

IDEOLOGICAL MISALIGNMENT IN THE DISCOURSE(S) OF HIGHER
EDUCATION: COMPARING UNIVERSITY MISSION STATEMENTS WITH TEXTS
FROM COMMERCIAL LEARNING ANALYTICS PROVIDERS

by

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DEDICATION

To my wife, Amy, who always knew when to tell me to “go write!” and when I should take a night off to watch bad movies with her.

To the memory of my dad, who after hearing a long and convoluted explanation of my dissertation topic, just nodded and said, “yeah, I get it” which I found encouraging. His subversiveness and his concern for other people no doubt inspired my own interests in critical theory and public service.

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ABSTRACT

This study analyzes, interprets, and compares texts from different educational discourses. Using the Critical Discourse Analysis method, I reveal how texts from university mission statements and from commercial learning analytics providers communicate and construct different ideologies. To support this analysis, I explore literature strands related to public higher education in America and the emerging field of study and practice called *learning analytics*. Learning analytics is the administrative, research, and instructional use of large sets of digital data that are associated with and generated by students. The data in question may be generated by incidental online activity, and it may be correlated with a host of other data related to student demographics or academic performance. The intention behind educational data systems is to find ways to use data to “optimize” instructional materials and practices by tailoring them to perceived student needs and behaviors, and to trigger “interventions” ranging from warning messages to prescribed courses of study. The use of data in this way raises questions about how such practices relate to the goals and ideals of higher education, especially as these data systems employ similar theories and techniques as those used by corporate juggernauts such as Facebook and Google. Questions not only related to privacy and ownership but also related to how learning, education, and the purpose of higher education are characterized, discussed, and defined in various discourses are explored in this study.

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CHAPTER ONE: INTRODUCTION TO THE STUDY

This study critically analyzes texts produced by two different types of institutions. Both institutions are associated with education. Higher education institutions declare their mission and purpose on their websites. Commercial technology providers advertise what their products or services, ostensibly for achieving this mission and purpose, are able to accomplish. Both types of texts are subjunctive and optimistic. Where university mission statements paint a particular vision of higher education and its purpose that is diverse, pluralistic, and global in its reach, the imagery and ideology evoked by technology companies is markedly different as it suggests a systematic approach to continuously shaping and directing students toward individualistic ends.

Different Views about Higher Education

The “university” has existed as a form of institution for a thousand years (Van Patten, 2009). In cases such as the University of Bologna or the University of Oxford, the very first universities in the world are still in existence today (Van Patten, 2009). Throughout history, universities have struggled with being both insulated from and influenced by economic and political factors (Cheit, 1975; Good, 1959; Whitehead, 1967; Van Patten, 2009). Universities have provided value and service to the public, yet they have upheld a commitment to *freedom*, in various definitions and for various internal constituents.

The concept of “liberal education” or “liberal arts” has been a cornerstone of American higher education since pre-colonial times (Cheit, 1975; Hansen, 2012; Thelin,

2004). Liberal curriculum in American education consists of the study of traditional or general subject areas in the sciences and humanities which prepare students for, among other things, a life of “civic engagement” (Colby, Ehrlich, Beaumont, & Stephens, 2003; Hansen, 2012). Liberal education, particularly the kind that is provided by public universities, does more than simply prepare people for future employment. To illustrate the additional value of higher education institutions, Keri Facer (2011) describes them as “the most important institutions we have to help us build a democratic conversation about the future” (p. 28). Facer (2011) further argues that higher education institutions are spaces that allow diverse groups of people to address modern challenges like intergenerational differences, environmental crises, and globalization. In a similar vein, Jennifer Washburn (2005) advocates for a public higher education that encourages “creative problem solving” and one that focuses on the education of “well-rounded citizens” (p. xix). These views that higher education supports democratic ideals or “well-rounded citizens” are different from the views that focus exclusively on higher education’s graduate employment rates or other economic metrics; in other words, Facer (2011) and Washburn (2005) frame higher education as a *public good* rather than something that only supports private or individualistic pursuits.

A person’s attitude toward higher education will inform how that person understands and articulates conceptions of higher education’s purpose. These conceptions will differ depending upon whether someone is a student currently attending a college or university, a president or top administrator at an institution of higher education, a member of the community who may or may not have attended an institution of higher education, a local business owner, a politician, or someone who works for a technology

company. The expressions and articulations of different viewpoints about higher education reflect interests, biases, values, beliefs and ideologies (Gee, 2012; Fairclough, 2003). Some may assert that the primary purpose of higher education is to train skilled workers for future careers (e.g., Lonsdale and Bush, 2017); others may focus on accountability measures like enrollment and graduation rates (Ackoff & Greenberg, 2008); and some argue that higher education institutions provide spaces for free and open discussions and for researching a range of topics that are unaffected by private industry or governmental control (e.g., Washburn, 2005). Each of these viewpoints, as they are expressed in texts and in speech acts, are representative of certain “discourses,” or ways of communicating, generating, reinforcing, and influencing the opinions, beliefs, values, practices, and interactions of different social groups through language (Wodak & Meyer, 2001).

Today, university’s use mission statements to encompass the broad range of programs and stakeholders they serve (Kerr, 2001; Morpew & Hartley, 2006). Contained in these mission statements are signifiers of historical movements that have left indelible marks on the structures and characteristics of modern universities. Higher education now exists in a world where digital information is produced, shared, and commoditized in new ways. The ubiquity and convenience of accessing online content through a range of devices and in a range of settings (from the smartphone in your pocket to the smart speaker in your home) are adding new textures to arguments and viewpoints about educational purpose and value.

As questions about the nature of knowledge, the role of technology in education, and the purpose of education are being recontextualized in an increasingly technology-

saturated world, many education researchers are exploring the educational potential of “big data” and new technology-enhanced methods of analyzing human behavior. In some cases, researchers and developers will automate personalized content or feedback and interventions (similar to how Facebook, Google, and Amazon use data to create personalized experiences and advertisements for users of their platforms). Collectively, such research in education is known as “learning analytics.”

Learning analytics involves the use of digital data to help solve educational “problems” such as suboptimal student performance or low course or program completion rates (Long & Siemens, 2011). A widely cited definition of learning analytics states that it is “the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs” (Long & Siemens, 2011, p. 34). The types of data available to educational officials as well as to students themselves are generated automatically through students’ online interactions combined with other records that are available to the institution. Activity such as mouse clicks or time spent on a web page are recorded, analyzed, and used in various ways to tailor online instruction and to “optimize” student behavior (Cope & Kalanzis, 2015; Long & Siemens, 2011). These analysis techniques are borrowed from adjacent field of “web analytics” which admits that behaviorism is the conceptual basis on which it is founded (Jansen, 2009). Behaviorism is similarly cited as the theoretical progenitor of learning analytics methods used by companies such as Dreambox (n.d.). In this vein, the goal of learning analytics is to understand student *behavior* (sometimes referred to in contemporary research literature as the “learning process”) as it observed in digital trace data. It has the additional goal of

influencing or changing the behavior of students through things like automated “interventions” (Bainbridge, Melitski, Zahradnik, Lauría, Jayaprakash, & Baron, 2015; Pistilli & Arnold, 2010; Pistilli, Willis, & Campbell, 2014; Smith, 2016; Wise, 2014). One defining characteristic of learning analytics is that it uses large sets of data, colloquially known as “big data,” to analyze, manage, and improve educational activities from the academic performance of individual students to the overall performance of entire institutions (Long & Siemens, 2011; Pardo & Siemens, 2014). The concept of learning analytics is particularly important because it has garnered much interest from education researchers, technologists, and administrators (Buckingham-Shum & Ferguson, 2012). Corporate entities have also entered the conversation with their own pre-conceptions of what education is as well as assumptions about how to improve it (Williamson, 2017).

Commercial entities and even some education researchers propose goals and solutions that may or may not align with the goals and purposes of higher education institutions. Why these differences exist and how they came to be are revealed in certain texts associated with each entity.

Research Problem

The need for higher education to fulfil multiple purposes in practical skills, professional studies, research, and liberal education, and the question of whether education is or should support individualistic or communal interests have been topics of discussion and debate throughout history (Cheit, 1975; Lagemann, 2000; Thelin, 2004). The fact that there are different viewpoints about higher education is not necessarily nor inherently problematic by itself. It is where these different viewpoints both reflect and

reproduce socio-cultural structures, assumptions, and beliefs that new problems and questions will arise.

The very concept of learning analytics contains ideological assumptions. It is founded on approaches to education research that utilize scientific methods of inquiry and behaviorist approaches to understanding, studying, and manipulating human activity. The predominance of these inductive, deductive, and *reductive* methods in education research arose around the beginning of the twentieth century and continues to influence all aspects of the field of education (Lagemann, 2000). Today, learning analytics practitioners advocate for outcomes such as increased rates of efficiency in student learning, increased speed at which courses are completed, and increased number of degrees conferred by institutions (Pistilli et al, 2014). In contrast, some scholars are critical of purely positivistic education research because it reduces complex phenomena (like educational activities, and people) to detached and generalized data models (e.g., Carr, 1995; Lagemann, 2000). Those who object to pure positivism argue that human activities are irreducibly complex and cannot be fully explained by any externally observable or generalizable metrics (Frankish & Ramsey, 2012). Further, critics of positivist research in education raise the issue that a focus on performance outcomes and efficiency measures often exists independent from any moral or even rational justification (Creswell, 2013; Frankish & Ramsey, 2012). Meanwhile, educational aims are often articulated by higher education institutions in ways that are difficult if not impossible to achieve by any formulaic or procedural means. These stated aims include things like service to the community, civic engagement, and preparing students to “change the world!” (Morphew & Hartley, 2006). These aspirations are not only difficult to measure,

but they also introduce nuance and complexity related to the breadth and ambiguity of concepts like “service” or “civility.” Statements about educational mission and purpose are declarative and presuppose ideologies. Explaining and interpreting the presuppositions, ideologies, and declarations reveals the sources, powers, histories, and agendas behind the texts (Foucault, 1970).

