personalized learning” represents a range of online platforms that track student data as they work through competency-based learning progressions based on the Common Core State Standards (CCSS) (Bill & Melinda Gates Foundation et al., 2014). The U.S. Department of Education has partnered with philanthropies, edu-businesses, think tanks, and policy entrepreneurs to promote personalized learning as the present—and future—of learning (Duncan, 2010). This self-described “network of innovators” (Bill & Melinda Gates Foundation, 2010) has held up the online platforms of Summit Learning and Teach to One as exemplars of personalized learning. A quick overview of these platforms highlights some of the languages and practices that constitute “personalized learning” in the present.

Summit Learning¹

Summit Learning began as a partnership between Summit charter schools and the Chan-Zuckerberg Initiative (CZI)—the limited liability company launched by Facebook CEO Mark Zuckerberg and his wife, Priscilla Chan, to manage the couple’s investments, philanthropy, and political activities. CZI contracted Facebook software engineers to develop the Summit Learning platform as an “online tool to power personalized learning.”

Summit’s personalized learning platform includes a pre-set “base curriculum” based on the CCSS and on-demand “content-area assessments” that students complete at their own pace. During “Personalized Learning Time,” students log in to Summit’s online platform to complete a “Playlist” of pre-set “Resources” sourced from non-profit and for-profit vendors, including: online study guides, videos, worksheets, slideshows, and graphic organizers. Students progress

incrementally across a linear “learning continuum” as they “demonstrate mastery” of CCSS objectives by scoring 80% or better on short, multiple-choice quizzes. Summit’s “Data Dashboard” tracks students’ mastery of CCSS learning objectives and compares individuals’ achievement data against their short-term and long-term goals for GPA, test scores, college, and careers.

Summit Learning is “personalized” in the sense that individuals work at their own pace to complete pre-set resources and assessments. Summit teachers do not make curricular decisions, nor do they teach academic content during Personalized Learning Time. Rather, their primary roles are to monitor student assessment data and teach generic “academic literacy strategies” to help students “extract and retain information” from playlist resources, such as modeling how to take Cornell Notes or how to apply reading strategies (e.g., chunking, skimming, reading charts). Teachers “develop personal connections” with students during weekly “mentoring time”—ten-minute meetings in which they discuss performance data and coach students to set measurable performance goals and embody Summit’s “Habits of Success.” This is how Summit Learning “empowers instructors to customize instruction to meet students’ individual needs and interests, while putting students in charge of their own learning.”

Teach To One²

In a 2016 keynote to entrepreneurs, Bill Gates named Teach to One “the future of math.” Teach to One started out as School of One, the New York City Department of Education’s personalized education program. In 2011, however, School of One founders partnered with philanthropies and investors to form New Classrooms, a non-profit company that scaled the platform up to the national market by aligning it with the Common Core and re-branding it Teach to One.

New Classrooms’ flagship product is Teach to One: Math. Like Summit Learning, Teach to One: Math has organized CCSS-aligned playlists and on-demand assessments in a browser-based platform, and it tracks students’ mastery of CCSS skills and objectives through online, competency-based assessments. Again, “learning” is the practice of demonstrating competence or mastery of standardized objectives and skills. In contrast to Summit Learning, however, Teach to One mediates *non-linear* routes to skills mastery (New Classrooms, 2015) by using *algorithms* to assign lessons from an online Lesson Bank using data on (1) Historical Learner Patterns, (2) Individual Learner Attributes, and (3) Lesson Characteristics.

In personalized math, students check a monitor for their assigned physical location(s), instructor(s), and lesson modalities as determined by algorithms. They complete online or print resources sourced from McGraw-Hill, Pearson, Houghton Mifflin Harcourt, LearnZillion, IXL Learning, or Khan Academy. After each lesson, students complete an online “Exit Ticket”—a 4-6 question quiz to assess competency of a CCSS skill or objective. Learning is “personalized” in the sense that computers process exit ticket data to update learner profiles and algorithmically generate the next day’s schedule for students and teachers.

Ultimately, software engineers determine what, when, where, and how students learn math. Teach to One: Math teachers have neither their own students nor their own classrooms. Instead, they monitor online lessons or implement externally sourced lessons for variable groups of students determined by software algorithms. According to Teach to One, this is how the program “empowers students to accelerate their own learning through a personalized curriculum that meets

them where they are, allows them to progress at their own pace, and incorporates a combination of approaches aligned to the ways they best learn.”

Historicizing Grand Claims of Personalized Learning

Many of the world’s leading corporations, philanthropies, think tanks, NGOs, and venture capital firms take for granted that personalized learning constitutes a fundamentally new model of “next-generation learning” (e.g., Bill & Melinda Gates Foundation, 2010). Likewise, Summit Learning and Teach to One have branded themselves the 21st century alternatives to the industrial model of education:

We are living in a post-industrial age, but our public education system still reflects the careful design of an earlier era. Summit Public Schools...and its personalized approach to teaching and learning, Summit Learning, represent an alternative to the industrial model of education. (Summit Public Schools, 2018, p. 11)

The rigidity of the traditional school model...makes it nearly impossible for teachers to meet each student’s unique needs. Instead of being based on research on how students best learn, it is instead a reflection of industrial era thinking, where factories provided the template for mass education. (New Classrooms, n.d., p. 1)

However, these historical claims obscure how personalized learning has recycled early 20th century learning theory and industrial era thinking. They also overlook how 21st century platforms have descended from 20th century technologies that were deemed commercial and educational failures. These historical ironies come into view by revisiting the rise and fall of Sidney Pressey’s “Automatic Teacher” and B. F. Skinner’s “teaching machines.”

Pressey’s Automatic Teacher

This country’s faith in technological solutions to educational and social problems is at least as old as the Puritans (McKnight & Triche, 2011). However, Sidney Pressey’s invention of the Automatic Teacher in the 1920s arguably marked the first personalized learning technology (Benjamin, 1988). Pressey was a psychologist from The Ohio State University who launched his own testing business a hundred years ago as intelligence testing went mainstream. He not only created standardized tests and sold testing blanks, but also set out to invent an inexpensive “labor-saving device” that would spare psychologists and educators from the “drudgery” of administering and scoring standardized tests (Pressey, 1926).

Pressey sought to solve two overlapping problems of mass education that were made worse by the invention of the modern objective test. In his view, teachers were “woefully burdened” by the time they wasted on (1) the clerical demands of standardized testing and (2) mechanical teaching routines associated with “the mastery of drill and informational material” assessed by standardized tests (Pressey, 1926, p. 373–374). He hoped his labor-saving device would spare teachers from these “unnecessarily labored and enthusiasm-killing routines” to free them to “do very much more than at present in the way of class discussions, special help on difficulties, and so

on . . . [and] much more real teaching, of the thought-stimulating and ideal-developing type, than is now possible” (p. 376).

In 1926, Pressey filed his initial patent application for a “Machine for Intelligence Tests”—a desktop machine assembled from typewriter parts. In many ways, Pressey’s “testing machine” was not far removed from the content assessments of Summit Learning and Teach to One: Math. It displayed multiple-choice questions in a window, and pupils pressed one of four keys to select answer A, B, C, or D. A mechanical counter scored the response, a drum-like device rotated to the next question, and the apparatus documented students’ “mastery” of standardized objectives and skills with a printed receipt.

However, Pressey (1926) was explicit that his invention was merely a “testing machine” or “drill apparatus.” It automated “clerical” and “mechanical” routines of standardized assessment that were distinct from “those inspirational and thought-stimulating activities which are, presumably, the real function of the teacher” (p. 374). With the addition of a simple locking mechanism, however, his labor-saving device could be understood as “a simple apparatus which gives tests and scores—and teaches” (Pressey, 1926). His updated model—the “Automatic Teacher”—not only came equipped with a “test” mode, but also a “teach” mode, where

the subject *must* get the correct answer to each question before he can go on to the next. When he [sic] does give the right answer, the apparatus informs him, immediately, to that effect. In short, the apparatus provides for . . . efficient learning. (Pressey, 1926, p. 374–375)

This notion of efficient learning gained popularity with the “social efficiency” reforms of the early 20th century. As education was linked to Edward Thorndike’s behavioral psychology and Frederick Winslow Taylor’s science of industrial management, it became possible for a simple machine to teach rudimentary “drill and informational material.” The behaviorists’ invention of the modern objective test had reduced learning to observable and measurable responses that were “simple and definite enough to permit handling of much routine teaching by mechanical means” (Pressey, 1926, p. 374). At the same time, Thorndike’s psychology constituted a radical break in the history of learning theories when he argued that laws of human learning could be extrapolated from experiments on animals.

Pressey designed his apparatus in accordance with Thorndike’s Laws of Learning—learning theory primarily derived from rats. Much like Thorndike had trained lab rats to run through mazes, Pressey’s apparatus taught in the sense that it “tells the subject at once when he [sic] makes a mistake (there is no waiting several days, until a corrected paper is returned, before he knows where he is right and where wrong)” (Pressey, 1926, p. 374). It also incorporated a “reward dial” that could be set to dispense rewards, such as candy, to reinforce test-subjects when they met predetermined performance goals.

Pressey’s apparatus also automated scientific curriculum-making processes that social efficiency educators had recently adapted from F. W. Taylor’s model of industrial management. Taylorism had inspired scientific curriculum-makers, such as Franklin Bobbitt, to disaggregate fields of study into discrete “objectives” and “skills” and to employ scientific analysis to focus instruction on the sub-set of objectives and skills over which individuals had not demonstrated mastery (Au, 2011; Kliebard, 2004). Accordingly, the Automatic Teacher administered modern objective tests and utilized a mechanical counter to tally correct and incorrect responses to “*omit a question from further presentation as soon as the subject has attained the correct answer twice in succession*” (Pressey, 1926, p. 376, italics in original). In the 1920s, “mastery” represented

100% correct responses on all test items in two successive assessment cycles—much more stringent than today’s personalized learning (80% on a short quiz). This level of “mastery” would (a) not reward lucky guesses and (b) reinforce correct responses. This (industrial) mode of automated teaching was thought to be “efficient” in the sense that it “eliminated overlearning” and secured an “individual and exact adjustment to difficulty” along each rotation through the assessment cycle (Pressey, 1926, p. 376). Thus, the Automatic Teacher was thought to “teach informational and drill material more efficiently, in certain respects, than the ‘human machine’” (Pressey, 1926, p. 374) and to “adjust to the detail of each child’s needs” (Pressey, 1926, p. 376).

Like present acolytes of personalized learning, Pressey positioned this automated teaching and learning at the forefront of an educational revolution. However, 21st century reforms have inverted his line of thought. For example, personalized learning has been branded a “shifting paradigm of teaching” in which curriculum and content-area instruction have been delegated to computers to free time for teachers to “assess metacognitive skills, standards, and learning targets...and continually monitor and respond to students’ data” (Jenkins, Williams, Moyer, George, & Foster, 2016). Ironically, this paradigmatic shift has (re)centered 21st century teaching on the (“mechanical” and “clerical”) assessment tasks that Pressey positioned as opposed to *real* teaching and learning in the early 20th century: “What the writer is urging is the freeing of the teacher from the mechanical tasks of her³ profession—the burden of paper work and routine drill—so that she may be a real teacher, not largely a clerical worker” (Pressey, 1926, p. 376).

In another irony, personalized learning is now branded the 21st century alternative to the industrial model of education. In the early 20th century, however, technologies that adapted automatically to individuals’ performance were recognized as desired instruments and effects of the industrial revolution:

There must be an “industrial revolution” in education, in which educational science and the ingenuity of educational technology combine to modernize the grossly inefficient and clumsy procedures of conventional education. Work in the schools of the future will be marvelously though simply organized, so as to adjust almost automatically to individual differences and the characteristics of the learning process. (Pressey, 1933, p. 582–583)

In this sense, personalized learning clearly is derived in part from an old strain of (efficient) learning and scientific management that is inextricably linked to F. W. Taylor’s industrial model.

Ultimately, Sidney Pressey failed to bring about the industrial revolution in education. In the early 1930s, he hoped the crisis of the Great Depression would force schools to adopt his machines as a cost-saving measure (Pressey, 1932). After years of financial losses and a nervous breakdown, however, he acknowledged that the Automatic Teacher was a commercial and educational failure (Petrina, 2004). Pressey attributed this failure to his manufacturer (Petrina, 2004) and to teachers’ resistance to the industrial model of education (Pressey, 1932). Whatever the reasons, Pressey’s work fell into obscurity—until the eminent psychologist B. F. Skinner resurrected the dream of teaching by machine.

Skinner’s “Teaching Machines” & “Programmed Instruction”

In 1953, Burrhus Frederic Skinner brought machine-based teaching back to life after a visit to his daughter’s elementary school. The Harvard psychologist was horrified to observe a 4th grade math lesson where students had to (1) proceed at the same pace and (2) sometimes wait more than a few seconds for the teacher to reinforce correct responses. Within days, Skinner developed his first “teaching machine” for arithmetic—one that would “restore important features of *personalized instruction*...by enabl[ing] students to profit from an immediate evaluation of what they have learned and to move forward at their own pace” (Skinner, 1986, p. 103, italics added).

Today’s personalized learning echoes Skinner’s “personalized” instruction—a model of learning he previously outlined in *How to Teach Animals* (Skinner, 1951). Like Thorndike, Skinner reasoned that a universal learning process could extrapolated from laboratory studies of “lower organisms,” such as “pigeons, rats, dogs, monkeys, human children, and psychotic subjects” (Skinner, 1968, p. 33). Thorndike had his rats. Skinner was partial to pigeons.

Indeed, Skinner’s teaching machine rose from the ashes of Project Pigeon—a federally funded project to train pigeons to pilot Pelican missiles for the U.S. military (Skinner, 1960). During World War II, Skinner worked with engineers from General Mills to develop a missile nose-cone equipped with bird-sized windows and a missile guidance system that three pigeons controlled by pecking on navigation screens. Using operant conditioning, Skinner successfully trained pigeons to fly missiles in flight simulation experiments; however, the military shut down Project Pigeon in 1944, recommending that Skinner give up on his “crackpot idea” and “go out and get drunk!” (Skinner, 1960, p. 34). The Navy later resumed Skinner’s experiments in Project ORCON before scrapping pigeon-guided missiles for good in 1953. However, not all was lost. That same year, Skinner applied the science of pigeon training to a machine that would teach his daughter math:

there is a direct genetic connection between teaching machines and Project Pigeon.... [Those] techniques of shaping behavior and of bringing it under stimulus control can be...directly applicable to education.... Call it a crackpot idea if you will; it is one in which I have never lost faith. (Skinner, 1960, p. 36–37)

Skinner’s teaching machine worked much like the Automatic Teacher. Both “taught” by (1) presenting a stimulus prompt, (2) providing means for response, and (3) providing immediate feedback on the correctness of each response (Benjamin, 1988). Indeed, these similarities prompted Pressey’s former students to accuse Skinner of ignoring their work, if not plagiarizing it. Skinner (1968) countered that he had never heard of Pressey’s forgotten work—and later highlighted three key differences between teaching machines and the Automatic Teacher. The most important distinction, Skinner wrote, was that Pressey’s invention “lack[ed] a skillful program which moves forward through a series of progressive approximations to the final complex behavior desired” (Skinner, 1968, p. 35). In contrast, Skinnerian teaching machines arranged discrete learning tasks into a linear sequence called “Programmed Instruction.”

Programmed Instruction organized school subjects into a series of instructional “frames” that divided (or “programmed”) a field of study into incremental steps that built up to a complex, terminal behavior. Skinnerian teaching machines then “taught” these programs by ordering contingencies of positive reinforcement to reinforce correct displays of observable behaviors and sub-skills that operationally defined mathematics. Much like Skinner had trained dogs to stand on

their hind legs (Skinner, 1951) and pigeons to play ping-pong (Skinner, 1968), teaching machines conditioned children to demonstrate mathematical competence—step by step, subskill by subskill, positive reinforcement by positive reinforcement.