Theoretical Framework

Critical Discourse Analysis holds the theoretical position that human perceptions of reality are “built” or constructed (and reconstructed) by social groups, through language and representation (Gee, 2012; Machin & Mayr, 2012; Parker, 1999) and that language communicates ideologies (van Dijk, 1998; Fairclough, 2003). Ideology is the set of beliefs that underpin the activities of a social group (van Dijk, 1998). When ideologies become dominant, are entrenched in a society or culture as taken-for-granted facts about the world, or when ideologies are framed as self-evident or universal, they may be considered “hegemonic” (Fairclough, 2003). Ideological hegemony can be especially problematic if the dominant viewpoint is based on and/or perpetuates beliefs and practices that are harmful or oppressive (Horkheimer, 1972). Critical approaches to research explore historical influences on how concepts and practices are reproduced by social groups and whether and how these reproductions exploit people or benefit powerful interests. Many of these sociological concepts were articulated by members of the Frankfurt Institute for Social Research in Germany (Bronner, 2002).

In the 1930’s at Goethe University in Frankfurt, Germany, a group of social researchers referred to as the “Frankfurt School” established early forms of critical theory as a means for understanding historical and political structures with the goal of advancing

progressive social change (Bronner, 2002). Max Horkheimer was considered to be part of the first generation of Frankfurt scholars; he served as the Director of the Institute's more formal program, the Institute for Social Research, during the school's formative years (Bronner, 2002). Horkheimer articulated powerful critiques of scientific methodology and positivist approaches to certain types of research--or what he and other Frankfurt scholars referred to as "instrumental reason" --as lacking personal, ethical, or humanistic dimensions when applied to researching social phenomena (Buchanan, 2010). Using the phrases "instrumental reason" or "instrumental rationalism" these scholars elaborated on Weber's (1949) concept of "instrumentalism" as a term to describe bureaucratic processes or the mechanisms and means by which increases in efficiency and automation become self-justifying and seemingly impenetrable to critique.

Karl Marx' and Friedrich Engels' (1848/2008) dialectical materialism considers history in economic terms related to class struggles and power dynamics associated with how goods and services are produced, distributed, and consumed. Frankfurt scholars extended these Marxist concepts to consider *technology* and *science* as examples of concepts or ideological domains which are presented as neutral or objective, but which in reality may represent both structures of and motivations for control and manipulation (Horkheimer, 1972). According to the Frankfurt scholars, particularly Horkheimer and Habermas, the tendency to view scientific knowledge as "axiomatic," or self-evident, leads to what they called "reification" or a form of objectification that relegates human subjects, even human knowledge, to instrumental or purely mechanistic properties (Habermas & Seidman, 1989; Horkheimer, 1972). Reification refers not only to the objectification of human subjects (treating people like objects or cogs in a machine) but

also to the externalization and elevation of certain types of knowledge domains (natural laws, for example) to appear as timeless and absolute as opposed to concepts that were invented by humans as ways to interpret and describe empirical phenomena. These concerns led critical theorists to challenge what they felt were reductionist research methods being applied to human behavior and human consciousness (Horkheimer, 1972). Habermas and Horkheimer developed an epistemological perspective that situates much human and social activity as beyond the scope of scientific (instrumental) rationalization and a perspective that problematizes science and technology as worthy of careful ethical and sociological scrutiny (Habermas & Seidman, 1989; Horkheimer, 1972). This notion is succinctly summed by Norm Friesen (2009) who writes that “critical theory singles out for criticism and critique one particular kind of knowledge: knowledge that presents itself as certain, final, and beyond human interests” (p. 174).

Critical Discourse Analysis (CDA) applies the humanistic advocacy frame of critical theory to the analysis of language in order to elucidate patterns of power and objectification (Fairclough, 1989, 2003; Rogers, Malancharuvil-Berkes, Mosley, Hui, & Joseph, 2005; van Dijk, 1995). CDA posits that language will often contain examples of social control, biases, and contradictions which are used to either overtly or covertly perpetuate some imbalance of power or some perspective that is oppressive or objectifying (van Dijk, 1995). Where politicians and advertisers use language and rhetoric to persuade, impress, and convince readers, the critical scholar asks questions to reveal inconsistencies, contradictions, and opportunism (Fairclough, 1995). On a fundamental level, this technique of dismantling a rhetorical argument is at least as old as Socrates and the Socratic method (Nussbaum, 1997). Critical scholars acknowledge this

lineage as the method is grounded in philosophy as much as it is influenced by more recent disciplines of sociology, psychology, and rhetoric.

Significance

The promise and optimism associated with emerging techniques for improving learning and education with data should be critically analyzed. As Karl Popper states in his preface to the 1959 edition of *The Logic of Scientific Discovery*, “. . . whenever we propose a solution to a problem, we ought to try as hard as we can to overthrow our solution, rather than defend it” (p. 16). Concerns about data in education tend to focus on privacy, ownership, and the potential for discrimination (Rubel & Jones, 2016; Scholes, 2016). These concerns are presented in a way that is resigned to the inevitability of “big data” in education rather than trying to “overthrow” it.

Private companies have economic and social capital in the field of educational technology and in the realm of education in general (Williamson, 2017). It is important to consider what private companies are communicating about public higher education. It is also important to consider what higher education institutions say about themselves with regard to their stated aims and aspirations. The methodology used in this study is Critical Discourse Analysis. Theory, research, and practice are influenced by "discourses" or language-in-use (Gee, 2011). The words that are chosen or omitted in a text often belie some hidden (or overt) agenda, ideology, or external influence (Gee, 2011; Fairclough, 2003; Wodak & Mayr, 2016).

Research Question

This research considers the following question: What ideological assumptions about the purpose of higher education are advanced by commercial learning analytics providers as compared to those advanced by American public universities?

Supporting sub-questions are:

1. How are signs and significance represented in texts from each organization (Gee, 2011, 2012)?
2. How are activities and identities represented in each text (Gee, 2011, 2012)?
3. How are politics and connections implied by the use and configuration of language in the texts (Gee, 2011, 2012; Fairclough, 1995, 2003)?

The first and main research question allows for an interpretive analysis to reveal characteristics of structure and meaning that are both explicitly stated and covertly implied by texts from each organization. The characteristics of claims and presuppositions contained in each text will be examined. Broader topics that are developed in Chapters 4 and 5 address the ideological assumptions and social, political, or economic structures that are invoked by them. In Chapter 2, I describe the evolution of American higher education from colonial colleges to large universities. In these stages of evolution, American higher education drew inspiration from European universities. In the early 20th Century, advances in science and private industry also had significant impacts on the structure of American universities. And in the latter half of the 20th Century, changes in societal attitudes about equality and inclusivity changed both the demographic of students who attended college, as well as the missions of universities.

Indeed, the 20th Century was a pivotal time for education research. Advances in psychology and technology intertwined as new devices for instruction were invented to improve learning and reduce inefficiency in education. These devices spanned from early mechanical testing machines to computer programs with branching logic that were designed to try to replicate or replace human tutors. Learning analytics research contains echoes of the theoretical paradigms that influenced the goals and assumptions of such 20th Century programs and devices.

Chapter 3 explains how Critical Discourse Analysis is carried out in this study. Texts contain meaning. A phased approach to analyzing words and phrases, people and actions, and politics and connections does two things: it shows how social reality and beliefs are “built” by language, and it reduces researcher bias in the explanation and interpretation of what is being built in each text.

CHAPTER TWO: LITERATURE REVIEW

Introduction and Organization

Like this study as a whole, this literature review focuses principally on the dual topics of educational data systems (like learning analytics) and the purpose of American public higher education. As Gee (2012) writes, “all discourses are the products of history” (p. 159). There are parallels and intersections between the history of higher education and the history of educational technology. I will discuss the purposes of public universities in the United States as articulated in historical sources, books and articles about the history of education and different viewpoints on education, and sources (such as popular books or websites) which represent popular discussions and debates about higher education. I will situate some of the different viewpoints within educational frameworks and taxonomies that attempt to categorize the goals and benefits of education as either public or private, social or economic, and along political spectra like liberal or conservative. As I trace the historical origins of American higher education from colonial colleges through eras of growth and expansion of public universities to today’s diverse and dynamic higher education landscape, I identify models and historical events that significantly influenced the trajectory of American higher education. I then discuss some of the modern trends related to the management and measurement of higher education institutions, the shifts in student demographics, and current debates around higher education reform.

In the section about learning analytics and educational data systems I first review various definitions of learning analytics as they appear in the literature. Then, I discuss some typical applications and notable examples of learning analytics initiatives. These provide context for how learning analytics are popularly understood and applied. Next, I discuss how learning analytics was established as a “discipline” by its own proponents. Following this coverage of learning analytics, I provide summary descriptions of terms that are adjacently related to learning analytics. These terms and concepts often appear in the descriptions and definitions of learning analytics. I then widen my discussion of learning analytics and related terms to identify and discuss the precursors and parallels to learning analytics that exist historically and in adjacent fields of study. I explore historical foundations and related areas of research and innovation that preceded or influenced current conceptions of learning analytics such as teaching machines, programmed instruction, and artificial. I draw connections between conceptions of education as advanced by learning analytics practitioners and the types of managerialist and behaviorist theories that emerged in the beginning of the 20th Century. I review the literature that offers critical perspectives to a certain orientation towards scientific education research in a broad sense as well as criticisms to learning analytics more specifically. Lastly this section contains a brief sample of literature that criticizes “big data” and machine learning applications beyond educational contexts.