The conditions necessary for programmed instruction were simple: “A first step is to define the field. A second is to collect technical terms, facts, laws, principles, and cases. These must then be arranged in a plausible developmental order—linear if possible, branching if necessary” (Skinner, 1968, p. 64).

Skinner’s (1968) “linear programming”—adapted from animal training and the treatment of human psychoses—was (and remains) a prominent design of educational technology:

In acquiring complex behavior the student must pass through a carefully designed sequence of steps, often of considerable length. Each step must be so small that it can always be taken, yet in taking it the student moves somewhat closer to fully competent behavior. The machine must make sure that these steps are taken in a carefully prescribed order. (p. 51)

In contrast, Norman Crowder’s (1963) “intrinsic programming,” or “branching programs”—first developed for military training—structured non-linear (“branching”) routes to skills mastery:

A linear program is self-pacing in the sense that some students read faster than others, but all must read the same material. An intrinsic program provides different amounts and kinds of material for individual students, based not on prior estimates of the student’s needs or on his self-evaluation as he goes through the program, but on his demonstrated performance in choosing answers to the questions. (p. 253)

Skinner’s linear programming was the dominant model of programmed instruction into the 1960s (Benjamin, 1988). However, Crowder’s intrinsic programming was more “diagnostic” and “remedial” in the sense that his devices assessed each response in real time

to control the material that the student sees next. If the student passes the test question, he is automatically given the next unit of information and the next question. If he fails the question, the preceding unit of information is reviewed, the nature of his error is explained to him and he is retested. (Crowder, 1959, p. 109)

Much of this old distinction between “linear” and “intrinsic” programming has carried into present distinctions between “responsive” and “adaptive” systems of learning personalization (e.g., Bulger, 2016). Responsive systems, such as Summit Learning, mirror linear programming in the sense that they primarily monitor students’ mastery of a linear sequence of pre-determined content and assessments. Likewise, Crowder’s intrinsic programs did not use algorithms; however, their “branching” design and capacity to adapt to students’ demonstrated performance bear a family resemblance to today’s adaptive systems, such as Teach to One: Math (New Classrooms, 2015), which adapt online content and assessments based on user performance data and competency measures.

These historical continuities suggest that personalized learning is not a fundamentally new model of “Next Gen Learning” (Bill & Melinda Gates Foundation, 2010). Indeed, Crowder (1963) argued almost sixty years ago that programmed instruction was not new—it simply automated “educational functions that have previously required a live teacher or tutor...to allow *some rather*

old ideas about teaching to be more effectively implemented” (p.250–251, italics added). Indeed, 1960s instructional designers explicitly linked learning principles of programmed instruction to Taylor’s principles of scientific management (Richmond, 1963, p. 36):

- (1) The subject matter, process, or skill to be taught is first defined, then analysed and broken down into its elements.
- (2) The material is then presented step by step in a carefully prearranged sequence.
- (3) At each step, the learner is given just enough information to ensure that he can make an active response before going on to the next.
- (4) The learner receives immediate confirmation of the results of his responses, works at his own rate, and checks his own progress.

These four learning principles continue to operate in Summit Learning and Teach to One: Math. Thus, personalized learning clearly has re-inscribed industrial-era thinking and behavioral learning theory. Over time, however, people have forgotten how this understanding of learning was made possible when education was linked to Taylorism and the behaviorism of the modern objective test, rat psychology, and pigeon-guided missiles.

The Rise and Fall of Programmed Instruction

Our history has drawn attention to personalized learning’s “lowly beginnings” and “questionable ancestry” (Foucault, 1984) to wear away at grand claims of “innovation” and change. In addition, examining the rise—and fall—of personalized learning’s 20th century ancestors may have tactical use in reassessing the present movement to personalize education through technology (Foucault, 1984).

Pigeon-guided missiles may have been too eccentric for the U.S. military, but Skinner’s “crackpot idea” launched teaching machines and programmed instruction into the educational spotlight during the Sputnik-era reforms of the late 1950s and early 1960s. Teaching machines made the front page of the New York Times in 1957, and IBM developed teaching machines for commercial distribution (Skinner, 1986). By 1962, approximately 200 companies were producing machine-based and print-based systems of programmed instruction, and hundreds of programmed instruction courses were available for elementary and secondary students, especially in mathematics (Benjamin, 1988). This included desktop teaching machines, programmed instruction workbooks, and the first computerized self-instruction systems, such as PLATO at the University of Illinois.

Military and industrial trainers embraced these technologies; however, teaching machines and programmed instruction quickly fell out of favor with educators and researchers. By the end of the 1960s, they had all but disappeared from education (Benjamin, 1988). Psychologists and entrepreneurs would later exhume programmed instruction and adapt it to desktop computers in the 1980s—only to see it fail again (Skinner, 1986). With personalized instruction technologies attempting yet another comeback, it’s worth revisiting these controversies and failures from the past to reassess the present.

In previous generations, researchers challenged the empirical and conceptual bases of programmed instruction. Research associations, including the AERA and APA, critiqued how commercial companies were selling programmed instruction materials that had not been vetted by

educational experts or empirical research (Benjamin, 1988). The few empirical studies of programmed instruction yielded inconsistent results and often challenged prominent claims about machine-based learning (Pressey, 1963). Even the most prominent scientists and instructional designers within the programmed instruction field found themselves working at cross purposes, forming rival factions, and assuming different positions on machine-based teaching and learning (De Grazia & Sohn, 1962).

At the K-12 level, teachers worried that teaching machines provided politicians and administrators a ready means to increase class sizes or replace them with technologies. Many educators and psychologists objected that “teaching machines” did not really “teach” and that “programmed learning” was not “real learning,” since they were primarily used in *remedial* education and limited to *rote* learning—not “*human learning of meaningful matter!*” (Pressey, 1963, italics in original). These older machines were also considered “de-humanizing” in the sense that they reduced human interactions with teachers and peers and also subjected children to behavioral modification techniques designed for animals. As Benjamin (1988) noted, the media amplified these concerns with a series of provocative headlines that helped topple machine-based teaching and learning: *Can Machines Replace Teachers? Will Robots Teach Your Children? Do Teaching Machines Really Teach? Can People Be Taught Like Pigeons? Which Is It? New World of Teaching Machines or Brave New World of Teaching Machines?*

Much like today’s reformers, Skinner blamed the “educational establishment” for its rejection of science and technological innovation. This was yet another example of educators resisting the industrial revolution, Skinner (1986) reasoned, as he compared teachers’ fears of teaching machines to automobile workers’ irrational fears that technology would make factories so efficient that they would lose their jobs to robots. Progressive educators were right to reject the “discipline of the birch rod,” Skinner reasoned, but their dismissal of “skills mastery” as “rote learning” went too far: “Skills are minimized in favor of vague achievements—educating for democracy, educating the whole child, educating for life, and so on” (Skinner, 1958, p. 37). Likewise, cognitive psychologists undermined more efficient learning, Skinner argued, as they replaced operant conditioning and behavioral objectives with “vague” notions of “understanding” mathematical relationships (Skinner, 1968, p. 44) and calls for children “to think, grasp concepts, explore, be creative” (Skinner, 1986, p. 106).

As cognitivism began to supplant behaviorism as psychology’s dominant paradigm in the 1960s, however, psychologists increasingly rejected Skinner’s radical behaviorism. Among them, Jerome Bruner (1963) argued that programmed instruction had been “derived willy nilly from a theory of learning which states that learning is incremental and goes in small steps” (p. 524). Even if learning were linear and incremental—which Bruner rejected—it did not necessarily follow that children needed learning to be reduced to “bite sized packets of information” or “organized in small steps [as if they were] lower primates” (p. 524).

Even Sidney Pressey—the so-called “grandfather of personalized learning” (Petrina, 2004)—came to reject learning theory derived from experimental analysis of animal behavior. Thirty years after pulling the plug on the Automatic Teacher, he argued “current animal-derived procedures in auto-instruction destroy meaningful structure to present fragments serially in programs and replace processes of cognitive clarification with largely rote reinforcements of bit learnings” (Pressey, 1963, p. 5). Given “the all-important fact that human [learning] has transcended animal learning,” Pressey (1963) reasoned, it was remarkable that learning theorists would insist on teaching people as if they were pigeons:

Far more remarkable than Skinner's pigeons playing ping pong is the average human scanning a newspaper—glancing about to find matter of interest to him [sic], judging, generalizing, reconstruing, all in silent reading without overt respondings or reinforcings. Most remarkable of all is it to see learning theorists, hypnotized by the plausibilities of a neat theory, trying to teach that human as if he [sic] were a pigeon—confining his glance to the rigid slow serial peep show viewing of innumerable “frames” each demanding that he respond and be reinforced. (p. 5)

Finally, the press fueled parents' fears that programmed instruction granted corporations and instructional programmers considerable powers of social engineering without public oversight (Benjamin, 1988). Many Americans feared how an anonymous programmer could shape thousands of lives from a distance with a single technology. At the height of the Cold War, the image of children sitting in automated classrooms, staring at screens, completing standardized programs struck many Americans as the dystopic education of Orwell's *1984* or Huxley's *Brave New World*—not a democratic society (Benjamin, 1988).

Personalized Learning: New Conditions of Possibility

At different points in the 20th century, entrepreneurial psychologists teamed with technology companies to sell self-paced learning and assessment machines to the public school market. In each instance, however, these technologies were deemed educational and commercial failures. One might assume that “personalized learning” might suffer a similar fate since it shares considerable lineage with these failed technologies from the past. However, personalized learning has (re)surfaced in a neoliberal context that's forged new connections among education, business, government, and philanthropy (Ball, 2012). These new conditions of possibility are much more conducive to Ed Tech and educational entrepreneurship.

In the 21st century, personalized learning platforms are not the side hustles of university psychologists turned entrepreneurs, such as Sidney Pressey or B. F. Skinner. Rather, personalized learning has been incubated, hatched, and nurtured by a network of businesses, philanthropies, and governments that have worked together to open the education market to for-profit and non-profit providers. Their aim is to disrupt, and provide market alternatives to, the public education system (e.g., Bill & Melinda Gates Foundation, 2010; Duncan, 2010). The personalized learning network is comprised of multinational corporations (e.g. Facebook, Google, Pearson), ed tech startups (Summit Learning, Knewton), government (U.S. Department of Education), philanthropies (Gates Foundation), think tanks (Brookings Institute), online learning and charter school advocacy organizations (EDUCAUSE, iNACOL), and venture capital groups (CEE Trust, Charter School Growth Fund, Global Silicon Valley) (Bill & Melinda Gates Foundation et al., 2014).

This self-described “network of innovators” (Bill & Melinda Gates Foundation, 2010) has also functioned as “new policy network” (Ball, 2012) in education. In the 21st century, Ball (2012) has noted, business, government, and philanthropy have assembled new networks to develop education policy on behalf of states and independent of states. For example, the Common Core was developed for the states by a network of trade groups, policy entrepreneurs, philanthropists, non-profits, and testing companies—in part to lay the groundwork for computer-adaptive testing and personalized learning (Brass, 2016). With the rise of “network governance,” education policy-making increasingly has bypassed legislative bodies, blurred the boundaries between the “public”

and “private” sectors, and circumvented democratic governance in the interest of reforming education through markets, entrepreneurship, and corporate managerialism (Ball, 2012). The personalized learning network’s “Policy Playbook” has recommended state and federal policies to (1) increase the supply of personalized learning models, (2) build demand for those models, and (3) “eliminate barriers” to private sector participation in education, such as relaxing student privacy laws to expand companies’ access to students’ personal data (Bellwether Education Partners, 2014). These policy “plays” have featured prominently in federal education policies and funding schemes since 2010 (e.g., Duncan, 2010; U. S. Department of Education, 2012).

Importantly, these new alignments of education, business, government, and philanthropy represent a global shift from social democratic to neoliberal governance of education (Rizvi & Lingard, 2010). In Foucault’s (1991a) terms, neoliberalism is a governmentality in which market principles have been adapted to social and political domains as means to govern people’s conduct. In neoliberal government, free markets are thought to be ideal mechanisms to coordinate thought and action, and individuals’ pursuit of their economic self-interests is thought to maximize their well-being and contribute to a more efficient, innovative, and productive society (Rose, 1999). Further, neoliberal governments are to limit interventions to secure social welfare; instead, they intervene to create and maintain markets, to inject market principles and managerial practices into public organizations, and to encourage the private sector to “partner” and compete with the public sector.

The ascendance of neoliberal governance has facilitated the (re)emergence of personalized learning in the early 21st century. In the 1960s, for example, the public demanded more government oversight of programmed instruction and commercial education vendors to protect the public interest (Benjamin, 1988). In the present discourse of education reform, however, public oversight and government regulations are considered outdated barriers to educational innovation (Bellwether Education Partners, 2014). According to this view, the role of state and federal government is to deregulate public education and partner with the private sector, venture philanthropy, and intermediary organizations “to design, develop, validate, and scale up new technology-based assessment resources” and “new business models” in education (Duncan, 2010, p. xxi). Thus, the U.S. Department of Education has funded and partnered with technology companies, corporate philanthropies, and their intermediary organizations to develop personalized learning systems to disrupt, and provide market alternatives to, public education.

Algorithmic Governance, Learning Analytics, Behavioral Economics

The (re)emergence of personalized learning is not only tied to neoliberal rationalities of government. It is also constitutively linked to new technologies of government—that is, “technologies imbued with aspirations for the shaping of conduct in the hope of producing certain desired effects and averting certain undesired ones” (Rose, 1999, p. 52). This includes a range of calculative technologies (e.g. algorithms), inscription devices (college and career readiness standards), and governmental practices adapted from the business, technology, and entertainment sectors:

Education has not...incorporated many of the practices other sectors regularly use to improve productivity and manage costs, nor has it leveraged technology to enable or enhance them.... What education can learn from the experience of business is that we need

to make the fundamental structural changes that technology enables if we are to see dramatic improvements in productivity. (Duncan, 2010, p. xiv)

Former Secretary of Education Arne Duncan seems oblivious that schools have contracted with private sector consultants and intermediary organizations for more than a hundred years to improve the efficiency and productivity of education (Trujillo, 2014). As Tina Trujillo (2014) has noted, much of the work of today's intermediary organizations has been derived from early 20th century "scientific management," such as "distilling work into discrete, quantifiable tasks; measuring observable outputs; exercising heavy managerial control over workers; and minimizing costs by appealing to workers' economic self-interests, as well as by engaging in systematically derived best practices and planning" (p. 208). At the same time, however, personalized learning is also part of technology-based reform movement that's explicitly modeled itself on venture capital (Williamson, 2017), Silicon Valley (Williamson, 2017), big business, and big data (Thompson, 2016; Thompson & Cook, 2016). It's these rationalities and technologies—adapted from "big data" and social media—that have created new possibilities for the business and technology sectors to extend their performance management systems and practices of social engineering into the education sector through personalized learning technologies.

In the 21st century, for example, personalized learning reflects the rise of "big data" and emergent practices of "datafication" adapted from multinational firms and technology companies (Thompson & Cook, 2016). Even as the school reform movement's "data-based" decision-making has deep roots in early 20th century Taylorism (Trujillo, 2014), today's "software-powered" platforms (Lynch, 2015) also have radically extended the volume, velocity, and variety of data collection, data sharing, and data analysis (Thompson, 2016). Personalized learning platforms not only collect demographic, curricular, and standardized testing data, for example; they can also track online behaviors and social interactions across their platform and third-party applications (e.g. clicks, response time, pauses, mouse movements, scroll rates, navigation patterns, email content, interactions with other users) and "off-put data" from students' social media profiles and web browsers (Williamson, 2015), such as age, geographic location, IP address, hardware specifications, reading and writing habits, searches, browsing history, and online purchases.