A Brief History of American Higher Education

Although each university will differ in its precise history and makeup, there are common elements among college and universities in the United States. These common characteristics exist because there are shared historical and cultural influences that have shaped each institution (DiMaggio & Powell, 1983). Some of these values, practices, and traditions and how they came to be are explored in this section. I focus on major milestones as well as public sentiments that influenced changes in the activities and structures of higher education institutions. For instance, European models of colleges and universities, particularly those found in England and Germany, have strongly influenced the American model of higher education. Kerr (2001) somewhat facetiously summarizes the integration of continental Europe's influence with America's own commitment to the public good:

A university anywhere can aim no higher than to be as British as possible for the sake of the undergraduates, as German as possible for the sake of the graduates and the research personnel, as American as possible for the sake of the public at large—and as confused as possible for the sake of the preservation of the whole uneasy balance. (p. 14)

As America borrowed its models of higher education from Europe, so too did American institutions inherit the recurring tensions surrounding the notions of freedom and “effectiveness” in education that have appeared throughout the history of higher education in both continents (Cheit, 1975). Tensions associated with the purpose and practice of higher education were pronounced throughout the 20th Century as various

waves of cultural amalgamation occurred alongside new theories of learning and of the mind. These tensions persist today.

Formal education in the global West has existed for thousands of years with documented accounts of early Egyptian, Greek, and Roman institutions devoted to education (Van Patten, 2009). *Universities* have existed in the global West for nearly a thousand years with the University of Paris (previously the Cathedral School of Notre Dame) in France, the University of Bologna in Italy, and Oxford University in England being established in the 11th Century (Van Patten, 2009). These ancient institutions were quite different from modern colleges and universities, but some of the values of universities have persisted through the ages: to provide free and open public access to knowledge and information, and to protect and insulate the nature and scope of academic pursuits as independent from religious or political (or other) oversight. These principles of *access* and *freedom* in higher education can be traced to the *Authentica Habita*, a decree issued by the Holy Roman Emperor Frederick Barbarossa which offered protections and immunities related to travel and research for legal scholars studying at the University of Bologna (Wickham & Di Palma, 2019). 19th Century education scholar Simon Laurie, in an 1886 survey of the history of higher education, noted as three common characteristics of early (medieval) universities: that they were “open to all; that there [was] free teaching and free learning; that [they were] free autonomous organization[s] of teachers and scholars” (p. 172). While many pre-medieval educational institutions were affiliated with religious institutions, the goal of the early universities was, according to Laurie (1886), to provide a curriculum that was “free from the canonical or monastic obligations and control” (p. 174). These early institutions provided

opportunities for citizens to attend public lectures on topics like philosophy, history, and literature (Laurie, 1886; Woodward, 1906). The institutions also developed alongside major changes in how local governments were structured, as new forms of municipal leadership were, like the universities, attempting to declare their independence from traditional “oligarchic plutocracies” and the dominating influence of the Christian establishment:

In the eleventh century the towns in Italy and France were reviving or initiating their municipal constituents, and seeking and obtaining charters which gave the right of free popular government, and independence of feudal and episcopal interference. (Laurie, 1886, p. 17)

The desire (and difficulty) to keep church, state, and higher education separate is a theme throughout higher education’s history; and this separation was often hard to realize as there were varying degrees of influence and interdependence among the different social organizations (Pasque, 2014; Washburn, 2005). Tensions from the competing efforts to be at once independent and *interdependent* were evident even as higher education institutions were being established in colonial America.

Colonial Higher Education

American higher education formally began when British colonists established Harvard in 1636. William and Mary, Yale, and others were soon to follow. These early colonial schools were modeled after Oxford and Cambridge in England (Spring, 2005; Thelin, 2004; Van Patten, 2009). These schools emulated the “OxCam” model of living and learning communities where students and scholars mingled on quads and studied together (Thelin, 2004). The colonial schools deviated in some ways; for instance, their

geographical placement and architectural styles represented “openness” as they were often built in rural or pastoral settings away from the main city or town center; and in the case of William and Mary, the “quad” only had three sides in order to signify a kind of metaphorical doorway that was open to the citizens of Williamsburg (Turner, 1984).

Another difference between the Oxford-Cambridge model and that of American colonial model higher education was how the institutions were governed. The early American colonists felt that Oxford and Cambridge granted too much autonomy to faculty members; to curb this, the American solution was to establish independent boards that would provide oversight and administrative authority for educational institutions (Thelin, 2004). These boards worked alongside presidents or chancellors (who were given more power than their British counterparts) to manage all aspects of the institutions (Thelin, 2004). Representing an early example of how American higher education and American business are intertwined, Harvard College was the very first corporation in colonial America (Thelin, 2004; Van Patten, 2009). A century later, Dartmouth also filed for status as a corporation. Dartmouth status as a corporation was the subject of an 1819 U.S. Supreme Court case which confirmed the validity of the school’s private charter, setting precedent for more private educational institutions, as well as private corporations in general, to be established in the 19th Century (Spring, 2005; Van Patten, 2009). The notions of “freedom” and “disinterestedness” had extended, and to some degree shifted, from individual faculty and researchers to corporate entities and governance structures in American higher education.

In early colonial America, college and university leaders were not concerned about the number of degrees they conferred, nor, for that matter, were state or

government officials concerned too much about accountability or measuring the economic output of higher education institutions (Thelin, 2004). After attending college for some variable length of time, young men (typically from wealthy families) would serve in apprenticeships to learn their specific professions (Thelin, 2004). The purpose and value of the colonial American college experience was exclusive, esoteric, and self-evident to its aristocratic beneficiaries. Whether these values were also evident to the “general public” was not a matter of consequence at the time.

As early America gained its independence from Britain, idealism about democracy and the public good, and higher education’s central role in advancing them, began to make its way into policy and law. In 1785 the University of Georgia was chartered by the Georgia State legislature (Thelin, 2004). Four years later, in 1789, the University of North Carolina at Chapel Hill was chartered by North Carolina’s General Assembly (Thelin, 2004). These are considered to be the first public, state supported Universities in the United States. The creation of these public universities occurred at a time when U.S. leaders promoted the benefit of education for the citizenry. Thomas Jefferson (1787), who was a member of congress at the time, argued that education for the “whole mass of the people” was the path to a participatory democracy.

Expanding Education for an Expanding Nation

The further establishment of American *public* schools, including state universities, coincided with the expansion of American land holdings throughout the newly established United States in the late 18th Century. The Northwest Ordinance of 1787 and the later Morrill Act of 1862 each codified in federal documents both the value and the purpose of public education institutions according to government leaders in their

respective time. The Northwest Ordinance of 1787 facilitated the creation of new states beyond the original thirteen colonies, and the Ordinance included language about the value of education. Article three of the Northwest Ordinance of 1787 states that, “Religion, morality and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged,” and an edited version approved by the United States Congress in 1789 amended that “*Institutions for the promotion of religion and morality and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged and all persons while young shall be taught some useful occupation* [emphasis added to show the additions to the edited version].” The Morrill Act of 1862 (and the revised Morrill Act of 1890 which guaranteed additional funding) was also instrumental in the expansion of new public colleges and universities as the Act guaranteed funding while articulating goals for these new educational institutions:

The leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life.

Multiple educational aims and interests are put forth in this legislation. A key phrase in the Morrill act is that state-funded higher education institutions should “promote the **liberal and practical** education [emphasis added].” The passing of the Northwest Ordinance and the Morrill Act played an important role in the expansion of both public schools and public universities as settlers were encouraged to populate the American west

and take advantage of public education (Van Patten, 2009; Cheit, 1975). These federal documents highlighted the dual aims of education to provide both moral development and the acquisition of “useful” skills.

Specialized colleges (and some universities) began calling themselves “liberal arts” institutions in the 1700’s (Thelin, 2004). These liberal arts colleges focused on “classical” studies such as Latin and rhetoric, but they also incorporated studies in the “new” natural sciences (Hansen, 2012; Hirt, 2009). As public universities were formed in the late 1700’s they too included the liberal arts as part of their curriculum (Spring, 2005; Thelin, 2004). In the late 1700’s and early 1800’s there was a proliferation of religious institutions -- typically those affiliated with some denomination of Christianity -- that were established through large private endowments (Spring, 2005). The overabundance (and questionable quality and rigor) of privately endowed religious institutions contributed to what some perceived as a decline in the quality of American higher education in the late 1800’s (Hofstadter, 1963; Spring, 2005). This public skepticism would set the stage for the (re)establishment of “high quality” American public universities toward the end of the 19th Century.

The AAU and the German Model of Higher Education

The formation of the Association of American Universities (AAU) in 1900 was a significant milestone in the history of higher education in the United States (Geiger, 1986; Thelin, 2004). The creation of this association was necessitated in part by the proliferation of higher education in the U.S., the questionable quality of American higher education institutions, and by a sense of competition with European higher education institutions. European institutions were, around the turn of the 20th century, seen by

American college and university leaders as more prestigious than their American counterparts and therefore a threat to the integrity of American educational institutions:

Weighing on their minds were three things: that the lack of consistency and standards in American higher education was hurting the reputations of the stronger institutions, that U.S. students were going to Europe to earn graduate degrees rather than staying home to attend U.S. institutions, and that European universities had little respect for U.S. academic degrees and, in some cases, were "dumbing down" graduate programs for American students. (Association of American Universities, 2018)

There is evidence that the founders of the AAU were influenced by higher education institutions in Germany in particular (Ash, 1997; Geiger, 1986). Each of the university presidents who were instrumental in founding the AAU "either studied in Germany or cited the German university as a model" (Menand, Reitter, & Wellmon, 2017, p. 2). The German model that inspired the formation of the AAU was established in the early 19th Century as post-enlightenment notions of freedom, democracy, and methodical approaches to understanding the natural world were part of the intellectual Zeitgeist in Europe (Menand et al, 2017). These attitudes toward knowledge and the human spirit inspired renewed interest in higher education and its role in society. Among the Europeans who helped rejuvenate and transform higher education is Wilhelm von Humboldt who is considered to be perhaps the most significant figure in the establishment of the "German university model" that would serve as a mold for the rest of the western world (Menand et al, 2017). Humboldt, a Prussian state official, was charged with reimagining the University of Berlin. In an 1810 document discovered some

several decades later, “On the Internal and External Organization of Institutions of Higher Education in Berlin,” Humboldt articulated principles of teaching and research that would be embraced by both German universities and American universities in the century to follow (Menand et al, 2017). These principles included: the integration of research with teaching, the promotion and preservation of academic freedom as being independent from state influence and control, and the pursuit of knowledge for its own sake (Ash, 1997; Menand et al, 2017). Humboldt’s vision for higher education drew from multiple philosophical influences including: Immanuel Kant’s appeal for critical inquiry that is free from state or other influence; Joseph Schelling’s Romantic position that stressed an interaction between natural and philosophical sciences; the German concepts of *Bildung* which promotes organic self-development; *Lehrfreiheit* and *Lernfreiheit*, or the freedom to choose what to teach and research, respectively; and *Wissenschaft*, or a commitment to scholarly rigor (Colby et al, 2003; Menand et al, 2017). The significance of Humboldt and his influence on global higher education is so glorified in the German history of education, the term *Mythos Humboldt* is used to describe Humboldt’s mythological status as a key figure in the history of higher education (Ash, 1997). The influence of the German model of higher education had a major impact on the reimagining of higher education structures, disciplines, and curriculum around the turn of the 20th Century.