With interoperability the norm in the tech sector, this data can be collected, shared, analyzed, and used by a range of companies, third party vendors, and intermediary organizations. Most of this data sharing and data mining is invisible with Summit Learning, Teach to One, and other personalized learning platforms. Blurring the boundaries between the public and private sectors, these technologies are proprietary black boxes that obscure which data are collected and shared, with whom, and for what purposes. In addition, the U.S. government has relaxed student privacy protections (such as FERPA) over the last decade and explicitly supported personalized learning providers to share, aggregate, and mine personal data to develop educational products that exploit patterns in users' online activity:

The interconnected feedback systems...rely on online learning systems collecting, aggregating, and analyzing large amounts of data and making the data available to many stakeholders. These online or adaptive learning systems will be able to exploit detailed learner activity data not only to recommend what the next learning activity for a particular student should be, but also to predict how that student will perform with future learning content, including high-stakes examinations. (U.S. Department of Education, 2012, p. 3)

At this point, it's clear that personalized learning is not only descended from behavioral psychology and Taylor's "scientific management." In adaptive platforms, such as Teach to One: Math, interventions upon the learner's thoughts and conduct are made possible by a range of statistical calculations and governed by an algorithmic governmentality not possible in the programmed instruction movements of the past. With personalized learning, it is reasoned that tracking and quantifying individuals' online behaviors and social relations renders them knowable—and, therefore, more amenable to being shaped, optimized, and controlled through technology (Thompson & Cook, 2016). Thus, educational thought and practice may be governed in novel ways by the algorithmic power of "big data" and by social media technologies underpinned by consumer psychology and behavioral economics.

On one hand, personalized learning platforms have adapted the "big data" techniques of multinational corporations to govern the child through "learning analytics" and "educational data mining" (Baker, 2016). Learning analytics mine demographic, performance, and behavioral data to profile users and build predictive models of individual and group conduct through practices of statistical correlation, inferencing, and probability. For example, Teach to One: Math mines individual and collective data to classify and cluster users into population groups for which algorithms predict which commercial resources in its lesson bank are statistically most likely to increase engagement and outcome measures. More broadly, large-scale and longitudinal data mining can identify demographic variables and user behaviors that are positively and negatively correlated with college and career outcomes. With these analytics, it becomes possible to steer youth towards schools, academic majors, and jobs (etc.) that are positively correlated with their demographic or behavioral classifications; conversely, certain data patterns can trigger software interventions to remediate problem populations and/or steer them away from life pathways for which their data profiles demonstrate statistical risk factors, negative correlations, or weak predictors of success (Baker, 2016). Importantly then, "the conduct of the learner is to become the target of decision making that is in part delegated to the automated and algorithmic power of database software" (Williamson, 2015, p. 100)—not to psychologists, teachers, parents, or students themselves. This social engineering goes well beyond the "social efficiency" reforms of the early 20th century and the programmed instruction of the mid-20th century that many Americans considered anti-democratic, if not dystopian.

On the other hand, personalized learning has also leveraged techniques from consumer psychology and behavioral economics that social media platforms use to predict and shape people's choices and social affiliations (Thompson & Cook, 2016; Williamson, 2017). The "Science of Summit Learning," for example, references "learning sciences" that have combined older behavioral and cognitive sciences with neuroscience, social psychology, and behavioral economics (New Classrooms, 2015). As Taubman (2009) noted, the learning sciences have popularized notions of learning that have facilitated the rise of standardized testing and outcomes-based performance management systems in education. Beyond this, personalized learning has also aligned educational governance with the expertise and governing practices of behavioral economics and consumer psychologies. Behavioral economics assumes that the habitual and predictable nature of human behavior makes it possible to manipulate consumer choices; thus, tracking, quantifying, and modeling user behavior in personalized learning platforms enables software to predict and shape people's future conduct through "hyper-nudging," persuasive computing, and "political hacking," and other techniques that Facebook and other social media have used to manipulate brand loyalty, consumer purchases, public sentiments, political opinions, and voting behaviors (Williamson, 2017). These behavioral controls are more intrusive and

extensive than the classical conditioning (Pressey) and operant conditioning (Skinner) of personalized learning's 20th century predecessors. These governing practices are also highly controversial, given current debates about online privacy and the role that social media played in manipulating the 2016 presidential election.

In summary, the rise of personalized learning is constitutively linked to 21st century practices of educational commercialization and privatization, new policy networks, algorithmic power, and digital governance that are radically different from the market conditions, calculative technologies, and social-democratic governance of 20th century education (Ball, 2012; Williamson, 2017). Today's personalized learning platforms not only have reproduced older learning theories and industrial models of management, but also re-appropriated elements of Silicon Valley startup culture (Williamson, 2016), "big data" practices of multinational corporations and firms (Thompson & Cook, 2016), and the online consumer experiences of Netflix, Google, Amazon, and Pandora (U.S. Department of Education, 2012). All together, these networks of relations have enabled programmers, businesses, and philanthropies to infiltrate the education "market" in new ways and to align educational thought and practice with the logics, values, expertise, and performance management systems of the business, technology, and entertainment sectors (Ball, 2012; Thompson & Cook, 2016; Williamson, 2016).

Conclusion

It's largely taken for granted in philanthropic, government, and corporate circles that personalized learning represents the leading edge of technology-powered revolution in education. Our history of the present has worked against such faith in technology and market-based reforms by confronting personalized learning with its histories—histories that link 21st century learning personalization to Taylorism and behaviorism, "crackpot" experiments with pigeon-guided missiles, and at least three generations of technologies that were deemed educational and commercial failures. On one hand, this study has highlighted how personalized learning remains constrained by the industrial model of education and by dated learning theories long associated with the training of animals and treatment of human psychoses. On the other hand, personalized learning is not simply the online version of the "New Taylorism" (Au, 2011) or a 21st century "cult of efficiency" (Trujillo, 2014). Older notions of learning and industrial management now intermingle with practices borrowed from the commercial and entertainment sectors in a political and economic landscape that has dissolved traditional distinctions between public and private, non-profit and for-profit, government and business. Thus, personalized learning is also an instrument and effect of a radical shift from social democratic to neoliberal governance and the rise of a techno-economic model of education reform based on Silicon Valley venture capital and startup culture (Williamson, 2017).

Since the 1970s reconceptualization of curriculum, curriculum theorists have resisted technocratic models of educational reform and the commercialization, commodification, and privatization of education. At a time when venture philanthropists, tech companies, and software engineers increasingly assume the roles of educational policy-makers, curriculum-makers, and social engineers, curriculum workers should confront the rise of personalized learning platforms and the rise of new policy networks, algorithmic power, digital governance, and Global Silicon Valley in education (Ball, 2012; Thompson & Cook, 2016; Williamson, 2015, 2017). Toward this end, our curriculum history has highlighted the strange histories that have made it possible for

personalized learning to re-emerge in the early 21st century as a possible supplement, or successor, to face-to-face teaching and learning. With a nod to Foucault (1991b), this mode of historical problematization might open new spaces of contestation and debate and help bring it about that “personalized learning” can no longer be spoken so lightly, no longer so unhesitatingly adopted.

Notes

1. This section draws on and quotes from Summit’s official website: www.summitlearning.org (Summit Learning, n.d.), which has neither a cited author, date, nor page numbers. As such, this endnote serves as citation for the section in lieu of repeating a citation of limited information. In addition, Summit Learning recently announced the formation of a new organization, T.L.P. Education, which will lead the Chan Zuckerberg Initiative’s efforts to scale their personalized learning platform nationally.
2. Similarly to the previous section, this section draws on and quotes from the official homepage of Teach to One: www.newclassrooms.org/ (New Classrooms, 2020).
3. This gendered construction of the teacher as female is instructive since the convention of the time was to represent third person singular with the masculine “he.” Due to space constraints, we could not explore this and other gendered dimensions of machine-based teaching, past and present.

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We are All Made of Stars

A Metaphor for Exploring the Greater Whole in which Beliefs Subsist

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The nitrogen in our DNA, the calcium in our teeth, the iron in our blood, the carbon in our apple pies, we're made in the interiors of collapsing stars. We are made of star stuff.

Carl Sagan (1980, p. 190)

The Importance of Metaphors

THE WAY IN WHICH A PROSPECTIVE TEACHER INTERPRETS the world is based on the traditions, experiences, and cultures he or she inhabits. Prospective teachers develop their belief systems, collections of beliefs about teaching, learning, and their content specialization through the experiences and narratives constructed about education. Once a person graduates from high school, he or she has been through more than 15 years of schooling. The graduates have experiences leading them to have certain expectations of what education is and what it should be. For this reason, teacher education can be seen as combating the past of the individual, specifically intervening in their beliefs. In other words, teacher education programs can be seen as being in the business of changing beliefs. Teacher educators plan a series of interventions through the teacher education program to change the beliefs of prospective teachers to produce teachers who can teach the content effectively. The beliefs teachers should possess are defined by our institutions (e.g., departments, program committees, college mission statements) and specialized professional associations. For example, the National Council of Teachers of Mathematics (NCTM, 2014) described in *Principles to Action* the productive and unproductive beliefs for effective mathematics practice. In order to better impact the teaching practices of prospective teachers, teacher educators need tools to understand the beliefs of individuals. The purpose of this paper is provide one such metaphor for thinking about how beliefs are held and ways to intervene.

Britzman (2009) discussed the paradox prospective teachers face:

Newcomers learning to teach enter teacher education looking backward on their years of school experience and project these memories and wishes into the present that they then identify with as somehow indication of what should happen or never happen again. (pp. 28–29)

When prospective teachers begin their preparation programs, they already have belief systems justified by their previous experiences and observations. To explore the changes, modification, and compromises of these beliefs has been a goal in teacher education research (e.g., Cho & Huang, 2014; Conner, Edenfield, Gleason, & Ersoz, 2011; Philipp, 2007; Weller, Arnon, & Dubinsky, 2011). Charalambous, Panaoura, and Philippou (2009) described the actions taken as teacher educators to create a mathematics methods course focusing on the history of mathematics to change the epistemological and self-efficacy beliefs of prospective mathematics teachers. Teacher educators have developed and described a variety of interventions used in methods and content courses to change the beliefs of prospective teachers (see Gomez & Conner, 2020).

In his own investigation on the activities of teaching, Green (1971) argued for a metaphor to aid others in the exploration of a teacher’s collection of beliefs. Green stated that metaphors “permit us to construct ways of leading the mind from the familiar to the unfamiliar” (p. 60). Metaphor, as a tool, is important to support researchers in their exploration of phenomena. Atwell-Vasey (1998) wrote that a metaphor “relies on the imagination of its users to see that we can only include some elusive phenomena in our talk by letting other things, more sensible to us, stand in the position of the more elusive phenomenon” (p. 11). Metaphors provide the individual with a language to discuss challenging phenomena by providing conceptual osmosis (Sfard, 1998). This can be tricky as metaphors come with a set of assumptions that may be warranted or unwarranted. For example, when using the metaphor of reflecting, the individual is assuming one’s perspective is clear and untainted by the self (Markham, 1999). Metaphors, allegories, and similes aid the individual in attaining a new way to speak about an event, object, or emotion. It is these similarities that enlighten researchers and philosophers to new ideas and constructs in our uncertain world.

In this paper, I expand on Green’s (1971) metaphor to attain a deeper understanding of one’s belief system. I will use this exploration to expand his metaphor by looking at it as a part of a greater whole using the Onion model described by Korthagen (2004) (adapted from Bateson’s model—see Dilts, 1990). This thought experiment will then lead to the creation of a new model representing a belief system as a piece of a whole, the different levels in which beliefs exist, and the possible connections one’s beliefs have with competencies, identity, and other levels of change (Korthagen, 2004). To conclude, I use Gadamer’s (1966, 1975) ideas of tradition to explore the forces holding our beliefs and other aspects-of-self.

This thought experiment only demonstrates one way the galaxy metaphor could be helpful in thinking about the beliefs of preservice teachers. In the same way constructivism helps in thinking through how one learns and interprets the world, the galaxy metaphor aids researchers in considering how beliefs may be influencing the act of learning and being-in-the-world. I imagine that, as readers proceed through this construction, they will bring in their own experiences, beliefs, and knowledge and overlay them onto the metaphors. I recommend the reader reflect on how these metaphors may help in seeing their interactions with students differently. In addition, the metaphor you use now to make sense of teaching and learning may be enveloped within the galaxy metaphor.

My goal through this document is to provide a metaphor to work with the metaphors of the reader to provide new avenues of exploration.

Green's Metaphor of a Belief System

Green (1971) described a metaphor for an individual's belief system. He made no claim that this was the only possible model, but it was one idea aiding him in his own thinking about beliefs. Green (1971) stressed the importance of calling this a metaphor because "no major philosopher in the history of the subject has escaped [metaphors] use and no major field of knowledge in the modern world can do without them" (p. 56). In addition, the metaphor Green constructed is solely for how beliefs are held and not for how beliefs come to fruition. He argued, however, that, when one constructs or derives a belief, it becomes part of the individual's belief system, and when a belief is modified, it then modifies the individual's belief system (Green, 1971).

Green continued his assembly of the metaphor saying that our beliefs occur in sets or groups:

It seems true that whenever a person holds a certain belief, he must also take some attitude toward that belief; and that attitude is always itself capable of formulation as a belief. It is a belief about a belief. Indeed, there will be a whole set of such beliefs about beliefs. (Green, 1971, p. 42)

The relationship between these groups is dynamic and in constant flux. Some beliefs are dependent on one another while others exist independently, but never in total isolation. Although Green did not state it directly, he implied that our beliefs are fluid.

Green (1971) explained that there are derivative beliefs, those that are a consequence or a direct product of another belief, and primary beliefs:

We might describe this relationship by saying that, in the belief system of any particular person, some beliefs will be derivative, meaning simply that they will be seen by him as derived from some other belief. This observation also suggests that in any given system of beliefs there may be some beliefs so basic that they are not themselves derived from any other beliefs. (p. 44)

Green discussed the interconnectedness of our beliefs. Although some of the connections may be weaker than others, a hidden thread or force connects them all. It could be said then that all of our beliefs occupy the same space even though one may not be aware of their existence. As a result, no belief exists outside of this space. Green does not discuss the space in which beliefs exist or the greater system to which they belong. Further on, we will argue for the construction of such a space and the benefits of navigating it.

Green (1971) continued molding his metaphor by expanding on the sets and groups in which beliefs exist. He imagined beliefs exist in clusters, consequently allowing for the existence of contradictory beliefs. The individual is unaware of the contradictions existing within their own belief system, due to a "protective shield." These shields are valuable since they protect the individual from recognizing contradictions within their system. The clusters are then organized to

be consistent with one another in what Green called a quasi-logical manner. Thus, a prospective or in-service teacher may have conflicting beliefs, but only from the observer's point of view. To the individual, their belief system is sensible (Leatham, 2006) meaning that to the individual there are no contradictory beliefs. To change beliefs then, it has been argued, the individual needs to be perturbed in such a manner that their beliefs are challenged.

Green (1971) takes into account the validity one has for their beliefs. He compartmentalizes beliefs into those held evidentially and non-evidentially. For a belief to be held evidentially meant the individual is holding on due to a basis of evidence. These beliefs are open to modification and criticism because the evidence holding the belief can be questioned through the production of new evidence (perturbation). Non-evidentially held beliefs are more difficult to change because evidence does not support them. Consequently, the non-evident beliefs are not prone to rational argument. So, an individual considers their beliefs to be right to varying degrees in relation to their understanding of truth. "When a person believes something, he believes it to be true or to be a reasonable approximation to the truth. Besides arriving at some decision about its truth or reasonableness, a person need not decide" (Green, 1971, p. 43). This means that some beliefs are held with a stronger, more "passionate conviction" than others and with different kinds of justification. This allows us to consider the psychological strength by which beliefs are held.

Green (1971) envisioned a belief system as a series of concentric circles. At the center of all these concentric circles one has "core beliefs," which are the beliefs that have a high psychological strength and are less likely to be challenged to change. On the outskirts of a belief system one has beliefs with a weak psychological strength or peripheral beliefs, beliefs more susceptible to being challenged and changed (Green, 1971). Hence, within a belief system there is a quasi-logical structure and a positioning of beliefs based on psychological strength. The space within a belief system can further be deconstructed by considering Korthagen's (2004) onion metaphor.

Korthagen's Onion Metaphor

Korthagen (2004) described an adaptation of Bateson's model, which Korthagen referred to as the onion. The goal was to represent different *levels of change* or "the various levels in people that can be influenced" (Korthagen, 2004, p. 79–80). His objective, thereafter, was to construct a framework for researchers to investigate the deeper aspects of the onions of teachers. He does this in an attempt to find the essential qualities of a "good" teacher and to start a conversation on how to appropriately intervene at different levels of change. As the metaphor of the onion implies, the model is a series of concentric circles, and only the outer layer is visible to others. For teacher education, Korthagen makes the argument that this model helps focus preservice teachers' reflection practices:

[The onion] provides support in supervising the reflection processes of teachers because it focuses attention on the possible contents of that reflection.... In this sense, the model of levels of change (the "onion") supplements such process models of reflection, in that it helps educators to determine on which levels the teacher is having problems, as well as on which levels the supplement might lie that should take shape. (p. 87)

By compartmentalizing changes in these different levels, Korthagen is able to focus research to different aspects of the individual teacher and explore ways to reveal these diverse levels.

As previously mentioned, the environment in which the onion exists and the outermost layer are all that is visible to others. So, the environment and the behavior of the individual makes up the exterior of the model as these components of people can be directly observed (Korthagen, 2004). The environment one inhabits, whether it be a classroom, office, coffee shop, or park, can be easily changed either by the self or others. At the same time, an individual's behavior can also be influenced to change by the environment. The model also demonstrates that influence can be in reverse; the behavior of the individual can influence an alteration to the environment he or she occupies. For example, a teacher who guides students through the construction of routines, pressures students toward certain behaviors. Thus, the teacher, through these actions, changes the environment of the classroom, the space in which he or she resides.

The inner levels of change are one's competencies, beliefs, identity, and mission (Korthagen, 2004). Beginning with the *competencies* of the individual, these are an important stimulant to the layer of behavior, yet it is essential to recognize the difference between behaviors and competencies. Korthagen (2004) cites Stoof, Martens, and Van Merriënboer (2000) to describe how competencies are an integrated body of knowledge, skills, and attitudes. Competencies influence the possibility for a change in behavior. Competencies are also reflected in our behavior. For example, consider the reflections one goes through after a particularly regretful event. One begins to play out various scenarios in hindsight. The numerous behaviors imagined in these phantasies represent possible behaviors (explored through the competencies created or altered) but not the behavior the individual actually went through. If a similar event occurs, then from previous experience and reflection, one has constructed new pieces of knowledge or has shifted their attitude towards said event.

The beliefs of the person will impact the competencies he or she demonstrates. Green (1971) discussed the intricacies between beliefs and knowledge (a competency):

The only difference between the two, believing and knowing, seems to lie in the truth condition. When the truth condition is unsatisfied, then what one took to be knowledge turns out to have been only belief.... Knowing is simply believing plus something else, and that something else must be the fulfillment of the truth condition. (pp. 68–69)

The discussions on beliefs are focused on a specific aspect of the individual preservice or inservice teacher. Korthagen (2004) focused on the beliefs teachers and students have as to what makes a good teacher. Other researchers have emphasized beliefs of student teachers, mentors, and supervisors (Leatham & Peterson, 2010), beliefs and teaching practice (Decker, Kunter, & Voss, 2015; Raymond, 1997), and beliefs about diversity (Garmon, 2004; Jong & Jackson, 2016) as important to consider during teacher education. Neither Korthagen (2004) nor Green (1971), however, define or discuss what a belief is, but instead discuss the ways in which research has developed the concept. This supports the claim that belief has been used differently by many researchers and that the term is generally left defined in a vague way or in a way that contradicts with others (Furinghetti & Pehkonen, 2002; Pajaras, 1992; Philipp, 2007; Thompson, 1992). For our consideration, I follow Rokeach's (1968) definition of belief as a disposition to action or "any simple proposition, conscious or unconscious, inferred from what a person says or does" (p. 113). This definition highlights the relationship between beliefs and behaviors.

The next level of Korthagen's (2004) adaptation is the teacher's professional identity or their self-concept as a teacher. Developing a professional identity is the attempt to answer the questions 'who am I?' and 'how do I see my role as ...?' (Brown, 2008). It is the individual believing certain aspects or characteristics about themselves. Gecas (1985) stated that identity "gives structure and content to the self-concept, and anchors the self to social systems" (p. 739). Part of our identity is related to our current position in the world. More importantly, the interpretation of the space one inhabits will affect the behaviors, competencies, and other aspects of self. Accordingly, Gee (2001) described four different views of identity (nature, institution, discourse, and affinity), which are not mutually exclusive. Instead they overlap and interact with one another in complex and significant ways.

Educating future teachers is preparing them for the position they will take in a school, community, and society. The composite character of "good teacher" is presented and developed throughout the teacher preparation program. It is through the interpretations of pedagogy and content that preservice teachers construct the archetype. Thus, the institutional, discursive, and affinitive identity (Gee, 2001) of the individual as teacher needs to be understood not only by researchers, but also by the prospective teachers themselves.

The center of the onion is one's *mission*. Korthagen (2004) described mission in the following way:

This level is concerned with such highly personal questions as to what end the teacher wants to do his or her work, or even what he or she sees as his or her personal calling in the world. In short, the question of what it is deep inside us that moves us to do what we do. (p. 85)

The mission of the individual is the answer to the question 'what is my purpose in my life?' In addition, the mission gives meaning to one's being-in-the-world. This is not to be confused with a spiritual or religious understanding of purpose. It could be a teacher's purpose in the classroom to improve the lives of students through education or to have them become proper citizens of our society. This does not mean spirituality is not influential on one's mission, but they are not one and the same. I argue, however, that the word *mission* is just as problematic as the word spiritual. When one thinks of a mission, it has the implication of a direction, an understanding of where someone is going or has to go. Thus, the metaphor of a mission makes the assumption that the individual understands what the operation will entail, which is not necessarily true of these central beliefs. Hence, by mixing metaphors, the limitations and assumptions of Green's (1971) belief system and Korthagen's (2004) onion can be alleviated, accepting that all metaphors have some taken-for-granted assumptions to them (Markham, 1999). In the next section, I mix the metaphors in order to construct a Galaxy metaphor.

The Metaphor and the Onion: Developing a Galaxy

Green (1971) and Korthagen (2004) play with language and imagery to discuss the relationships between beliefs, attitudes, and competencies. Altogether I refer to these as aspects-of-self. Through metaphor, the authors inspired new questions and opened up new possibilities for research. So, stretching the metaphor, one could ask, where does a belief system reside? Is this system of beliefs part of a greater whole? To explore these questions, let us consider a belief system

to be a piece or “a part that can subsist and be presented even apart from the whole” (Sokolowski, 2000, pp. 22–23). Korthagen’s (2004) onion helps us envision the greater whole of which one part is Green’s belief system. Consequently, a new metaphor can be constructed, preserving Green’s belief system ideas within the levels of change. I argue this construction allows for a metaphor of a galaxy to be used to explore the relationships between beliefs and other aspects-of-self.

I envision the levels of change as a vast array of clusters or a galaxy, a collective of stars, planets, moons, and other celestial bodies representing our aspects-of-self (behaviors, competencies, beliefs, identities, and missions). These aspects-of-self are the filter used to interpret and make sense of the space one inhabits. All of the stars and objects (planets, asteroids, etc.) in a galaxy revolve around a central point called the galactic nucleus. A galaxy exists within a universe, which is endless, just like the possible environments one might inhabit in a lifetime. Within this infinite number of environments, there lie the clusters influential to the aspects-of-self. Thinking about a galaxy can help us imagine the relationships between the aspects-of-self, an elusive phenomenon, in a concrete way (Atwell-Vasey, 1998).

Moreover, in a galaxy, there exists a collection of solar systems that move at different speeds and have their own rotational trajectories. The planetary systems on the outskirts of the galaxy have a slower orbital velocity; those closer to the nucleus have a faster orbital velocity. Additionally, if a system is closer to the center, then it has a stronger gravitational force applied to it from the nucleus. Consequently, this preserves how both Korthagen (2004) and Green (1971) envisioned the workings of one’s core beliefs (identity and mission). These beliefs require a more significant pressure or force to change due to the clusters’ stronger psychological strength. This also represents the influence or strength one’s core levels have on the other parts of the galaxy and how challenging it is for researchers to determine which forces are being applied. The outer most systems, those furthest from the galactic center, are changing more often, as well as being more susceptible to other forces, just like the outer aspects-of-self (i.e., environment, behavior, and competencies).

According to Dahlberg, Dahlberg, and Nystöm (2008), when Merleau-Ponty (1968) described the flesh of the world, he meant “that all phenomena and meanings are interconnected and it can be hard to see where one phenomenon ends and the next begins, where one meaning is and whether it is connected to one phenomenon or another one instead” (p. 15). The galaxy metaphor as described gives the aspects-of-self a flesh, blurring the lines between beliefs, competencies, and identity. When prospective teachers begin their methods and content courses, there are years’ worth of development in their own galaxies. The prospective teachers are imbued with these characteristics of their past schooling traditions. When teaching preservice teachers new ways of talking about education, providing a new academic language, it can clash with the pasts and traditions that have constructed their experiences. Change then travels through space with magnitude and direction, potentially changing other aspects-of-self. We, as educators, construct interventions to have the individual question his or her accepted history, traditions, and prejudices. So, one must be cautious and understand that all of the aspects-of-self are difficult to separate and tease out. This perspective of students as resisters of knowledge should not be pessimistic. On the contrary, understanding the uncertainty and confrontations of knowledge is empowering. Having students become aware of, question, and deconstruct their resistances and then restructure their prejudices is important and necessary for them to learn to teach.

Overall, the galaxy metaphor preserves Green’s (1971) description of how beliefs are held (clusters, psychological strength, and pseudo-logical structure) and the different levels of change Korthagen (2004) discussed. The galaxy metaphor provides a new perspective for doing research

in education. I begin by exploring beliefs and other aspects-of-self through Gadamer's (1975) ideas of tradition. Thereafter, I describe how the galaxy metaphor can be used when considering teacher preparation programs' curricula.

The Galaxy Through a Hermeneutic Lens

The galaxy metaphor invites different perspectives to come into conversation with one another. To begin, the metaphor better demonstrates how beliefs are held fluidly, because in a galaxy nothing is ever static; objects are constantly moving due to the forces being applied. The only way one holds an aspect-of-self is on the orbit it travels. Using Gadamer's (1966, 1975) ideas of tradition and language can help in exploring this type of hold. Gadamer (1975) wrote that hermeneutics is "the art or technique of understanding and interpretation" (p. 174). Individuals are interpretive beings born and raised in the traditions and histories of ourselves, of others, of objects, and ideas. As a result, our histories and traditions hold our aspects-of-self in place, along with the prejudices that are consequences of those traditions. Take for example how Leatham and Peterson (2010) found that mentor teachers believe one of the main purposes of student teaching is to experience the *real* mathematics classroom. The use of the word *real* demonstrates the mentor teachers' interpretation of the student teaching experience and the prejudices they have, not only towards teacher preparation programs, but potentially their own teacher education. If the mentor teachers believe they are providing the *real* experience for prospective teachers, then teacher educators would be providing an unrealistic experience. This can make the act of bridging field experiences with course work challenging for the teacher in training.

Hermeneutics takes into consideration the problematic nature of language and the fact individuals are always immersed in language. Gadamer (1966) wrote, "we can only think in a language, and just this residing of our thinking in a language is the profound enigma that language presents to thought" (p. 62). Accordingly, every event is interpreted through the flow of experiences changing our horizons of understanding. Consequently, because people are interpretive beings (Gadamer, 1975) having new experiences, ideas, theories, and environments, one cannot make the assumption that our aspects-of-self remain static as beings-in-the-world. Thompson (1992) warned against this mentality in research on mathematics teacher beliefs and knowledge. This fluidity, however, should be kept in mind beyond research on beliefs and knowledge, but also identity and other aspects of being an educator or a student.

As one attains more and more experiences, the horizon of understanding shifts, consequently changing the way in which one interprets objects and events. This includes when one reflects on an event in one's past; "every experience has implicit horizons of before and after, and finally fuses with the continuum of the experiences present in the before and after to form a unified flow of experience" (Gadamer, 1975, p. 237). If the interpretation one makes changes through the flow of experiences, this means an aspect-of-self has potentially changed. Although the cluster stays on an orbit, leaving it at the same level (behavior, competency, etc.), it is still changing ever so slightly, it will never return to what it once was, even if the language one uses to describe it may be similar. One can only capture a participant's tentative manifestation of beliefs through the interpretation of said cluster, because our aspects-of-self are always moving.

Just like the orbits of planets can be closer at times than others, one can envision the beliefs of an individual at times becoming difficult to distinguish between other levels. This means one has to keep in mind the consistent movement of the clusters and the possible significant events

occurring intermittently. This is particularly relevant when investigating the influence of an event on a preservice teacher. The extent of that movement and the significance of that advancement on the orbit will need to be considered between reflections. One can only just catch a tentative manifestation of the individual's cluster, as they will shortly move. Researchers and teacher educators must consider the places and spaces they and their participants and students inhabit at a given moment, as these will be influencing factors as well. Finally, the constant movement of aspects-of-self also aid in understanding how the individual may not recognize contradictory clusters.

Also to be considered are the forces holding these clusters in orbit. As noted above, Green (1971) argued that beliefs are held evidently or non-evidently, but with this galaxy metaphor, the evidence the individual has for those clusters is only one possibility. It takes many different combating forces to hold objects in orbit. One other possibility is the traditions in which one exists and with which one compromises daily. Gadamer (1975) stated:

That which has been sanctioned by tradition and custom has an authority that is nameless, and our finite historical being is marked by the fact that the authority of what has been handed down to us—and not just what is clearly grounded—always has power over our attitudes and behavior. (p. 281)

These traditions and norms are reflected in these clusters and influence the psychological strength with which these objects are in orbit. The traditions into which one is born have an influential power over us. Gadamer (1975) claims all power exists in its expression, and thus, each aspect-of-self, as one expresses it, demonstrates power. The force an aspect-of-self exerts conflicts and compromises with other clusters and other levels. The larger the cluster, the greater power it can demonstrate and the greater power it has over other clusters.

So, consider a teacher educator's position in the classroom. There are a variety of expressions of power occurring, and through these manifestations, one is attempting to change the beliefs, perspectives, and professional identities of the preservice teachers who may demonstrate their own beliefs to resist the power expressed before them. Take for example the following exchange taken from a study I conducted on the vision (Hammerness, 2006) of prospective elementary teachers in their first of two mathematics methods courses. Karenina (pseudonym) was given a task featuring 10 open spaces evenly distributed on a circle with a blank space in the center of the circle. Each of the 10 spaces were connected to the center of the circle with a line segment. She was asked to place the numbers 1 through 11 in the spaces such that every three numbers in a straight line added up to the same quantity. The purpose of the task was to problematize Karenina's belief that mathematics problems only have one possible solution, though many different strategies are possible. Karenina successfully found a solution for the problem, and when asked if this was a mathematics problem, she responded with a confident yes. When told, however, the problem had three different solutions, she was asked again if it was a mathematics problem. She responded as follows:

Yes because—yes a lot of math problems have one answer. But there are problems like... [sighs] I was going to say that there are problems that can go on for forever, but are those problems—I don't know if those problems have multiple solutions or if they are just the answer to a problem that goes on for forever. I guess you could think of it as like, you could go about solving this in multiple ways, just as you can go about solving a math problem in

multiple ways. But yeah with a lot of math there is mostly one answer unless you look at—like when I was in statistics there’s like multiple answers or you could explain your reasoning for things. *I feel like I can’t say yes or no; yes it’s a math problem because you can think of about math and solving that in multiple ways. But I guess I would also say no because when I think of math a lot of it is one answer ‘cause that’s also why I like math is ‘cause you can most of the time know if you are right or wrong is ‘cause there is one answer.* So, I don’t know I’m kind of torn. (Karenina, Int. 2, emphasis added)

The tradition of mathematics Karenina had been raised to understand came into question, and she desired to keep those traditions the same. Her beliefs clashed, and she attempted to reason through the conflict by externalizing her internal speech. Leaving the issue unresolved, Karenina’s solution was to attempt to split with her knowledge of mathematics from her past. This perturbed her on many different levels. Seeing a contradiction within her beliefs led her to attempt to justify their existence. Karenina desired to hold on to her tradition that mathematics problems had one solution but, with the given task, was forced to think otherwise, allowing the possibility for change within various levels if she could get past the traditions holding her beliefs in place.