Charles Eliot, President of Harvard from 1869 to 1909, was instrumental in the formation of the AAU (Eliot, Low, Gilman, Harper, & Wheeler, 1900). Eliot was inspired by European models of education including the German/Humboldtian model (Menand, Reitter, & Wellmon, 2017). Eliot made significant contributions to the

structure and curriculum of higher education institution in America (Ash, 1997; Menand, et al, 2017). In particular, Eliot instituted policies at Harvard that required that students have a general liberal arts education prior to their professional education that they would pursue in graduate school (Menand et al, 2017).

Management and Measurement in American Higher Education

By the beginning of the 20th Century the industrial revolution, mass immigration, and urbanization was changing the social landscape of the United States. Various disciplines and occupations began to focus on new forms of *professionalization* which manifested in the form of specialized academic disciplines and new requirements for professional workers to earn advanced training certifications (as attained from professional and graduate programs at colleges and universities) (Douglas, 1992; Geiger, 1986; Lagemann, 2000; Thelin, 2004). New disciplines in the natural sciences and social sciences were being formed along with their corresponding professional societies and organizations (Geiger, 1986). The trend of creating specialized disciplines and professions was in part a reaction to new scientific discoveries and the corresponding optimism about the scientific method as an infallible, objective approach to solving a range of problems (Colby, Ehrlich, Beaumont, & Stephens, 2003; Lagemann, 2000). As new scientific fields were being formed (e.g., anthropology, administration), they each required their own jargon and research conventions (Geiger, 1986). The trend towards specialization and professionalization was also an example of what sociologists refer to as “normative isomorphism” or a tendency of some social groups to fortify and validate themselves through increasingly specific self-identities and discourses (DiMaggio & Powell, 1983). One field that was not immune to the types of scientific specialization was

education itself. Psychologists at this time began describing “learning” in terms of stimulus and response, punishment and reward, and observable, predictable patterns of physical behavior (Logan & Wagner, 1965).

Another movement that had a lasting impact on higher education was the rise of business management and scientific principles being applied to the administration of public and social organizations (Douglas, 1992; Lagemann, 2000). One reason business practices were so readily adopted in higher education was because a new class of wealthy businessmen viewed higher education institutions as a way to leave their legacy. Having capitalized on the unregulated extraction and distribution of goods and natural resources that marked the Gilded Age in America, these “captains of industry” began founding new American research universities. For example, Johns Hopkins founded and funded his namesake institution, railroad tycoon Leland Stanford established his namesake University in California, and John D. Rockefeller provided large endowments for the University of Chicago. George Douglas (1992) describes how the influence of business and industry had a negative effect on the priorities of American universities:

It would have been much better for America if education had not developed a sense of grandiosity, of raw power and compulsive achievement; it would also have been better if large educational institutions (whether huge urban school systems or giant universities) had not been modeled on the corporation, with its zest for profit and production, its bureaucratic hierarchy of administration, its competitive urges, and, above all, its sense of specialization and fragmentation of talent. (p. 20)

A major influence on management practices in higher education and every other type of organization in the early 1900's America was Frederick Taylor's "Scientific Management." The theory was initially applied to improving the engineering processes in steel plants, but it soon established unprecedented adoption as it was quickly seen as a panacea to the problem of inefficiency in every line of work (Callahan, 1962). As an example of how this preoccupation with efficiency extended to education, William Bagley's (1907) popular *Classroom Management*, a text for students of education aspiring to be teachers, is rife with economic language and suggestions on how to increase efficiency and reduce waste. Bagley (1907) admits that the model of a classroom wherein a teacher instructs a large number of pupils organized by age or ability has been in place since "the earliest days of formal education" (p. 2); yet, he contends that this format is inherently problematic:

Primarily it is a problem of economy: [classroom management] seeks to determine in what manner the working unit of the school plant may be made to return the largest dividend upon the material investment of time, energy and money, from this point of view, classroom management may be looked upon as a "business" problem. (p. 2)

This excerpt is a garish example of how some viewed education as akin to a manufacturing plant. Yet, such language would not seem out of place in some contemporary discourses. The influence of Taylor's scientific management had created a new and lasting American obsession with efficiency as an essential function of economic prosperity (Callahan, 1962). In the early 1900's critics of public education chastised educators for being inefficient. These critics wondered whether there were any positive

economic impacts of public education (Callahan, 1962). Critics of *higher* education wondered why students were being taught “cultural” subjects like literature and philosophy rather than practical skills that could be used in the “business world” (Callahan, 1962).

In 1904, steel magnate and philanthropist, Andrew Carnegie established pension funds for faculty at MIT (Geiger, 1986). Concerned about the seemingly unstructured nature of faculty work and the corresponding difficulty to accurately measure “workload,” Carnegie instituted new pension eligibility policies that required measurable levels of productivity and “output” (Geiger, 1986). These new policies led to the creation of the *credit hour* and eventually the “Carnegie classifications” for institutions of higher education that are still in use today (Geiger, 1986). In addition, governmental concerns about institutional accountability began to take hold around the same time that credit hours were being instituted. By the 1920’s several professional accrediting bodies such as the National Association of Accredited Commercial Schools (which would later become the Accrediting Council for Independent Colleges and Schools) and the American Council on Education were established as means to enforce state and federal standards and to provide government oversight of things like admissions and credit transfer in higher education (*Accrediting Council for Independent Colleges and Schools*, 2010).

Coinciding with this new focus on measurement and management were new forms of assessment of student learning. By the end of the 19th Century “grading” students with various formulae and averages were common practice in universities (Durm, 1993). Yet, no sooner had grading with letters and scores become commonplace,

it attracted criticism for being *too* subjective and “unscientific” (Durm, 1993; Watson, Learned & Wood, 1938).

The era of management and measurement in American education was defined not only by an embrace of scientific rationalism, but also by attitudes and beliefs that “progress” in terms of productivity and economic prosperity was something that endlessly grows and improves as a result of incorporating scientific methods into business practices. These beliefs were characteristic of *Fordism*, an economic theory that generalizes Henry Ford’s approach to standardizing and de-skilling labor in his automobile manufacturing. Additionally, Fordism reflects the ways in which Ford (and others) sold their employees’ labor back to them in the form of consumer goods the workers created. Ford increased his worker’s wages, a policy that was intentionally designed to stimulate consumerism--well-paid workers bought the cars they produced in the assembly line, thus creating an endless, self-feeding, self-contained cycle of supply and demand (Gartman, 1998; Harvey, 1990). Viewing students as both specialized laborers and consumers made its way into educational ideology. Behaviorism, supported by economic Fordism, promoted a kind of “regulated individualism” where both learners and workers would have the illusion of agency within tightly controlled systems of inculcation promoting whatever values those in power wished to instill (including the inherent value and inevitability the systems themselves).

In the 1920’s and 30’s The Carnegie Foundation carried out a comprehensive longitudinal assessment of higher education by way of a standardized test that would assess a student’s “knowledge” (Learned & Wood, 1938). A “public affairs pamphlet” titled, *How Good are Our Colleges?* that was published the same year by the same

authors boldly claimed that, “nearly all of the goals of education can be measured” going on to say that “. . . “knowledge, which is certainly one of the more important of these, can fortunately be measured rather easily” (Watson et al, 1938, pp. 2-3). Based on the results of a comprehensive, multi-year, multi-disciplinary exam, the report found that American colleges and universities were failing in producing measurable improvements in student knowledge throughout their college and university experiences and beyond. The report recommended that things like letter grades and “credit hours” (the latter of which was established by the very same Foundation that commissioned the report) “must be abandoned” and replaced by more personalized, individualized, “mastery” learning models (Watson et al, 1938). Around the same time, psychologists were exploring individualized programs of instruction that could optimally impart “knowledge” in the same narrowly defined way as the Carnegie study, as the “product of thought” or the “outcome of education” (Learned & Wood, 1938, pp. 6-7).

There has been a recent resurgence in models that embrace individual, self-paced approaches to demonstrating “competencies” (e.g., the Georgia Tech Commission on Creating the Next in Education, 2018), as well as a resurgence of critiques of higher education institutions being accused of failing to produce measurable outcomes. A *Private Universe* was a research study and corresponding documentary film which showed that Harvard graduates did not understand basic scientific concepts like weather patterns (Schneps, 2000). Echoing the kinds of sentiments that were common in the early 1900’s Richard Arum’s and Josipa Roska’s 2011 book, *Academically Adrift* claimed that students need measurable outcomes in the forms of “knowledge” and “skills” and that some of the goals and techniques pervasive in higher education are subjective,

inconsistent, inefficient, and ineffective (Arum & Ruska, 2011). Whether knowledge is “easy to measure” depends on one’s conception of knowledge. Some scholars associated with gender studies and multiculturalism have suggested that standardized tests such as the SAT’s are problematic because they are biased based on socio-economic, racial, and other identity factors (e.g., Green & Griffore, 1980; Soares, 2012).