Lenore was also prospective elementary teacher who participated in the same study as Karenina. Within the interviews, Lenore emphasized a different tradition she experienced as she progressed through school. To demonstrate this tradition, Lenore was asked to describe the relationship she had with who she identified as her ideal teacher.

Lenore: And I still have a relationship with her to this day, and I think that’s important. I mean I was a fifth grader. To still have at 21 years old, to have a relationship with your fifth grade teacher—I mean a close relationship. I can call her any day and talk to her about anything. I think that’s so important. Maybe not having one as close as she and I do but just having one that you know if you ever needed something you could go to them. And remembering at 21 or at 40 or at 50 how much fun you had in fifth grade. Because some of my grades I can’t remember at all. I can’t even tell you who my teacher was. I think the fact that I can tell you so much about my fifth grade teacher means that she was a great teacher.

Interviewer: So, what obstacles do you see in becoming this ideal teacher?

Lenore: Honestly, the relationship part. Nowadays there’s a very fine line between what...where you can take a relationship. You know like, I’m very close with all my teachers, and I can call my teachers even when I was in high school and to certain people that would look weird although it wasn’t. And I think that’s just going to get worse and worse and worse. So, I think it’s defining the line between what they can talk to you about—what you can talk to them about, when you can talk, where you can talk. I mean nowadays people are like, my mom was a teacher, and she tells me all the time, never be alone in your classroom with a student. And that’s sad to me that it’s gotten to that point. So, I just think that that’s going to be the hardest thing to overcome cause I’m not going to have a problem building the relationships. I love kids. I love students. I love teaching them things but

knowing when I just need to back up so that nothing looks bad because it's just going to get worse and worse as far as you know teachers getting in trouble. And I'm just dreading that everyday 'cause I think it's so sad. I was alone with my teachers all the time to talk to them about stuff, and now you can't do that. So, that's going to be the biggest obstacle I have in every area of teaching—just knowing the line that you can't cross.

Lenore's emphasis on the teacher-student relationships involved many levels in the galaxy that is within her. These constellations shine brightly and influence her perspective on her future teacher-self. She articulates the desire to create these relationships with students and how the current culture in education will make her desired acts difficult. The tradition and the meaning she had placed on the word teacher and the role of teacher conflicted with how others view the act. She seemed to be resistant to changing these aspects-of-self but aware of the context she will be working within. This awareness helped her in being resistant to changing her perspective on student-teacher relationships.

These are only some of the possibilities the galaxy metaphor provides for the ways in which we hold our clusters at various levels. Of course, with this model there are many other factors that can be contemplated and discussed. The previously mentioned are just a few, and I hope others will take these thoughts and open them up to unfold new inquiries and questions of the individual. As Gadamer (1975) stated "discourse that is intended to reveal something requires that that thing be broken open by the question" (p 357). Only by continuing to question the models can we continue to reveal new understandings.

Discussion: The Galaxy Metaphor as a Lens

One can envision a collection of super clusters of galaxies coming together, interacting with one another with forces of varying magnitudes, colliding in the space provided by the classroom. Even the authoritative figures outside the classroom influence the actions within (e.g., administration, education agencies). For example, Hammerness (2006) witnessed the pressures of standardized testing's impact on the vision and practice of one of her participants. So, we can see no galaxy exists alone. Every galaxy is by some degree affected by other galaxies in the universe it subsists in, even if it is only immersed in the light the other stars are emitting. In the cosmos, the smallest changes can influence how individuals interpret their world.

I believe one of the goals of a teacher preparation program is to implicitly teach resistance to the conservative teaching style rampant in today's schools. As Felman (1987) wrote, "teaching, like analysis, has to deal not so much with lack of knowledge as with resistances to knowledge" (p. 79). However, those same prospective teachers being taught resistance are resisting what they are being taught. So, looking at future teachers as resisting knowledge is supported by the galaxy metaphor. When these prospective teachers begin their methods and content courses, there are years' worth of development in their own galaxies. They are imbued with these characteristics of their past schooling. They are successful products of the education system in which they grew up. When we teach them new ways of talking about education, a new academic language, it clashes with the past language and traditions that have constructed their galaxy. Collisions occur in the emptiness of space creating a ripple effect throughout.

So, how can this metaphor be utilized to enhance our teaching? In general, our beliefs about teaching and learning influence the curriculum of our courses. A tool, like the galaxy metaphor, can help in designing stronger and more targeted interventions. For example, in mathematics methods courses for prospective elementary teachers, one goal is to have prospective teachers learn to use students' mathematical thinking. Philipp et al. (2007) found a stronger intervention is to have prospective teachers have the opportunity to conduct guided interviews with elementary aged students, rather than showing videos of students being interviewed or documents with students' mathematical work. Reflecting on our curriculum and selected interventions can also help in seeing what beliefs and levels we are targeting with assignments and activities. The galaxy metaphor can help in our own professional development and curriculum design.

In *The Activities of Teaching*, Green (1971) discussed the belief system of an individual to explore the actions of the teacher in the classroom and what it means to teach. Korthagen (2004) wanted to investigate distinct forces effecting different levels of change and the methods researchers could use to study teachers' inner most layers. By putting these two metaphors together into the galaxy metaphor, one is able to explore the same ideas through a different lens—opening up new avenues of investigation. When I first got glasses and the blur was no more, I was able to explore colors in new ways. The aesthetic experience I had with my doodles changed, and the way I interpreted what I created was different. Similarly, the manner in which I investigate my own and others' behaviors, competencies, and beliefs is now different. New factors are appearing, and other considerations are taking place when reflecting on my own past experiences. The blur has become more focused, and I realize the sensitivity of my own perspective. Is this correct though? This is only an idea, a possibility, but whether it is correct or not is impossible to say. The experience and analysis this galaxy metaphor is providing has the potential to change us at any level.

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Visualizing Mapping as Pedagogy for Literacy Futures

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“ABSOLUTELY WANTED TO FINISH READING that letter,” scribbled Nick, as he was reading a play that was assigned in his grade-12 literature classroom. Before him laid a map he drew to represent his reading experiences. When prompted to share further detail, Nick continued to highlight his insights as he linguistically, symbolically, and visually navigated his meaning-making processes: “I made links in my head between my perceptions and my judgments towards characters; I thought the two main characters meeting was the result of a symbolic quest—one that spoke about love and hate.”

In this article, we explore the pedagogical potential of mapping, such as how Nick’s map renders visible qualities of learning that are often left unseen, hidden, or left unexplored—feelings, thoughts, connections, memories, and experiences (Robinson & Petchenik, 1976). Rather than focusing on maps as representative end products, we emphasize the emergent qualities of the activity of mapping in learning. Through mapping, the dynamic ways in which individuals experience literacies—the ebbs and flows, rises, punctures, plateaus, disruptions, valleys of insights, connections—provide a rich and textured sense of how learners mobilize their meaning-making and sense-mattering.

With the pedagogical potential of mapping in mind, we present five empirical examples of student mapping from two cases of mapping pedagogy in literacy classrooms: three examples of body mapping from a Language Instruction for Newcomers to Canada program and two examples of mapping reading experiences in a high school classroom. Across these cases, we share examples of mapping activities that generated responses ranging from metaphorical to more literal renderings of learning as embodied experiences. We then chart the pedagogical dimensions of

these mapping activities using a 3D coordinate plane to illustrate the range of instructional approaches from tighter to looser instrumental structures.

Surveying the Landscape of Critical Mapping in Educational Research

Across time, mapping has taken a wide range of forms from navigational and topographical maps to thematic and figurative ones (Kitchin, Dodge, & Perkins, 2011). In recent years, place-based and identity-oriented educational studies have determined that map-making was a useful critical tool to disrupt socioculturally situated power dynamics (Gondwe & Longnecker, 2015; Morrison, Annamma, & Jackson, 2017; Parker, 2006). For instance, in a study on sociolinguistics and language learning by Dagenais, Moore, Sabatier, Lamarre, and Armand (2009), 5th-grade Canadian students used hand-drawn maps to develop awareness of language norms bound by territorial neighborhood tracings. Andrews and Smith (2011) similarly engaged youth in hand-drawn neighborhood maps as they participated in exploration of cosmopolitan practice with international peers. Spatial mapping in education has also taken a technical turn, with researchers and practitioners employing digital mapping technologies to layer felt life experience and memory across physical landscapes (Velez & Solorzano, 2017), conduct geohistorical and geopolitical analysis (Taylor, 2018), and create sociospatial arguments for policy change (Gubrium & Harper, 2013). Such critical mapping activities, Vaughan (2018) argues, engage a visual rhetoric that can situate urban phenomena, retrace histories, revert social justice imbalances, and chart spatial power dynamics in communities.

We suggest that this critical potential is not limited to mapping as spatializing activity focused on physical and social geography. Mapping can also be a creative and critical pursuit that charts experience and learning. It is this type of mapping—mapping experience and learning through thematic and figurative formats—that we are focused on in this article. Several forms of this type of mapping exist and have been taken up within critical and creative praxis. For instance, Annamma (2017) engages teacher educators in mapping the multiscalar inequities of their pedagogical journeys. Conceived as learning tools to heighten high school students' comprehension of texts, thinking maps are another example that help to graphically identify patterns of learning between such dynamic qualities as reflection, consistence, flexibility, development, and integration of ideas (Hyerle, Alper, & Curtis, 2004). In post-qualitative research, Ringrose and Coleman (2013) proposed a feminist Deleuzian mapping methodology to take the pulse of the relationships between adolescent girls' perceptions of gendered bodies, femininities, and masculinities—a dynamic, critical approach that elicited reconfigurations of sexualized bodies in the Western world. Like Ringrose and Coleman (2013), educators and researchers adopting rhizomatic methodologies have contextualized mapping as an agentic, critical, and flexible tool for inquiry. Mapping aimed at charting experience and learning can reveal and create relationships across complex sets of ideologies, discourses, feelings, aesthetic stances, and materialities.

Beyond Mapping Territories

As the philosopher Alfred Korzybski (1933) argued, “The map is not the territory” (p. 58). Following Korzybski, we argue that, rather than depicting reality, mapping offers an opportunity to territorialize emergent meaning-making processes (DeLanda, 2006; Deleuze & Guattari, 1987).

By territorialize, we mean that in the processes of mapping—as a metaphorical or literal depiction—the map-maker renders visible, discovers, and produces the evanescent, intertwined, mingling aspects of mind, body, and socio-material aspects of literacy engagements. Kamberelis (2004) explains that “a map produces an organization of reality rather than simply (re)presenting space” (p. 165). Thus, through thematic and figurative mapping activities focused on learning, map-makers’ active processes of coming to know are revealed as they reflect motives, reasons, and experiences. Corner (1999) offers a series of attributes to describe what happens when mapping is understood as a way of knowing: maps “dig, find, and expose...and they relate, connect, and structure” (p. 225). In other words, mapping lends the potential for a map-maker to territorialize or produce an organization of reality, visualized with markers for ideas, emotions, and experiences that otherwise remain undocumented, fleeting, or impalpable.

As a territorializing activity, mapping illuminates thinking and feeling in the moment. These mingling thoughts and feelings are in constant flux through and from multiple perspectives, connections, and epiphanies that are generated as the map is discovered. In doing this, mapping’s territorializing partners, *deterritorializing* and *reterritorializing* (DeLanda, 2006), support the map-maker in making and remaking connections. When confronted by the unfolding of the map-so-far, map-makers can make shifts and moves in their understanding and illustration of experience. These motions are influenced, but not determined, by the emergent territorializations process. Through these shifts and movements, learners reterritorialize their sense-making by expanding and repositioning boundaries and definitions. Therefore, one cannot pre-determine, set the terms for, or constrain the mapping activity because it follows the becomings (Deleuze & Guattari, 1987) of the relational states taking place as one draws. Mapping does not simply mirror reality; it repositions and reshapes the social worlds in which people live.

Theorizing through Mapping: Visualizing Two Cases of Mapping as Pedagogy

To explore the possibilities of mapping pedagogies, we revisited two classroom-based studies as cases for collective theorizing. In each case, literacy instructors employed thematic and figurative mapping activities to engage students in territorializing learning and experience. We drew on post-qualitative notions of “thinking with theory” to engage in processes of reinventing concepts (Jackson & Mazzei, 2012, 2017). Jackson and Mazzei (2017) describe thinking with theory as a new analytic to disrupt the concept of method as transferable in qualitative inquiry. Embracing conceptual instability over knowing, Jackson and Mazzei (2017) suggest a process of experimentation with ideas drawn from a wide range of sources (theory, feelings, data, reviewer feedback, past writing) approached with a flattened sensibility. St. Pierre, Jackson, and Mazzei (2016) outline this process as a series of actions in which we experiment with new knowledge and lace it against a dimension or plane of thought through “noticing” and “rethinking” what we know and how we come to know it, allowing “connectivities [to] emerge in between data and theory” (Jackson & Mazzei, 2012, p. 2).

Through rounds of collective dialogues (Kuby & Gutshall Rucker, 2016), we experimented with mapping theory as we situated and deconstructed concepts such as *mapping*, *intra-action*, *visualizing*, *agency*, and *territorialization*. Some of these concepts fell away, particularly as their conceptual potential was under-realized. We have come to dismantle our individual assumptions about what mapping was and what it did as a means to collectively formulate how mapping could be insightful as a pedagogical practice. This process permeated multiple modes of exchange across

several months including annotated texts, Zoom meetings, in-person discussions, text messages, chains of emails, manuscript drafts, doodles, and multiple walks.

We charted the cases' mapping activity across two continua representing the pedagogical (y-axis) and mapping (x-axis) dimensions we were theorizing (see Figure 1, below). As we mapped and experienced the territorializing↔deterritorializing↔reterritorializing process ourselves in attending to our cases, we realized that a third dimension—one that would visualize the dynamic territorialization process we saw in our cases and in our own processes—was needed. As a result, we theorize that mapping, as a pedagogical approach, can be viewed across these three dimensions: tight and loose pedagogies, literal and metaphorical mapping, and a dynamic third territorializing↔deterritorializing↔re-territorializing dimension that oscillates across, within, and beyond the other two dimensions. We articulate each of these dimensions below, and use the results of our mapping to illuminate five empirical examples from the two cases in our findings.

Dimensions of Mapping Pedagogy

Dimension 1: Tight↔Loose

As a first dimension of mapping as pedagogy, we draw a continuum on a y-axis to characterize pedagogy as working from a structured (tight) to open-ended (loose) range regarding assigned tasks, texts, modes, discourses, tools, and practices (Pahl & Rowsell, 2020). The instructional activities can take on more traditional approaches with teacher-led tasks. Within this context, the design, presentation, and substance instruction and responses may adopt a formulaic approach to developing and understanding student learning. Looser pedagogies occur in classrooms where the tasks allow for greater flexibility. In either setting, we argue from the following cases, students still engage in dynamic sense-making processes during mapping, and thus, the potential of territorializing↔deterritorializing↔reterritorializing can still be realized.

Dimension 2: Literal↔Metaphorical

Pedagogical mapping activities can also be seen to exist along a continuum of literal to metaphorical. We place this on an x-axis. In literal mapping, a map-maker attends more acutely to the empirical representation of experience in terms of dimension, shape, and scope. Although closer to what Deleuze and Guattari (1987) characterize as “tracing,” where the map-maker works to directly transfer the lived landscape onto the page, in literal mapping, a map-maker can (re)make their sense of their experiences and visualize their process. Examples of literal mapping include post-it charting to look at students' engagement (Lemieux, 2015; Maine, 2015) and concept mapping as a visual learning tool to organize and engage with readings (Hartsell, 2015).

At the other end of the continuum of the x-axis, metaphorical mapping embeds symbolic concepts into multimodal compositions. Metaphorical mapping prompts more explicit reterritorializing by signaling larger intersectional dimensions such as culture, religion, or social class. It is not that literal forms of mapping do not exert reterritorializing power, but they are more specific and tangible. A metaphorical map can give voice to the most often unheard, particularly in exploring how matters of health, gender-based violence, security, safe housing, and sexual violence can be expressed (Chege, Maina, Mitchell & Rothman, 2014; Ngidi & Moletsane, 2018).

To visualize these dimensions of mapping, we offer the coordinate plane in Figure 1. As a pedagogical heuristic, a teacher might design a learning activity at any point across this plane, and a learner might take up the prompt across each of these dimensions. In the cases that follow, we present empirical examples that illustrate this range.

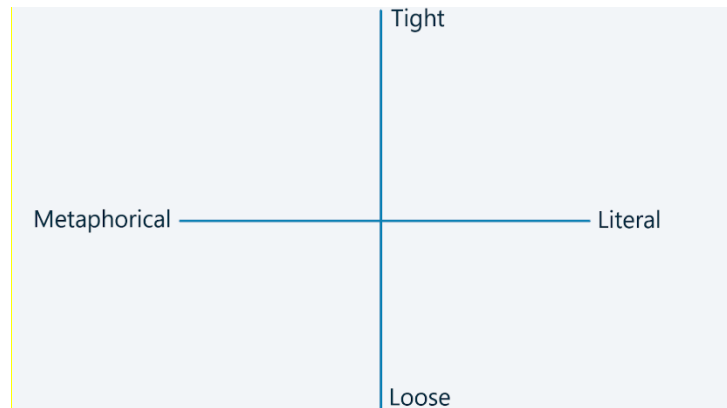


Figure 1. Coordinate plane illustrating pedagogical dimensions of mapping as pedagogy

Dimension 3: Territorializing↔Deterritorializing↔Reterritorializing

As we theorized this mapping heuristic, we recognized that conceiving these dimensions of mapping as existing on a 2D coordinate plane appeared to stabilize and flatten the dynamic, multi-sensorial experience of mapping. Learning and meaning-making are not static, binary, or unidimensional concepts. Mapping can simultaneously be literal and metaphorical, and the process can operate across the various dimensions. Just as experiences, practices, and perspectives of an event in any social space—including the classroom—can be layered, relational, and dynamic, so too are the processes for making sense of the event. For these reasons, it was important to plot a third dimension to illustrate the dynamism of mapping activity, one that signals the territorializing↔deterritorializing↔reterritorializing processes of mapping. Using metaphorical wavy lines to illustrate this dynamism across the z-axis, we intend to invoke the continual back and forth of mapping for each of the plotted empirical examples to come.

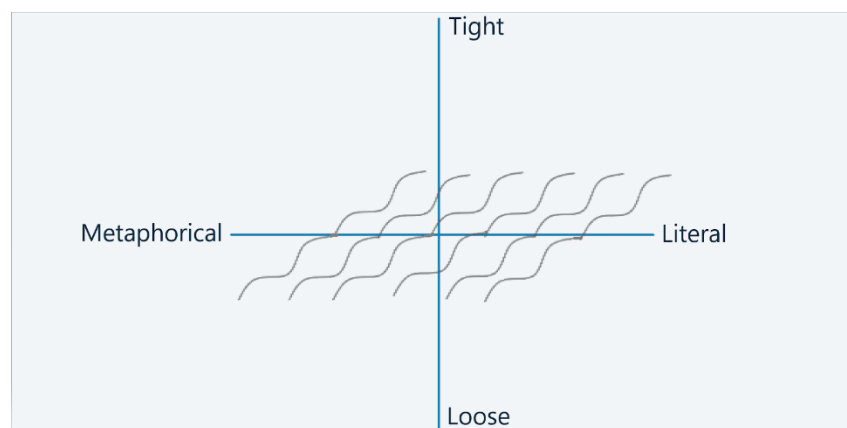


Figure 2. Coordinate plane with the dynamic third dimension territorializing↔deterritorializing↔reterritorializing

Two Cases of Mapping Pedagogy

When “thinking with theory,” as articulated by Jackson and Mazzei (2012), researchers are encouraged to intentionally draw from difference across data to challenge notions as they stabilize. Thus, to explore a wide range of mapping pedagogy, we revisited two cases of pedagogical mapping that, although linked as thematic and figurative types of mapping (Kitchin et al., 2011), present radically different uptakes of this type of mapping. The two cases also both employ literal and figurative interpretations of mapping with quite different populations. One population is adult language learners, and the other includes secondary school students. In these ways, the two cases provide different flows of meanings that rely in one case on learners’ experiences with resettlement, culture, and religion and in the other case with learners’ affectively-oriented responses to narrative reading. For educators and researchers, we bring these two cases together because they illustrate the range of ways thematic and figurative mapping of learning and experience can be taken up pedagogically.

Pedagogical Case One: Body Mapping with Adult Newcomers

As a part of a SSHRC-funded research study,¹ Jennifer Rowsell and Julianne Burgess worked with 20 language learners enrolled in a language program called Language Instruction for Newcomers to Canada (LINC). Funded by Citizenship and Immigration Canada, this ongoing initiative allows newcomers, permanent residents, and refugees aged 18 to 25 to take English classes for academic study in post-secondary settings (Burgess & Rowsell, 2020). Julianne is an ESOL teacher with 15 years’ experience who is interested in language learners’ transition to Canada. Julianne asked refugee research partners to draw body maps on 11” x 17” sheets of paper with colored pencils and markers, tracing their body outline and adding symbolic anatomy across their mapped elements. Body maps are drawings, paintings, or other artistic renditions of people’s bodies as reflections of internal worlds and lived experiences; they are a way of figuratively conveying one’s feelings of embodiment.

As students produced their body maps, they were encouraged to use color, symbols, and labels in their home languages. They were also asked questions to stimulate ideas for their artwork, including: What is your country of origin? How have you found and experienced the resettlement process? Draw a recent experience of home—it can be whatever comes to mind. Where is home—is it the place your parents come from, or where you grew up? Is it a location, a person, an artifact, a feeling you carry within yourself? In this instance, the body maps provided a “language” with which to deterritorialize and reterritorialize their thoughts, feelings, and lived experiences and, more importantly, to create their own narrative of transition. The activity moved beyond a simple tracing of a physical move to have them deeply reflect on the ways that their identities changed (if indeed they changed), which cast language, culture, memories, and so forth in a very different light. This is not to say that body maps served as therapy, rather that they were another vehicle for expression beyond their usual, more traditional, and at times instrumental instruction.

Pedagogical Case Two: Map-making with Adolescent Readers

Pursuing the idea that mapping renders ideas, emotions, and thoughts visible, Amélie Lemieux conducted an SSHRC-funded classroom-based study² where adolescents were asked to code and map their responses to literature. The larger study investigated 12th-grade students' literacy practices as they mapped their responses to a monomodal (print) and a multimodal (video) version of a text. Students enrolled in this class were part of different academic concentrations that ranged from physical education to advanced science. Their literature teacher was receptive to the project, and allowed Amélie to use map-making to teach about literature.

During the first phase of the larger study, students saw a visual presentation that illustrated a step-by-step process of making maps. These maps were participant-generated and recorded moment-by-moment reactions to texts in any mode or combination of modes. Map-making required readers to determine the level of intensity of each of their reactions to the reading (i.e., did a reaction correspond to an impactful moment or a barely noticeable moment?) and classify these moments into categories. To do so, Amélie provided students with a guide of reactions designed in the research methodology as a participative tool to help them code their responses. In this sense, the mapping activity was tightly designed to guide students in a particular way, but loose in the sense that they coded, selected, and invented categories that they felt best represented their responses. Prompted felt experiences included: perceptions, feelings, emotions, attitudes, tastes, explanations, judgments, reflections, and additional moments (the latter was an open-ended category that students could use to invent a category that was not on the list). Once students classified each of their reactions in the category that best described their response, they color-coded those categories. Finally, students drew their maps and made links between their reactions, justifying their meaning-making in an accompanying commentary. As part of this study, participants completed a pre-test highlighting reading preferences, a reading questionnaire that explored students' visual understanding of content (e.g., drawings of characters, scenes, book cover), two maps (one in response to a scene of the play *Incendies*, the other to its corresponding scene in an adapted film version of the play), two ekphrastic poems with accompanying commentary justifying their choices, and a post-test. As in the body mapping study, drawing maps went beyond simple tracing as it materialized designed patterns of visual representation in a process where responses merged into ideas, ideas into words, and words into categories, numbers, and expressions that territorialized the previously unthought and subsequently de- and re-territorialized perspectives.

Findings

Body Mapping: Situating Past, Present, and Future Literacies

In this section, we present three empirical examples of mapping that were part of a classroom-based study called *Mapping Home: Literacies of Resettlement* (part of the larger *Word in the World* research) and that sit on different quadrants within the coordinate plane. Within the reported research, body mapping is meant to elicit these map-makers' stories and uncover parts of their lives, inner thoughts, and memories as dynamic translations of felt experiences and meanings (Griffin, 2014). Participants considered notions of home and their lived experiences in new ways, using their intellects, cultures, languages and imaginations as key aspects of their identities. In this

process, body mapping allowed language learners to explore their subjectivities through the unfolding, enfolding, and becoming process: learners can see who they are, where they have come from, and where they are going.

Farah. “I love my life no matter where I live...but the journey has been hard,” Farah told us. Farah, a 22-year old woman, discussed with us how mapping helped articulate her experiences in resettling from Iraq to Canada. Farah was aware that her sudden and fraught move was not only physical, but also a marked shift in her identity. The first case study (Figure 3, below) presents a map by Farah, who was enthusiastic about sharing, through her map, some of her physical and emotional struggles with Crohn’s Disease.



Figure 3. Farah’s body map

Circulating within Figure 3 are ideas, languages, interpersonal connections, artifacts, and experiences that rekindle for Farah memories of her life back in Iraq. There are tensions that Farah felt in terms of gender and culture in her lived experiences as an Arabic woman. In class, during

the interview, and as seen in her body map, Farah voiced parts of her identity: “I am a strong woman who lives alone” in Canada. Farah moved to Canada for better healthcare services for the treatment of Crohn’s Disease because she had limited medical care in Mosul—hence, the image of her intestines and bleeding within her organs. Given her Crohn’s disease, Farah was selected by the United Nations High Commissioner for Refugees to come to Canada to receive urgent medical treatment, leaving her parents and brother behind. Farah’s design reflects her contested feelings about traditional, often gendered cultural and religious expectations, signifying her expressed desire for individualism and independence as a young unmarried Arabic woman. The arrow accompanies her body as a central figure shaping the terrain and landscape of her body map. Farah’s map shows great affection for her home in Iraq through her depiction of two friends back home with whom she connected on Facebook; representation of her strong allegiance to her first language Arabic; and aspects of her new life that she loves, such as living and thriving in her own apartment and having her own car in Canada.

Farah’s body map shows two faces: parts of her disease before she was able to receive adequate healthcare in Iraq and parts of her recovery after she sought healthcare in Canada. Through both the physical and conceptual map, there is a foregrounding and territorializing of: the disease in her intestines, a presence of her war-torn home with bombs falling on her neighborhood in Mosul, and tents under a hot sun in her refugee camp. In her written reflection, Farah wrote:

When I drew my body map I felt joy, because I like a lot of things in my life, happy and sad. There were a lot of ideas in my mind. I thought about my family; and now, I am happy: Farah is a strong woman. She lives alone and learns a lot of things in her new life here. I love my life no matter where I live.

Farah’s drawing of Arabic script echoes her close ties to Iraq, her culture, her mother tongue, which speaks to a process seeking to “visually reconstruct local memories” (Afonso, 2004, p. 87). Her visuals are not linear or hierarchical, but they circulate, flow, and move in unpredictable ways. As an example of a literal interpretation of mapping, the body maps contain layers of memories from the past, present, and future—blurring time in the process.

Applying our dimensions of the mapping pedagogy 3D coordinate plane to Farah’s body map, her visual rests within a quadrant on the bottom right corner because her drawing of her body is more of a literal depiction given these artifacts: her bleeding intestines; deceased soldiers with a helicopter circling over top; her two friends from Iraq; the Arabic script; her favorite dessert, Kupa; and her apartment and car in Hamilton, Ontario. It is also within the loose pedagogical parameters of the body map.

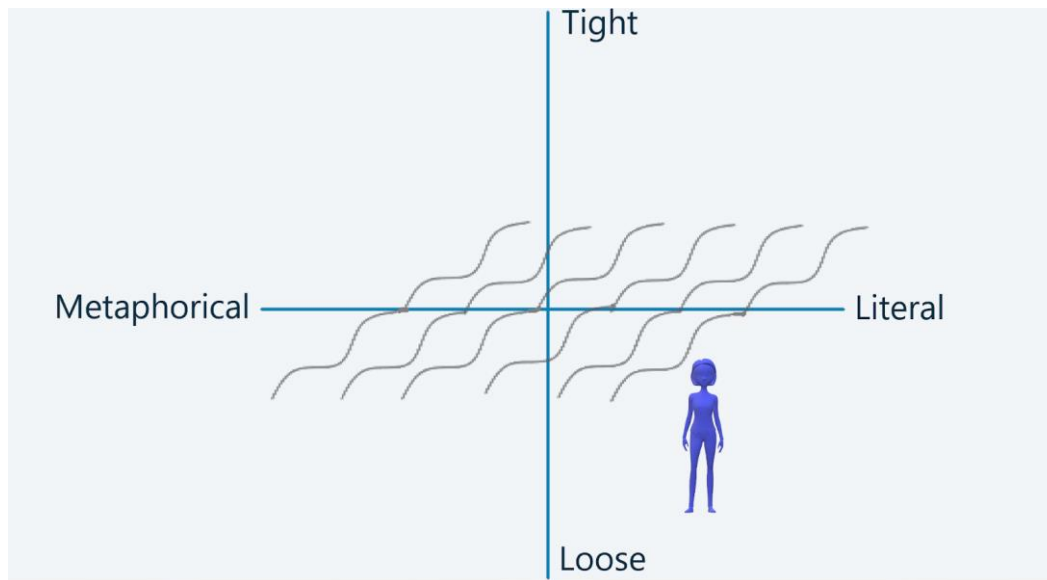


Figure 4. Farah’s map is located between the literal and loose dimensions of mapping

According to Farah, she arrived in Canada in very poor health, and with medical care, she grew stronger, and her views about Iraq shifted; those shifts materialized on her body map. Farah intricately depicted her Janus-faced feelings about Iraq, providing active forms of reterritorializing as she was working on her map and articulating her thoughts and emotions during conversations. Farah articulated how much she missed her parents, her home, her food, her friends, her language, but also talked about living in fear in Iraq due to ISIS. On a few occasions, Farah shared that her body map crystallized these conflicting emotions and allowed her to recognize changes that she has experienced with the passage of time. Given Farah’s clarity and literal depiction of her resettlement, we view her visual as a form of deterritorialization—of deconstructing her story in an explicit, highly materialized way.

Aadi. Aadi’s body map occupies a different quadrant of the mapping plane. By way of background, Aadi is a 24-year-old male from Nepal. His family is originally from Bhutan, but Aadi identifies as Nepali after living in a refugee camp in the eastern part of the country. He is married and is the father of a 2-year-old girl. As a result of a United Nations resettlement initiative, Aadi’s family is scattered across the United States, Norway, the Netherlands, and Canada. In a journal reflection on his body map, Aadi wrote: “When I drew this picture I forgot about Canada because my mind and body are in Nepal. In my heart are all my friends and our neighbors and cousins.” “*You mann to mero Nepali ho*” means “my heart belongs to Nepal.”