Who Attended American Higher Education Institutions?

Themes of “openness,” freedom, and inclusivity appeared throughout higher education’s history. Yet, in practice (and in hindsight), these sentiments were ironic in the same sense that the opening phrase of the Declaration of Independence refers to “all men” being equal, yet besides the obvious gendering of the phrase, “all men” meant “white men” at the time. For much of American higher education’s first three centuries of existence, the college and university student demographic was primarily wealthy, white, and male (Colby et al, 2003; Spring, 2005; Thelin, 2004). So too was the dominant demographic composition of American higher education leaders and scholars (Lagemann, 2000). In 1922, Dartmouth President Ernest Hopkins proposed radical new admissions criteria that prioritized intellectual ability as opposed to simply wealth and familial lineage (Geiger, 1986). This marked the nascent beginning of a turning point in how colleges and universities determined who should, could, and would attend their institutions. For the last one hundred years, higher education has been a battleground site in which marginal groups have fought for equal access and treatment. Beginning with increased enrollments of women during the Suffrage era, the evolving demographics of students in higher education institutions have reflected the cultural revolutions of the last century.

Women

Prior to the 1900's women attended higher education at a much lower rate compared to men (Geiger, 1986; Thelin, 2004). There is some evidence that there were "women's academies" or "women's seminaries" that either resembled or eventually evolved into "colleges" in the first half of the 19th Century (Thelin, 2004). Historical curriculum records indicate that these schools were both rigorous enough to be considered in the same category as colleges and universities but that they also had curricular requirements that emphasized "traditional" roles for women including skills related to being wives and mothers (Thelin, 2004). Women's *colleges* were established in the 1850's, but were immediately met with public skepticism and in some cases political resistance (Geiger, 1986; Thelin, 2004). The few women who did attend co-educational institutions during the latter half of the 19th Century were seen by their male classmates as both "professional threats" and "social inferiors" (Geiger, 1986, p. 55). In the 1800's, Wesleyan University went from being an all-male school to a co-educational model, only to revert back to being male-only (Thelin, 2004). Many more women attended college in both all-female and co-educational institutions during the early 1900's (Thelin, 2004). However, these women were still not exempt from the types of gender discrimination and bias both academically and in post-graduation career prospects. As cultural revolutions occurred throughout the 20th Century, women eventually began attending higher education institutions in equal numbers as men eventually surpassing them.

The Working Class

Another “German model” of education, that of the German vocational post-secondary school, served as a model that American policy makers would invoke as they advocated for more occupational training in higher education in the early 1900’s (Callahan, 1962; Spring, 2005). While the integration of research and teaching was integral to the German model of higher education, environmental constraints in the 20th Century United States led to tensions between these two enterprises. The growth of specialized research disciplines and new requirements for expensive equipment to conduct scientific research put a financial strain on even the most well-endowed American universities (Geiger, 1986). To curb the rising costs of research, colleges and universities increased both their enrollment capacities and their tuition rates (Thelin, 2004). As higher education institutions attracted new students from more socio-economically diverse backgrounds (namely, middle and lower-class white males) these new populations of students were often ill-prepared for the academic rigor of higher education; this in turn led to efforts to improve undergraduate teaching as separate enterprise from the advanced and specialized research projects that were taking place at American universities (Geiger, 1986). As more students attended public universities, public criticism of the *practical* and *economic* value of public education occurred with increasing frequency and fervor. These criticisms, coinciding with (and likely contributing to) students’ burgeoning interest in pursuing practical and work-related curriculum, led to the expansion of technical and vocational post-secondary institutions as well as an increase in the number of professional courses and degree programs offered at colleges and universities (Callahan, 1962; Cheit, 1975; Thelin, 2004).

Post-secondary education has often been seen as a way for individuals to enjoy higher levels of economic prosperity in their lifetime. Financial aid programs have made it possible for low income students to attend higher education institutions. Yet, as state funding (and financial aid support) has not kept up with inflation and cost of living increases, students are increasingly burdened with inordinate debt levels (Goldrick-Rab, 2016). Thus, enrollment trends continue to shift away from arts and humanities disciplines and shift towards vocational and professional programs. Questions about the “return on investment” of higher education continue to be raised.

Troops

Shortly after WWII a legislative bill that would provide unemployment benefits to returning veterans was proposed to the U.S. House of Representatives. The bill was intended to give veterans subsistence money while providing enough time for manufacturing plants to re-configure their operations to produce their pre-war wares like tires instead of tank treads (Thelin, 2004). The original bill was rejected, but a revised version arbitrarily included educational incentives. While veterans were waiting for plants to re-open, some of them may want to take some college classes, was the thinking. This 1944 legislation would become known as the GI Bill. It passed the Senate by just one vote. Both government officials and education leaders doubted that a significant number of veterans would take advantage of the bill (Thelin, 2004). They were wrong. Shortly after the educational benefits of the GI Bill became available, college and university enrollments doubled (Colby et al, 2003; Thelin, 2004). The makeup of the student population in higher education thereafter included a significant contingent of veterans and military personnel. The size, structure, and practices of American higher

education would all be affected by these students. For example, the GI students, described by Thelin (2004) as “pragmatic” and “impatient,” enrolled *en masse* in degree programs like business and engineering- programs that they felt would guarantee lucrative careers post-graduation. These returning veterans were also older than their “traditional” classmates. Veterans were early examples of what are now referred to as “non-traditional” or “adult” students.

People of Color

Prior to the Civil War, only twenty-nine African Americans received Bachelor’s Degrees from American institutions of higher education (Hirt, 2009). After the Civil War, new types of schools were established to provide literacy education to freed slaves and African Americans; these schools grew and expanded into what would become known as historically black colleges and universities (HBCU’s) (Hirt, 2009; Thelin, 2004). Enrollments at either HBCU’s or other American institutions of higher education were segregated until the mid-20th Century. *Brown v Board of Education* in 1954 was a landmark U.S. Supreme Court case which put an end to the “separate but equal” policy that had been in place since the late 1800’s (McCoy & Rodricks, 2015). *Brown v Board of Education* effectively desegregated all types of public schools, including universities. The Civil Rights Act of 1964 further guaranteed all Americans the right to be served in public establishments, although discrimination and structural inequities would continue to be present in other forms (McCoy & Rodricks, 2015).

Similar to HBCU’s, there are also Hispanic-Serving Institutions (HSI’s) and tribally owned Native American community colleges, though these do not have the same historical origins as HBCU’s (Hirt, 2009). Native Americans in particular had negative

experiences with American public education as they were forced to attend boarding schools in order to be assimilated into White culture throughout the 19th and 20th Centuries. Aside from data about tribally owned community colleges, the first of which was established in 1968 (Hirt, 2009) there is little research about Native Americans in higher education overall. To this day, populations of native students are often excluded from statistical reports in higher education (Reyes, 2014). As higher education institutions strive to be inclusive and integrative, native populations remain hidden and underserved.

Throughout the 20th Century and into the 21st Century, race has figured prominently in debates about college admissions policies and practices. In the 1920's, facing what university leaders felt was an overabundance of Jewish students, Harvard instituted new recruitment strategies to attract white students from the rural Midwest (Gersen, 2018). After the Civil Rights Act, new affirmative action policies were implemented to attract more diverse students in public institutions nationwide. In 1978 a white student was involved in a Supreme Court case (*Regents of Univ. of California v. Bakke*, 1978) for what the student felt was racial discrimination in school admission policies. The prospective student (Bakke) was actually discriminated against because of his age rather than race, but "agism" was not grounds for discrimination at the time. More recently, in *Fisher v University of Texas* (2013, 2016), the U.S., Supreme Court upheld the University's affirmative action admission policies citing the importance of both affirmative action precedents which protect minorities (the complainant in this case was a white woman who felt she was unjustly discriminated against for being white) and of universities being able to determine their own admission practices.

Today's Students

As new types of students entered higher education throughout the 20th Century, the size of American universities grew considerably. And the demographic makeup of student populations has become much more heterogeneous compared to the universities in the beginning of the 20th century, and especially compared to the early colonial American colleges and universities. According to the National Center for Education statistics (2015), only 56% of today's American higher education students are white, 28% of students overall have children, 62% have full or part-time employment, and 62% receive Pell Grants (an indicator that they are near or below federal poverty levels). Just over half of today's students in American higher education are younger than twenty-two years old; and slightly over half of today's students in American higher education are women. This demographic composition is drastically different than the students of early American higher education who were predominantly wealthy, white, and male. The GI Bill added momentum to the growth of professional degree programs, and the Civil Rights movements of the latter half of the 20th Century led to changes in admission standards and discrimination policies regarding women and students of color. As American higher education continues to attract and enroll more diverse students from different social and economic backgrounds, the expectations, experiences, and identities of these students' continue to influence goals and roles of American higher education in many ways (Colby et al, 2003; Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012). Conceptions of knowledge and education were no longer objective and neutral as they became relativistic and pluralistic. Today, diversity, multiculturalism, globalism, and

humanism are reflected in university mission statements and in the breadth of programs and initiatives offered by the institutions.