Figure 5. Aadi's body map

From what he expressed to us, in the forefront of Aadi's mind was designing a map that featured camaraderie, friendship, and community. A visual of linked figures holding hands in a circle appears on Aadi's t-shirt with him at the center. Aadi wears the Nepalese flag on his hat and is surrounded by visual anchors that embody his figured worlds (Holland, Lachicotte, Skinner, & Cain, 1998). Quiet and soft-spoken, he often got teary when he talked about Nepal, reminiscing about dwelling places or places where people congregate. On his map, there are people dancing and a building in the top right corner where he would have picnics with his family members and friends. There is his house in the top left corner, and he was popular amongst his friends for hosting impromptu parties. In his map, the circles imply family, connection, a sense of belonging. Aadi's design is more metaphorical than Farah's design because he uses scale, size, and height (e.g., the

large image of him at the center of the map); color (e.g., red signaling the Nepalese flag); and icons (e.g., notebook and pencil referring to the local public school as a hub for families). Although Aadi had a strong preference for more traditional, scripted, and tighter framing of language teaching, we witnessed a gradual shift in his interest in the body mapping activities. That is, as he produced his body map, he personalized the mapping process by focusing on music and relational aspects of his Nepalese life that he misses in Canada. As a result, Aadi sits in the top left quadrant of the dimensions of mapping figure as a learner who preferred tighter pedagogical framings, yet who gravitated to embodied activities like dancing and movement and had highly affective responses when discussing his connection to Nepal. Incorporating valued practices, preferred modalities, and a deep sense of community that he could not express in words or writing, there was a noticeable shift in his involvement and investment in the activities.

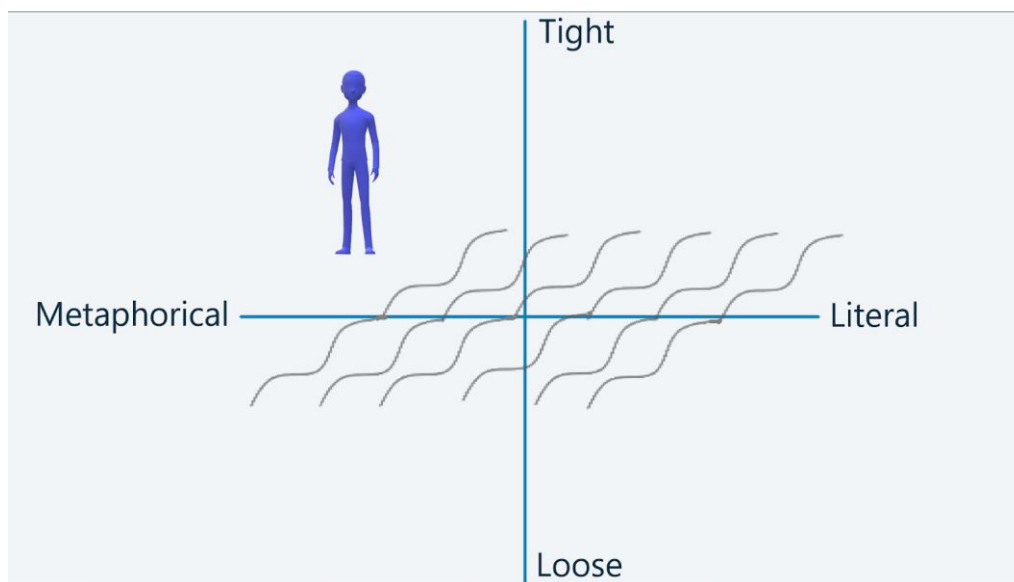


Figure 6. Aadi's map is located between the metaphorical and tight dimensions of mapping

Aadi's body map reveals efforts to territorialize by foregrounding favored parts of his culture, but his practices imply a deterritorializing or an isolation of discrete parts given prominence through size and color. Aadi's map is in the tighter section because he articulated at various points in the research a clear preference for more traditional language teaching involving rote memorization of words and writing expository essays. But, at the same time, Aadi also articulated how valuable it was to complete the body map and reflect on how much he misses his Nepalese communities of practice (Lave & Wenger, 1991). Although Aadi speaks through metaphors, within his map, there is deterritorializing with the minimal presence of symbols and metaphors and their isolation and recurrence.

Abdullah. The final case study traces the story of Abdullah, a 25-year-old university graduate from Yemen. With his mother, he fled to Canada after his activist father was forced into hiding. Abdullah had been dreaming of a life in Canada for a long time:

When I draw my body map, I made a mix about my future and my past, but I was trying to explain to everybody how I am. In the past I had friends, family, goals, and dreams. I attained my goal of finishing college, and I sat thinking how I can attain my dreams? My

dream was I wanted to go to another country...I was thinking about going to an Arabic country, because Canada is just a dream in my life. But I broke all the limits, and I insisted on going to Canada, and I attained my dream. Actually I take a long way, but I know I become happy when I reached Canada, because I wanted the make new friends, new home, and I will continue with my goals, but I will use my new language.



Figure 7. *Abdullah's body map*

Abdullah was considered the comedian in the class, often teasing his classmates, and he seldom became serious—unless he spoke of Yemen, his home country. As with the two aforementioned empirical examples, in Abdullah's body map, there are images of murders, killings, and strife outside of his home in Yemen. The Yemeni flag is on prominent display with a gradual trail—almost like footprints to Canada. Although the visual does not depict an expansive space, the map pictures three dimensions of space: 1) moving spaces; 2) shifting destinations from other Arab nations or Canada; and 3) movements to familiar spaces. In the map, there is a sense of a wide gap between Yemen and Canada and footprints between the two countries. While it is difficult to see in Figure 7, there are practices and discourses that inform Abdullah's sense of space, such as local sites or hubs, a cistern, and farmland. Abdullah's map is more complex to plot on the quadrant because there are literal elements and figurative elements. When we spoke with Abdullah about his map, he shared that, for him, true beauty is in the eyes, hence, the female with a niqab embedded within the map. This was an important moment during fieldwork because, through the mapping activity, Abdullah revealed parts of himself by describing and defending his conceptions

of beauty within our smaller group. After the conversation, he shared that he experienced trauma before leaving Yemen. In his map, the dead soldiers and the phrase “a den” located in a heart apparently depicted a hiding place near his home where Abdullah would go to hide from war and killing. The heart metaphorically mediates his feelings about the hiding spot, although he did not elaborate on this design feature. In fact, his rendering of and thinking through his map sit somewhere in the top middle of the axis (right between metaphorical and literal but closer to tighter).

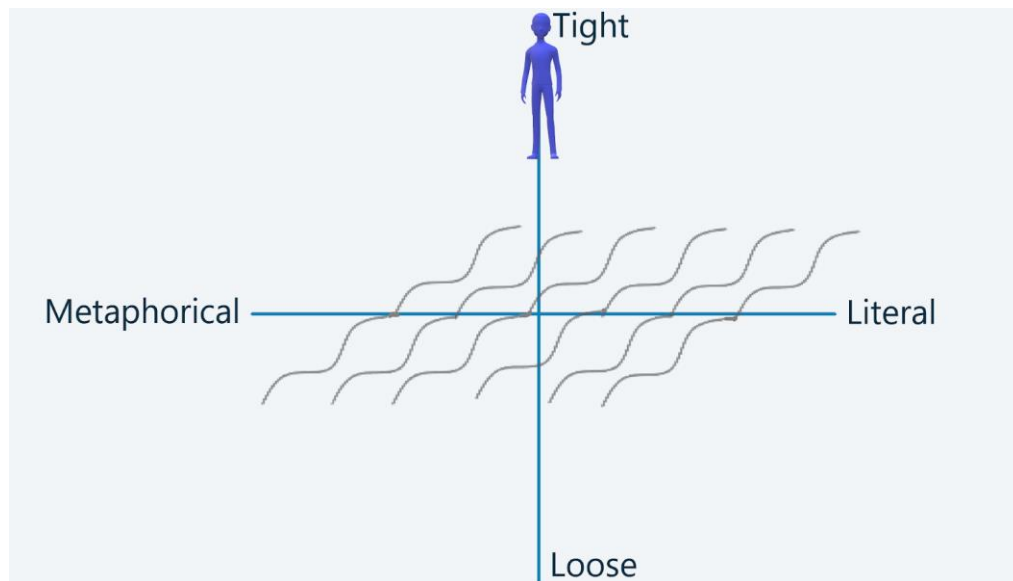


Figure 8. Abdullah’s map is situated between the metaphorical and literal dimensions

Abdullah’s map shows the processes of territorializing↔deterritorializing↔re-territorializing. He expressed changes that he had experienced during the unit and made manifest some of these changes in his body map, and it feels very much like a territorializing work-in-progress. Abdullah’s body map is neither entirely literal and deterritorialized in depicting his past life, nor is it entirely metaphorical and reterritorialized with new configurations and deconstructions of his past and future. Abdullah’s map is placed within the tighter quadrant because he said that he prefers more traditional language teaching methods that resemble teaching that he had back home, which privileged formal writing tasks. Yet, he became animated during moments of map-making that called into question his reticence.

Map-making: Mingling with Form and Experiences of Reading

We now direct our focus to mapping as a pedagogical activity situated on the tight and literal axes of the mapping dimensions, as illustrated through guided instruction (tight dimension) and diagram drawing (literal dimension). In our second case, students read a play, after which they listed their reactions to a particularly emotional and revealing scene in which a woman writes a letter to her son, disclosing that he is the prison guard who raped her while she was held captive after she murdered a politician in the Middle East. The collaborating teacher and Amélie chose this scene to generate ample opportunities for discussion in the classroom (Dutro, 2019).

As students mapped their thoughts—from moments of anticipation to reflection and comparison—they engaged in multiple instances of territorializing↔deterritorializing↔reterritorializing. For example, articulating expectations about the narrative, expressing admiration for a character’s actions, reflecting on the impact of form (e.g., stylistic devices) on affect (i.e., the overall sense and state of combined and mixed emotions, which at times cannot be named or identified), or expressing desires to complete the narrative (Lewkowich, 2016) are all processes that engaged students in territorializing↔deterritorializing↔reterritorializing. For the purposes of this article, we focus on the cases of two adolescents, Nick and Sara, by reporting on their mapped responses and considering how their meaning-making processes illustrate instances of deterritorialization↔reterritorialization.

Nick. In creating his map, Nick designed how he played, felt, thought, created, and experienced doubt and malaise, all the while establishing connections between his reading reactions. Nick’s understanding of the text was not constrained to the words on the page. Instead, his meaning-making was a complex process that merged the experiential, the material, the immaterial, the affective, and the cognitive. When charting his meaning-making, Nick engaged in coming to know parts of his reactive tendencies, a reterritorialization process acknowledging and documenting the intersecting paths, shifts, and transformations that characterize the ways of knowing in the literature classroom.

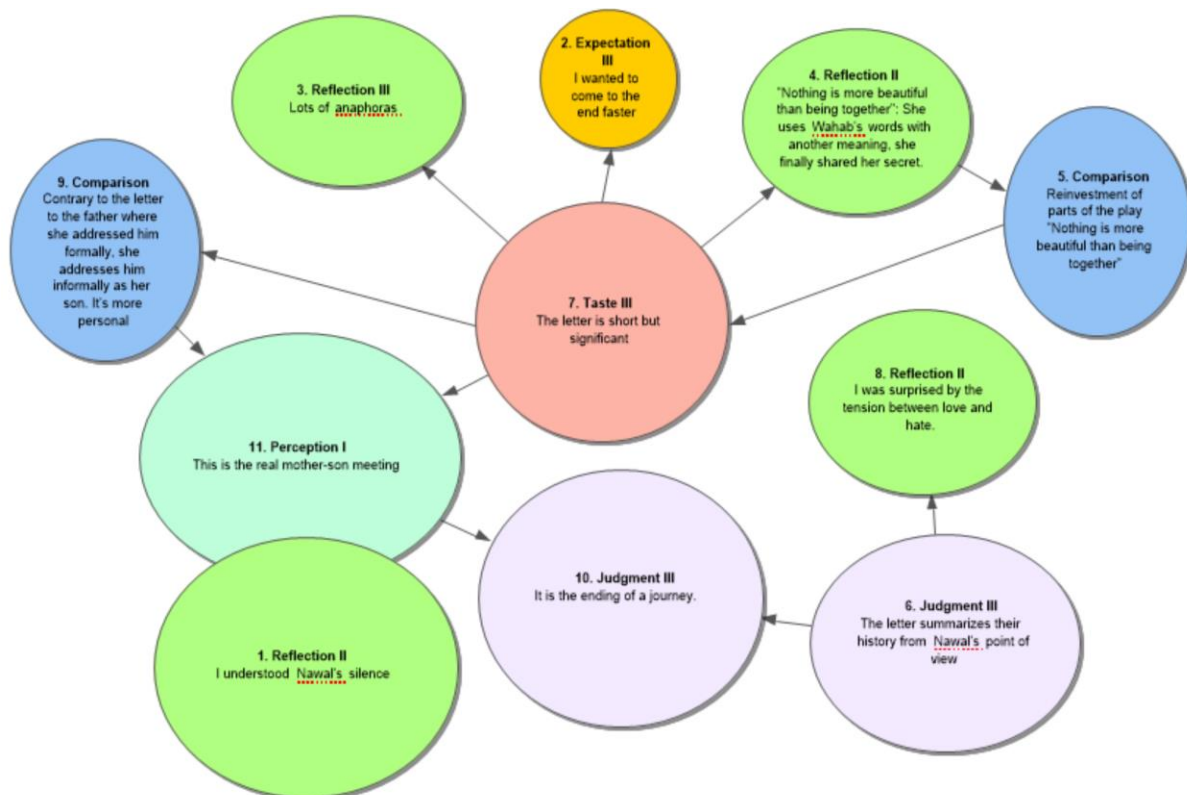


Figure 9. Nick’s map in response to *The Letter to the Son*

Nick’s map (Figure 9) and accompanying commentary were among the most detailed in this study. Nick’s experiences generated an ensemble of responses that spanned over seven categories and were drawn through eleven connected moments. His central reaction was an

observation of the text's brevity and impact: "My map gravitates towards taste, in that the letter is short, but really significant in itself." Nick's commentary points to traces of aesthetic impact (an observation of the repercussions of the author's style on the reader's affective reception of the text), insofar as he noted the incidence of form on his meaning-making.

Nick's second reaction echoes his enthusiasm in reading the text: "I absolutely wanted to finish reading that letter. I classified it in 'Expectations' because it is relative to time," pointing to a haste to finish reading the narrative, wanting to know more about the outcome, sometimes channeled as what readers may desire in their drive to end a text (Lewkowich, 2016). In his 11th reaction, Nick referred to the scene as a real encounter between mother and son. This associative thinking implies, in part, a desire to complete the narrative and a will to find coherence in the story as a form of reterritorialization.

In his first reaction, Nick explained how one of the character's silences created a lasting impact on him, as the scene triggered his empathy for the character. His statement refers to an empathetic stance and speaks to affective states while mapping his responses. His sixth response speaks to the understanding that the letter is written in the main character's voice, which impacts the affective tone of the letter and how it is received. Nick's eighth response depicted his surprise or malaise as a reader when he felt the tension between love and hate, pointing to potential malaise as a reading instance, having to come to terms with the seemingly conflicting emotions that surfaced as he read. Nick's tenth response was placed under judgment, and he maintained that the letter represented the conclusion of a quest. In reterritorializing his responses, Nick added information on the narrative based on his desire to shape his vision of the text—the conclusion of a quest—building on his reading of the scene. Nick engaged in deterritorialization before he identified and categorized again and distanced himself from his reading—he engaged with his map again by reterritorializing the connections between his moment-by-moment responses. In Figure 10, Nick's map is situated on the top right quadrant of our mapping chart between the tight and literal dimensions of the graph, pointing to how the mapping activity developed his engagement in a more guided and literal framework and with consideration for his de- and reterritorializations.