Recurring Themes about Higher Education

There have always been differing attitudes and opinions about the purpose of education, as well as oscillations between and among them (Cheit, 1975). The goals and aims of higher education run along political or economic continua (Pasque, 2014; O'Neill, 1981). The problem of “competing aims” has been a feature of formal education since its beginning (Cheit, 1975). Some ancient Greek scholars, for example, believed education should prepare people to participate in public democracy, while others felt education should focus on abstract concepts like “truth and beauty in the human experience” (Gildersleeve, Kuntz, Pasque, & Carducci, 2010, p. 92). In the 19th and 20th Century in America, higher education institutions reflected the themes and movements that were happening in American culture writ large. In the late 1800’s the Humboldtian model of a research university was being established alongside the “Gilded Age” of American progressivism. *Laissez faire* capitalism allowed the great accumulations of wealth by barons of the railroad and other industries that helped expand the American manifest destiny. Indeed, large 19th Century railways established hierarchical management structures that would later be reinvigorated by the likes of Taylor and Ford in the 20th Century (Gartman, 1998). Higher education institutions contained contradictions between student freedom (e.g., Harvard’s policy of letting undergraduate students chose whatever courses they wished) and disciplinary specialization and requirements for degrees. Meanwhile, college and university presidents increasingly acted like business leaders looking for ways to fund research endeavors that were

becoming unsustainably expensive. While a massive influx of immigrants came to the United States at this time, the popularity of Social Darwinism¹ allowed the dominant class to believe that wealth disparity among ethnic lines was “nature’s way.”

Demographic homogeneity in higher education was natural law rather than the result of social structures.

Liberal Arts Education and/or Occupational Training

Earl Cheit (1975) writes that “the tension between what is ‘liberal’ and what is ‘useful’ is one of the oldest and most persistent problems in education” (pp. 2-3). The intent of liberal arts or liberal education applies the root word *libre* in a twofold manner: liberal education is liberating in the sense that it encourages the student to be self-directed, critical, and capable of fulfilling his or her intellectual potential; it is also liberal in that it exposes students to an expansive range of subjects and disciplines (Hansen, 2012; Nussbaum, 1997). Liberal Arts education can be traced in a formal sense to ancient Greek curriculum that focused on music, poetry, math, grammar, and rhetoric, and in a broader sense to the Socratic method of critical inquiry and self-reflection (Hansen, 2012; Nussbaum, 1997). Suggesting that access to certain types of curriculum was a function of class distinction, Scott Samuelson (2014) claims that in ancient Greece and in the early Roman Empire education in the liberal arts of that time was afforded to only the wealthiest citizens, while technical and skills training were provided to the poorest classes or “slaves.” Indeed, liberal studies, or *studia liberalia*, referred to curriculum that was suited for those who were “born free” (Nussbaum, 1997). First century stoic

¹ Social Darwinism also (re)introduced the notion that people behaved like animals, a concept that would be central to behaviorist psychology in the coming decades.

philosopher Seneca proposed an expanded conception of liberal studies to mean that it emancipated students to think for themselves (Nussbaum, 1997). There is little resemblance between the Roman “quadrivium” (music, arithmetic, geometry and astronomy, or the liberal arts “trivium” (grammar, rhetoric, and logic) of the middle ages in Europe, and the “liberal arts” as they are defined today; yet the dual meanings of free thinking and exposure to a broad range of subjects remain central to modern applications of liberal education (Hansen, 2012). There is today an unofficial consensus that liberal arts curriculum includes “the arts, humanities, languages, natural sciences, mathematics, and social sciences” (Hansen, 2012). This broad scope of disciplines is partly why liberal arts are considered by some to be “incoherent” or poorly labeled. Furthermore, liberal arts are sometimes considered synonymous with general education or general studies which provide students with a range of “traditional” disciplinary courses in the sciences, arts, and humanities (Cheit, 1975). It is worth noting that the term “general education” was coined at Columbia University in 1919 (Turner, 1984) and has since become a common moniker to represent freshman and sophomore curricular offerings at many American institutions of higher education. This gradual displacement of the term “liberal” with “general” may have emerged in response to political concerns that members of the public or government associate “liberal” with a left-leaning political party.

Menand, et al (2017) contend that politicians are often the ones who advance the position that higher education should provide job training as opposed to liberal education stating that, “some state legislatures seem eager to make public research universities as institutions whose sole focus is teaching . . . of preprofessional and vocational fields” (p.

1). There is evidence of this claim. An example is found in the recent controversy over the University of Wisconsin's "Wisconsin Idea" which codifies in official state documents the public benefit of a state university system. In 2015, then Governor Scott Walker, attempted to rewrite sections of the University of Wisconsin System mission statement, using a biennial budget as the vehicle in which to do so. Walker's language omitted the phrase "Basic to every purpose of the system is the search for truth" replacing the phrase with proposed language stating how the UW Systems' mission is to "meet the state's workforce needs." When this attempted edit was exposed, Walker claimed it was due to a "clerical error" and walked it back amidst public outcry (Herzog, 2015). This is an example of how discourse is political and how political tensions are manifest in the reproductions, omissions, or inclusions of ideological positions. Depending on the political climate of a state, public university missions may be vulnerable to the types of edits and rewrites attempted by the Walker administration in Wisconsin. Liberal arts have been attacked by politicians as being contrary to the needs of the workforce, from President Reagan in the 1980's famously stating that taxpayers should not subsidize intellectual curiosity to Education Secretary Betsy DeVos admonishing colleges and universities for teaching the liberal arts in 2018:

Today, a significant proportion of the currently available jobs require more than a high school diploma but less than a four-year degree. Yet even at the nation's community colleges, the majority of degrees are conferred in liberal arts, general studies, and humanities. (U.S. Department of Education, p. 1)

DeVos' argument is one of mutual exclusion between professionalization *vs.* liberalization. It is an argument that education in "liberal arts" or "humanities" are

counter to occupational success. It is an argument that preparing students for occupational or economic success are all that education institutions should do as opposed to preparing citizens to participate in a democratic society. Devos' contempt for "liberal arts, general studies, and humanities" finds company in contemporary argument against liberal arts education that it is a luxury not worth indulging in. Students, according to this criticism, ". . . should stop dreaming and start thinking practically about the *skills* they will need in the *workplace*" [emphasis added] (Zakaria, 2015). Detractors of liberal arts education believe that "open-ended exploration of knowledge is a road to nowhere" (Zakaria, 2015, p.16). George Douglas (1992) offers a compelling rebuttal against these types of criticisms against liberal education:

In allowing undergraduate education --call it general education, if you like, or liberal education . . . to take a backseat to other and frequently bogus aims of education, American universities have cheated the nation of a valuable commodity. Undergraduate education was at one time the keystone in the arch of higher education. When that keystone was lost, and replaced by goals spun out by the graduate and professional schools, by the needs of vocational training (and all the so-called scholarly subjects are viewed in a vocational light nowadays). The heart was cut out of it from the students' point of view--and perhaps from the professors' point of view as well. . . (p. 5)

In his 1967 collection of essays, *The Aims of Education*, Alfred North Whitehead offers another defense of liberal education suggesting that universities are under-utilized if they only exist for the purpose of practical skills. Whitehead (1967) advocates for less

tangible things like “imagination” and “excitement” as being essential to the university's mission:

The justification for a university is that it preserves the connection between knowledge and the zest of life, by uniting the young and the old in the imaginative consideration of learning. The university imparts information, but it imparts it imaginatively. At least, this is the function which it should perform for society. . . This atmosphere of excitement, arising from imaginative consideration, transforms knowledge.” (p. 93)

Instilling curiosity and interest with a liberal education that exposes students to a broad range of topics and disciplines is a cornerstone of the American university model (Menand et al, 2017). Further articulating the value of a liberal arts education, Winter, McClelland, and Stewart (1981) make the case that if any outcomes of a liberal education are to be measured at all, they should not be limited to things like concept attainment, but they should promote attitudes and attributes like “divergent thinking, sensitivity, and empathy.” The debate continues. A 1997 national survey found that the majority of Americans felt that higher education was required for a lucrative career and that liberal arts education was irrelevant in supporting that goal (Hersh, 1997). Surprisingly, the one group besides graduates of liberal arts colleges that had a “very positive” attitude about the value of liberal arts education was “business executives” (Hersh, 1997). Some proponents of liberal arts education make the claim liberal arts education does in fact impart the skills and characteristics that employers are looking for, while others (e.g., Aitchison, 2015) suggest that undergraduate students should be made aware of and brought into the debate about the value of liberal arts.

Taxonomies and Frames of Educational Aims

Many of the viewpoints about liberal education vs. vocational education can be aligned with political ideologies. Some authors categorize the different viewpoints and ideologies in education according to their political corollary. William O’Neill (1981) established a taxonomy of six educational ideologies along a continuum-- fundamentalism, intellectualism, conservatism, liberalism, liberationism, and anarchism-- with these ideologies falling under two major categories: conservative and liberal. O’Neill’s (1981) taxonomy of educational ideologies, with defining characteristics, is adapted in the following table:

Table 2.1 Educational Ideologies According to Political Affiliation

Political Affiliation	Educational Ideology	Defining Characteristics
Conservative	fundamentalism	Upholding tradition (e.g., moral values)
	intellectualism	Objective truth revealed through reason
	conservatism	Utilitarian, conformist
Liberal	liberalism	Diversity and democratic decision-making
	liberationism	Critical of prevailing social structures and practices
	anarchism	Freedom and reinvention

In a 1998 analysis, “Reaping the Benefits: Defining the Public and Private Value of Going to College,” the Institute for Higher Education Policy developed a framework (what they call “An Array of Education Benefits”) which lists various public and private

benefits of higher education that are further categorized as being either “economic” or “social” in nature.