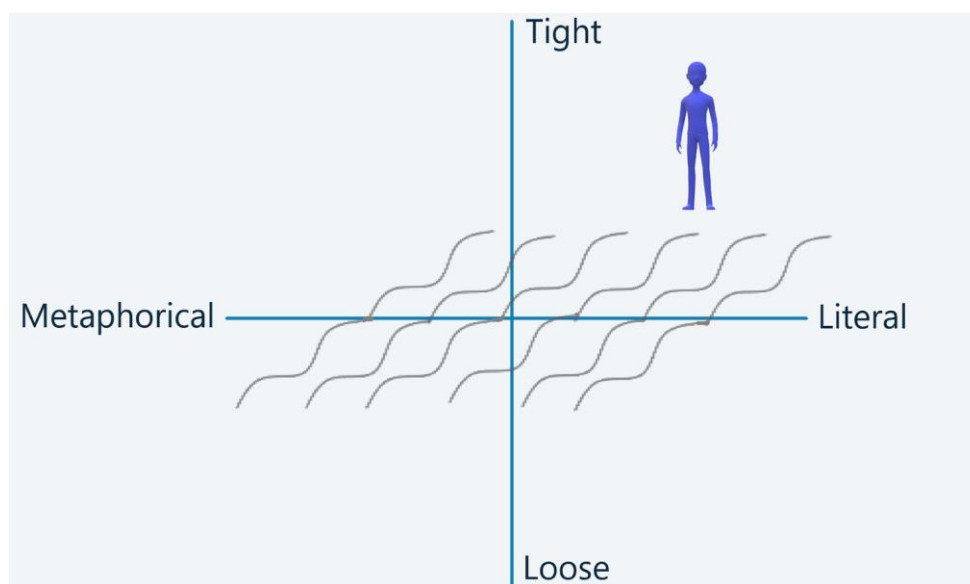


Figure 10. Nick's map is situated between the literal and tight dimensions of mapping

Sara. In her notes, Sara described herself as someone who enjoyed fiction, tinkered with texts, and appreciated having alone time to read. She expressed that mapping shed light on thoughts and feelings that were not apparent otherwise and explained that she was not used to participating in such processes of reflection. She wrote,

Drawing this map allowed me to better reflect on my reading, because I was able to reflect on my emotions, which I am not normally inclined to do when I read.... I did not realize to what extent I could have so many mixed feelings when reacting to a scene.

Accounting for a range of emotions when reading, Wender (2017) argues, is key to connective learning and engagement. Sara's awareness of the range of her emotions speaks to how she deterritorialized previous reading experiences and reterritorialized them as new territories in her map.

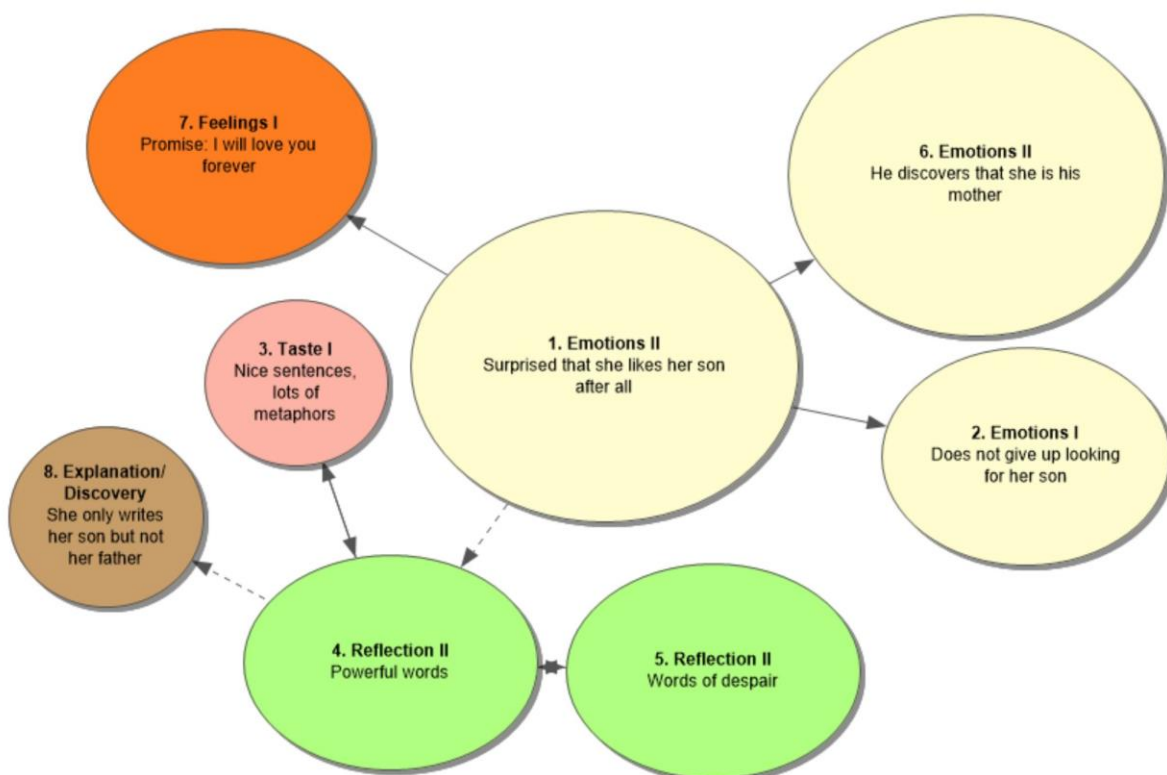


Figure 11. Sara's map in response to *The Letter to the Son*

Sara's first reaction was one of surprise—a clearly perceptible emotion:

The mother loves her son even after everything he did to her. It's the emotion that moved me the most. It was surprising to see that she had so much love for him despite his wrongdoing. So from there, I linked this reaction to all my other ones.

As Sara reflected on emotions that moved her as she was reading, her mapping exemplifies instances of territorializing affect through emotions that she linked to one another.

Sara linked her second reaction to her first (Emotions), emphasizing how the main character, Nawal, was determined to find her son as a sign of unconditional love. Sara linked the

emotion clusters to her seventh reaction, one she categorized in “Feelings”: “My seventh reaction points to the fact that she promised him she would find him.” Sara showed that mapping was an achronological and dynamic activity. Similar to Nick and other students from the larger study, relational understandings happened as students were drawing. As with any reterritorialization, the final setup could not be predicted.

Sara’s sixth reaction speaks to the scene’s paroxysm, i.e., the moment the son realized he assaulted his mother while he was a prison guard. “Then, there is the moment where the son realizes that the person he raped was his own mother. He must have felt extremely guilty to realize that given the love she had for him in writing the letter.” As with Nick, there is a sense of empathy that comes with Sara’s remark. This sense of empathy, or compassionate participation according to McGinley, Kamberelis, Welker, Kelly, and Swafford (2017), nurtures reading experiences in ways that complement them holistically. Form also has a role in these affective dimensions. Like Nick, Sara’s observation that the style influenced how she felt in that moment points to aesthetic impact: “All the reactions that are at the bottom refer to the structure and genre of the text. I feel like my fourth and fifth reactions (powerful words and words of despair) amplified all of my emotions.” The two-dimensional arrow drawn between stylistic and affective dimensions of her map reflects this affective dimension.

Reading experiences were catalyzed differently across participants through mapping. Despite points of conjunction, Nick and Sara experienced the focal scene differently: while Nick saw the letter as a meeting between mother and son, Sara saw it as a moment where “the mother distinguishes the son that she loves from the father that she hates.” These cartographies can serve as a starting point for discussion to pinpoint moments of affective engagement and situated reterritorialization of the narrative. Discussions could shed light on how individual readers received and experienced words and phrases differently. Conversations could speak to deterritorializing and reterritorializing affects, as Sara suggests, “The dashed lines represent reactions that are not directly linked to my main emotion; the link is still there but fleeting.” Making space for such conversations engage learners in considering how private affects can be made public through mapping. Sara wrote that producing her map allowed her to be aware of her feelings as part of the reading event: “The map activity allowed us to understand we could have many different emotions for the same scene. This activity also allowed us to sort of bring our emotions to light.” So in Sara’s case, there were assemblages between affective and more rational states that she charted, conveyed, and voiced through the drawn and spaces undrawn. Sara’s map is also situated in the tight-literal quadrant, in a mapping activity that deterritorializes and reterritorializes her thoughts, feelings, and dynamic utterances.

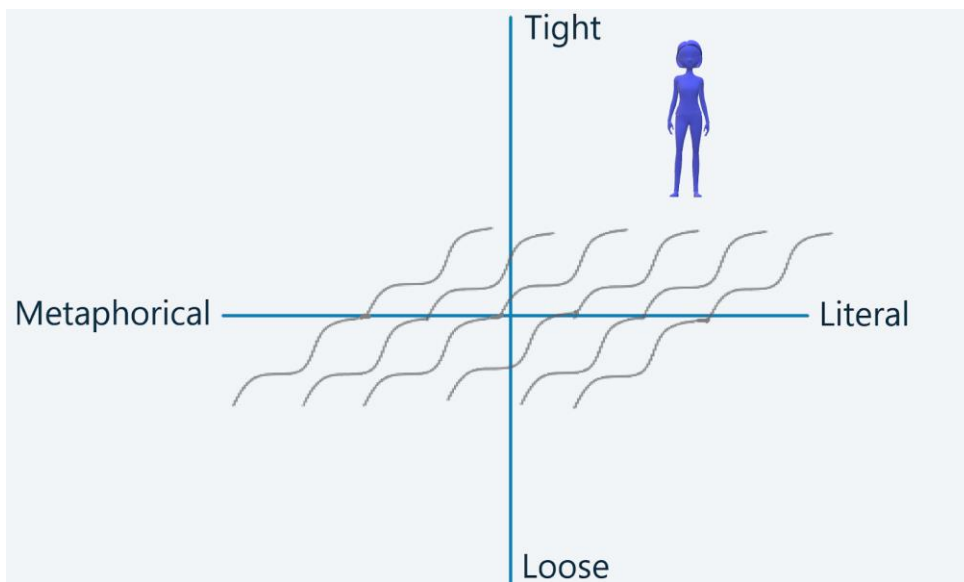


Figure 12. Sara's map is situated between the literal and tight dimensions of mapping

Students' maps provided examples where situated experiences were relational, open, and unpredictable, and these were rendered visible through progressively mapping thoughts, feelings, and reflections. Nick and Sara determined the relationships between reactions in a progressive manner, grouped, coded, and recoded their responses, and territorialized their maps that way. For example, Nick's map illustrates states of reflective unity, which developed progressively. These moments spanned across the impact of form on affect, making meaning across characters and scenes and affective states like malaise. Sara's map led to: 1) moments of affect with empathetic notes on the mother's will to find her son, and 2) the impact of form on affect, emphasizing relationships between words and metaphors.

While this mapping activity is tight (guided) and literal (categories), a closer look at the mapped responses reveals movements across the other quadrants. That is, a more structured approach to reading—when coupled with deterritorializations and reterritorializations—generated more open-ended thoughts that were looser and unguided. What is more, these shifting responses were generated and shaped by the relational and tension-filled terrains between form and affect.

Conclusion

Whether it is through the mapping of experience for Farah, Aadi, and Abdullah or the learning experiences of reading expressed by Nick and Sara, mapping invited these young people into deterritorializing↔territorializing↔reterritorializing their thoughts, ideas, feelings, and reflections. Pedagogically speaking, this exercise pushes for a call to consider mapping as a channel where students can (re)shape their conceptions of experience and learning. Mapping reveals the complex nature of learning by highlighting the interrelationships, synergistic connections, intersections, and dynamic interactions while making visible the tensions and meaningful tangents emerging out of existing territorializations.

The body mapping cases offered insights into the ways in which learners express themselves as language learners newly arrived in Canada. In creating their body maps, the meanings they associated with their drawings depicted both literal and socio-emotional shifts in

their physical movements. This territorializing process speaks to the ways that they illustrated, expressed, and talked about their experiences. We explained how maps account for learners' dynamic ways of mobilizing their literacies, thus, transcending representative end products.

Moving away from assessing objective “truths” from texts and moving towards addressing more affective and nonlinear ways of knowing, we suggest that mapping has the potential to discover connection and allow for the surfacing of feelings, thoughts, memories, and experiences often hidden in pedagogy. Mapping allows students, such as Farah, Aadi, Abdullah, Nick, and Sara, to embrace typologies of “being/knowing/doing” (Kuby & Rowsell, 2017, p. 1) in deterritorializing and reterritorializing paths of meaning-making.

We draw useful pedagogical and research conclusions from the coordinate plane framework we offer in this article. By providing an analytic rhizomatic tight-loose-literal-metaphorical axis framework to look at mapping literacy futures, the coordinate plane framework helped situate the ways in which rhizomatic and affective-laden analyses are helpful in understanding immigrant language learners' lives (Burgess & Rowsell, 2020; Waterhouse & Arnott, 2016) and how mapping provides sense-oriented insights into emotions, feelings, hesitations, imagination, reflections, discoveries, and so on—dimensions that otherwise remain fleeting and often unexplored (Lemieux, 2015, 2020; White & Lemieux, 2017). A coordinate plane framework may also incite map-makers—whether researchers or participants—to articulate the inchoate when prompted to do so, which in turn can illuminate pathways for meaning-making as part of literacy futures. Finally, situating maps within an analytic coordinate plane framework provides a process of determining where affective flows take place, within the map itself and outside of it, taking into consideration how matter comes to matter and what affective forces were mobilized in-the-moment and how they can be mobilized again through a dynamic relational framework.

Notes

1. The funded research study here is a smaller study within a Social Sciences and Humanities Research Council (SSHRC) Partnership Grant (grant number 895-2016-1008) entitled, *Word in the World*. Professor Gary Libben is the Principal Investigator and Jennifer Rowsell is a Collaborator.
2. This classroom-based research study is funded by a three-year Social Sciences and Humanities Research Council (SSHRC) Joseph-Armand Bombardier Canada Graduate Scholarship Grant (grant number 767-2014-1541) entitled, *Engaging Adolescents in Reading*, and led by Amélie Lemieux.

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An Invitation

Boni Wozolek

JCT Cultural Studies & Curriculum Section Editor

The Cultural Studies and Curriculum section of *JCT* welcomes manuscripts that address the intersection of two fields: “cultural studies” and “curriculum.” Cultural studies is an interdisciplinary field of research and teaching that investigates the ways that “culture” creates, transforms, and reinforces social relations—and the structures of power that are central to them—through every day experiences and interactions. Braiding fields like cultural anthropology, sociology, economics, history, gender studies, sexuality studies, and race studies, to name a few, cultural studies draws on methods and theories across fields to address sociopolitical and cultural questions that are resonant in contemporary societies and their associated popular cultures. Building on Stuart Hall’s (1981) argument that popular culture can be sites of “consent and resistance” (p. 239), this section seeks manuscripts that use the multiplicity of cultural studies as it intersects with questions of curricula and curriculum theorizing. Therefore, this section is as much about the field of cultural studies as it is about how popular culture creates curriculum that impacts educational spaces and places, both in and outside of schools and systems of schooling. Authors are urged to send manuscripts that not only advance the intersection of curriculum studies and cultural studies, but to submit work that attends to the fields in their historical and contemporary iterations in ways that commit to social justice in both their arguments and citations. Authors should consider questions such as: What is learned through popular culture as it relates to educational spaces and places? Using curriculum theory, what are the cultural politics of language and communication? What curricula are found in the history and contemporary iterations of media/technology? How might curriculum studies reflect on the cultural traditions of and across industries? What systems of power are learned or reinforced across forms of media and/or consumer culture?

Hall, S. (1981). Notes on deconstructing the popular. In R. Samuel (Ed.), *People’s history and socialist theory* (pp. 227–240). London, UK: Routledge and Kegan Paul.