Table 2.2 Public and Private Benefits of Higher Education

	Public	Private
Economic	<ul style="list-style-type: none"> ● Increased Tax Revenues ● Greater Productivity ● Increased Consumption ● Increased Workforce Flexibility ● Decreased Reliance on Government Financial Support 	<ul style="list-style-type: none"> ● Higher Salaries ● Employment ● Higher Savings Levels ● Improved Working Conditions ● Personal/Professional Mobility
Social	<ul style="list-style-type: none"> ● Reduced Crime Rates ● Increased Charitable Giving/Community Service ● Increased Quality of Civic Life ● Social Cohesion/Appreciation of Diversity ● Improved Ability to Adapt to and Use Technology 	<ul style="list-style-type: none"> ● Improved Health/Life Expectancy ● Improved Quality of Life for Offspring ● Better Consumer Decision Making ● Increased Personal Status ● More Hobbies, Leisure Activities

Penny Pasque (2014) expanded this framework in a typology that includes combined categories “Public and Private Good: A Balanced Frame” and “Public and Private Good: An Interconnected and Advocacy Frame.” The balanced frame upholds that both public and private benefits of higher education are valuable but exclusive from one another. The interconnected advocacy frame upholds that public and private benefits are mutually inclusive and supportive of one another (Pasque, 2014).

Is it Difficult for Higher Education Institutions to Articulate their Purpose?

These tensions and divergent aims and frames may make it difficult for higher education institutions to effectively communicate their purpose and benefits. There is limited empirical research about how universities describe their purpose, mission, and goals in public texts. Morpew and Hartley (2006) suggest that the potential functions of a university mission statement are “instructional” in that they articulate the types of activities that take place at the institution and “inspirational” in that they describe aspirations and mobilize support:

A clear mission helps organizational members distinguish between activities that conform to institutional imperatives and those that do not. Second, a shared sense of purpose has the capacity to inspire and motivate those within an institution and to communicate its characteristics, values, and history to key external constituents. (p. 457)

What Morpew and Hartley (2006) discovered in their analysis of over 300 mission statements from higher education institutions is that such documents provide complex signaling and symbolism which may contain references to their histories, local contexts, and model of control (i.e., public or private). This complex signaling may be the reason why the public has difficulty understanding the value and purpose of higher education (Hansen, 2012). Mission statements, as Hansen suggests, (2012) fail to “translate the intangible, perhaps ineffable aims of our educational models into terms that touch directly on the concrete and pressing needs of both individuals and society today. The vagueness and abstraction of our purposes is reflected in the published mission statements. . .” (p. 66).

Hansen concludes that the way to address this communication breakdown is to have a “national conversation . . . about the purposes [of higher education],” (2012) (p. 63). Even if such public dialogue were to take place (and it is unclear as to what would constitute a “national conversation”), some (e.g., Taylor, 2012; Washburn, 2005) argue that higher education and its purpose should be shielded from external political or economic forces. This latter position is reminiscent of that advanced by Humboldt in the 1800’s wherein Humboldt argued for an academia that was separate and insulated from other social institutions like government. Taylor (2012) further asserts that “administrators must insulate the academy from the anti-intellectual and market forces that threaten the mission of higher education,” citing as a facet of said mission, “unfettered intellectual pursuits” (p. 46) as a desirable function of higher education institutions. In order to facilitate protections against external forces, Taylor (2012) proposes that there be efforts to develop a better understanding of the tensions that exist in the various public discourses about higher education as well as a better understanding of their historical origins. Lagemann (2000) similarly warns about the influence of anti-intellectualism as a threat to higher education as “. . . a tendency to discount the complexity of education” (p. 3) and view it as simple, formulaic, and ripe for neoliberal ideologies of market competition and efficiencies.

Bill Readings (1997) makes the argument that modern universities are in the midst of a kind of identity crisis, no longer providing and preserving “culture” in the context of a traditional nation/state. Readings (1997) questions the tendency among higher education institutions to position themselves as providing and promoting “excellence” rather than “culture.” Readings (1997) accuses the focus on excellence as a

rhetorical stance that is influenced by the *corporatization* of higher education. This sounds similar to accusations against the early 20th Century influences of Taylorism and business practices in education. Readings (1997) further claims that the ideologies that cultivated the need for universities in prior centuries--the Kantian concept of “reason,” and the German idea that universities both preserved and advanced the culture of the state-- are obsolete in modern times. The current techno-bureaucratic concept of “excellence” is a vacuous response to a new trans-globalized world (Readings, 1997). Readings’ (1997) accusations are consistent with the cynical view held by some that university attempts at articulating their role and purpose in a modern society are too broad or ambiguous to be meaningful (Morphew & Hartley, 2016). Without concrete objectives, universities are vulnerable to criticism from an economic perspective. The lack of measurable results present in various “knowledge tests” over the years raises suspicion as to the quality and worth of a college or university education. Even some progressive viewpoints would assume that American higher education institutions, having been around for so long, should have improved over time (Bok, 2013). Former Harvard President Derek Bok (2013) wonders whether the lack of measurable outcomes or improvement over time are due to the fact that the college experience is more like writing poetry or designing architecture: esoteric, complex, profound, and incomparable to things like consumer goods or medical treatments. In addition to this ambiguity, universities have multiple competing interests from research, to teaching, to community outreach, to industry partnerships, all while being held accountable by education boards, students, community-members, alumni, and state and federal governments. Speaking from the perspective of a university president, Clark Kerr (2001) called the variety of institutional

programs and interests the “multiversity:” The multiversity, according to Kerr (2001), is a product of mid-20th Century shifts whereby increased enrollments, increased public accountability, and expanded specialization in academic fields has created a “pluralistic society” or a “city with infinite variety” within higher education. Kerr (2001) offers hope that universities, despite their being “torn by change,” are grounded in some universal principle of *freedom*.

Learning and/or Education

Embedded in these different frames and tensions of education are different definitions and conceptions of education as it relates to learning and instruction. Siegfried Bernfeld (1925/1973) in *Sisyphus; or, The Limits of Education* describes the differences and relationships between a “theory of instruction” and a “theory of education.” *Instruction* is concerned with the narrow topic of *learning*, but it is conflated with a more expansive theory of *education*; A theory of education would critically examine the history, structure, and expectations of education as a social construct (Bernfeld, 1925/1973). Bernfeld (1925/1973) criticizes the “content” of the theory of instruction, stating that the theory of instruction “mistakes the psychic surface of the child for the whole child” and that “it assumes that the young mind is neatly organized into distinct faculties for reading, writing, arithmetic, manual arts, and religion,” (p. 18) an assumption that Bernfeld finds problematic as there are many complicated experiential factors that cannot be measured by empirical means. Gert Biesta (2010), in a similar vein nearly a century after Bernfeld’s work, argues that educationists should not focus solely on measurement and efficacy (what he calls “learnification”), especially when these are not grounded in any moral or ethical framework. Contrary to learnification, “good

education” would focus on individual freedom, social connections, and ethics and morality (Biesta, 2010).

There are many benefits that higher education institutions may provide in a complex and dynamic globalized society, and there are many problems that members of higher education institutions can help address (Facer, 2011). For example, new technologies have increased the volume and scale of data at our disposal (Facer, 2011; Pasque, 2014). This introduces new temptations to manage and measure learning in ways that exploit these new forms of data and computing.

Learning Analytics

Various authors have attempted to either differentiate or lump together related terms like learning analytics, academic analytics, educational data mining, adaptive learning, and intelligent tutoring systems (Buckingham-Shum & Ferguson, 2012; Chen, 2016). Further, learning analytics can refer to either a field of study, the specific software applications used to present or interpret educational data, or the units and sets of data themselves (Larsson and White, 2014). The applications of learning analytics range from describing patterns of activity to predicting individual learner performance, to prescribing “interventions” based on the patterns and predictions. Interventions in this context refer to digital communication or other outreach activities performed by an instructor, an advisor, or another member of an institution. The intention of these interventions is to improve or otherwise influence student behaviors related to learning outcomes or retention. The outreach may occur automatically by way of what are described in game theory and behavioral psychology as “nudges” or “prods” (Fritz, 2017; Langmead, 2013). What learning analytics “do” in education depends on the perspective

of the researcher or practitioner. Verbert, et al (2012) describe six goals of learning analytics strategies:

1. Predict student performance
2. Suggest content and resources
3. Increase learner awareness and reflection
4. Improve the quality of social learning environments
5. Detect undesirable learning behavior
6. Detect emotional or affective qualities of learners

What “undesirable learning behavior” might mean and how data systems could somehow identify and correct such behavior will be explored later in this study, but these goals illustrate the types of solutions learning analytics may offer according to proponents.

First, it is worthwhile to review common definitions of learning analytics.

Learning Analytics Definitions and Examples

There is not a unified or agreed upon definition of learning analytics within the literature (Scholes, 2016). However, as mentioned in the introduction to this study, a commonly cited definition for learning analytics is Long’s and Siemens’ (2011) description of learning analytics as “the measurement, collection, analysis and reporting of data about learners and their contexts” (p. 34). Larusson and White (2014) describe learning analytics as “. . . the collection, analysis, and application of data accumulated to assess the behavior of educational communities” (p. 1). It is not clear in this definition nor in the rest of the article who is performing the assessment nor what desired behaviors are, but the authors allude to such things in terms of individual performance and institutional efficiencies:

Whether it be through the use of statistical techniques and predictive modeling, interactive visualizations, or taxonomies and frameworks, the ultimate goal is to optimize both student and faculty performance, to refine pedagogical strategies, to streamline institutional costs, to determine students' engagement with the course material, to highlight potentially struggling students (and to alter pedagogy accordingly) to fine-tune grading systems using real-time analysis, and to allow instructors to judge their own educational efficacy. (p. 2)

This conception of learning analytics provides not only multiple approaches to gathering and interpreting data, but it also uses bureaucratic or technocratic language to describe the applications and outputs for which the data can be used, e.g., to “streamline institutional costs” or to “fine-tune grading systems.”

In Larusson and White's (2014) description, the notion of predictive analytics is evoked by the phrase “predictive modeling;” it implies student data can be entered into formulae to anticipate future behaviors according to statistical probabilities. Clow (2013) defines predictive modeling in the context of education research as “a mathematical model . . . which produces estimates of likely outcomes, which are then used to inform interventions designed to improve those outcomes” (p. 686). In Clow's (2013) conception, predictive modeling might determine a student's likelihood of completing a course based on statistical analysis of factors like “age, gender, socioeconomic status, etc.” (p. 687), and comparisons of these characteristics among other students who have taken the course previously. The assumption is that students would receive interventions such as support or communication which could manifest in a variety of ways like being

encouraged to visit a writing center or being *discouraged* from enrolling in a course (Clow, 2013).

Larusson and White (2014) emphasize the desire to “effectuate positive learning outcomes” by defining learning analytics as “the effort to improve teaching and learning through the targeted analysis of student demographic and performance data” (p. 2). In this case, demographic data includes things like age, gender, race/ethnicity, parental income, high school GPA, and enrollment patterns (what courses a student enrolls in and when they enroll) (Larusson & White, 2014). The “performance data” in this definition may include a variety of digital data from student exam scores or assignment grades to activities such as “login patterns” or “session durations” in educational software like a learning management system (LMS). It could also include mouse movements and clicks in web environments, and the aggregation and statistical trends of such data (Larusson and White, 2014). With these data, interventions might be designed and deployed so that students who fail to login to the LMS would be contacted by the instructor or advisor. The instructor or advisor would be provided with information (and may even inform the student as such) suggesting that infrequent LMS access is considered a “risk indicator” (the “risk” being a high likelihood of failure in the course). The contact may occur in the form of automatic emails, automated notifications in institutional applications, or communication from an advisor or instructor (Larusson & White, 2014).

Some researchers are beginning to explore a much wider range of possibilities such as physiological data such as heart rate and geolocation (Oviatt & Cohen, 2015). Smith (2016), writing for the online publication *Educause Review*, outlines what the author presents as positive potential of measuring student performance via data from

“meal habits” and “gym visits” as examples of the types of physiological, behavioral, and other data that may be collected by learning analytics researchers and practitioners. The data, Smith envisions, would allow educational officials to “‘nudge’ individuals toward making better decisions and exercising *rational behavior* to enhance their *probabilities of success*” [emphasis added] (Smith, 2016). Others are exploring the biological data supplied by “wearable” computing devices, or eye-trackers built into a computer monitor. These devices are intended to measure things like “attention” and “anxiety” as elements of learning and education. These intrusive methods claim to be in the interest of the “whole student,” but they are also reminiscent of the kinds of studies that Henry Ford conducted on his own employees, measuring workers’ every movement, even sending researchers to the employees’ homes to ensure they were “good consumers” (Gartman, 1998).

Another conception of the purpose and potential uses of learning analytics offered by Siemens (2010, as cited in Verbert et al, 2012) is “the use of intelligent² data, learner-produced data, and analysis models to discover information and social connections, and to predict and advise on learning” (p. 133). The anthropomorphized “intelligent” is jargon from the related fields of artificial intelligence and machine learning (which are discussed later in this chapter). In this context, it is suggested that data may be used not only for predictive statistical modeling, but that the algorithms can also “teach themselves” and refine their own accuracy as they are programmed to seek and refine statistical patterns. An example of how these concepts are deployed is the use of “chatbots,” or applications

² The anthropomorphized “intelligent” is jargon from the related fields of artificial intelligence and machine learning (which are discussed later in this chapter).

that automatically respond to questions through SMS, email, or other text-based communication technologies. These tools reportedly use semantic natural language processing algorithms to interpret questions, and they “self-teach” based on positive feedback in order to calibrate the accuracy of the responses (Kerly, Hall, & Bull, 2007).

Slade and Prinsloo (2013) define learning analytics as “the collection, analysis, use, and appropriate dissemination of student-generated, actionable data with the purpose of creating appropriate cognitive, administrative, and effective support for learners” (p. 1512). This definition is similar to Siemens’ and others’ definitions which advocate for practical applications focused on either individual performance or economic benefits for institutions. How these components are put into practice is illustrated in the following example.

Pistilli and Arnold (2010) developed a data visualization and intervention tool called “Signals” at Purdue University. The application calculates “risk indicators” from student data as entered into predictive data models and produces a traffic light graphic (red, yellow, and green lights) to indicate a student’s current and predicted academic performance. The warnings are acted upon by university officials (e.g., an academic advisor) who reach out to students through email messages (Pistilli & Arnold, 2010). Pistilli et al, (2014) in describing the implementation of the Signals project state that, “the identification of patterns provides an institution with the opportunity to provide targeted actions (interventions) to improve student learning” (p. 179). Pistilli and Arnold (2010) also describe the Signals project as a “behaviorally based model” (p. 23).

In addition to the visual warning system, Pistilli and Arnold (2010) measured the impact of the email messages that were sent to “at risk” students. The purpose of the

Signals project was, as Pistilli and Arnold state, to help students “better understand where they stand gradewise early enough so that they can seek help and raise their grade or drop the course. . .” (p. 23). The results were reported as positive, as the study showed an increase in what the authors describe as “help-seeking” behaviors (Pistilli & Arnold, 2010). Pistilli, et al (2014) admit that their use of data in education borrows from the use of data in business, stating that “corporations have long used data on consumers and their habits to determine marketing strategies, directions for product development, and predicting sales based on current buying habits” (p. 80). The Signals project is a notable early example of a learning analytics project.

“The Emergence of a Discipline”

The term “learning analytics” first appeared in Jeffrey Berk’s 2004 *The State of Learning Analytics*, which described the use of training and performance data in a corporate environment and which framed learning analytics as having evolved from the field of “business intelligence.” Learning analytics was largely absent from scholarly literature until it appeared in 2011, the year in which a new academic journal, the *Journal of Learning Analytics*, and its corresponding academic conference, the Learning Analytics and Knowledge conference, and a professional organization, the Society of Learning Analytics Research (SOLAR) were all launched concurrently, with SOLAR being the group responsible for editing the journal and planning the conference. The coordinated creation of the society, the journal, and the annual conference concretized learning analytics as a recognized field of research and practice (Siemens, 2013).

Since 2011, the term learning analytics has been more widely used in both academic literature and in institutional practice. Today, the *Journal of Learning*

Analytics continues to publish articles about current research and findings in the realm of learning analytics. Each volume of the journal focuses on a particular theme related to learning analytics (e.g., “self-regulated learning” or “21st century skills”). As an illustrative example, one article, from the issue that focuses on the ambiguous theme of “learning theory,” ponders how learning theory can effectively be incorporated into inferential statistical models as they are applied to education (Wise & Shaffer, 2015). This type of self-reflective discussion often reveals how learning analytics is still in its infancy and also connected to a range of other disciplines and methodologies.

Related Terms

Learning analytics is often described as interdisciplinary or related to other fields (both within and outside of academia). Dyckhoff, Zielke, Bultman, Chatti, and Schroeder (2012) describes learning analytics as related to fields such as “Educational Data Mining (EDM), Academic Analytics, Social Network Analysis or Business Intelligence (BI)” (p.58). Here I will provide summaries and descriptions of these terms and other related terms (namely, “big data” and “adaptive learning”) that are prominent in learning analytics literature.

Academic Analytics

Referring to the use of student data to determine priorities and interests at an institutional level (and beyond), the term “academic analytics” has been both distinguished from and conflated with learning analytics. Prior to its inclusion in learning analytics literature, the term “academic analytics” was used to describe the use of “business intelligence” methods to improve the efficiency and operations of an institution of higher education (Goldstein, 2005). Siemens and Long (2011) suggest that “academic

analytics” should refer to the use data that benefits an institution, while “learning analytics” should only refer to data and techniques which affect student learning.

Learning analytics and academic analytics are fairly new terms (Davies et al, 2017), so the distinction between them is not universally agreed upon in the literature and some authors conflate the terms and do not adhere to Long’s and Siemens’ (2011) proposed delineations. An example of this conflation is found in Ekowo and Palmer (2016) who state that higher education institutions should use predictive learning analytics for three things: “to identify students most in need of advising services; to develop adaptive learning courseware that personalizes learning; and to manage enrollment” (p. 5).

Siemens and Long (2011) “ideal” conceptions of the differences between “academic analytics” and “learning analytics” and their respective purposes is represented in the following (adapted) table:

Table 2.3 Beneficiaries of Learning Analytics and Academic Analytics

Type of Analytics	Level or Object of Analysis	Who Benefits
Learning Analytics	Course-level: social networks, conceptual development, discourse analysis, “intelligent curriculum”	Learners, faculty
	Departmental: predictive modeling, patterns of success/failure	Learners, faculty
Academic Analytics	Institutional: learner profiles, performance of academics, knowledge flow	Administrators, funders, marketing
	Regional (state/provincial): comparisons between systems	Funders, administrators
	National and International	National governments, education authorities

Siemens and Long (2011) provide a model whereby individuals and institutions benefit from the use of data to improve education; in this model, both learners and instructors (“faculty” in the table) benefit from course-level, and department-level “learning analytics.” Learners do not directly benefit from academic analytics, according to this model.

Social Network Analysis

Social network analysis is a term and corresponding method to analyze patterns of interactions among actors (individuals) and social groups (Butts, 2008). Butts (2008) describes social network analysis as, “an interdisciplinary research programme which seeks to predict the structure of relationships among social entities, as well as the impact

of said structure on other social phenomena” (p. 13). As applied to education, social network analysis may support constructivist pedagogies (Verbert et al, 2012). Comparing people with elements of a computer network, Clow (2013) argues that social network analysis in learning analytics is inspired by the computer science subfield of “network analysis:”

Individual people (or more technically, actors) in the social context are called nodes, and the connections between them are called ties or links. A map (a social network diagram or sociogram) can be drawn by treating the nodes as points and the connections between them as lines. (p. 688).

The combination of constructivist pedagogy with computer science concepts creates new forms of research and data analysis. Technology used for the analysis of social networks in education provide reports about things like how much students contributed to online discussions and with whom interacted virtually (Verbert et al, 2012). Social network analysis research is deemed important from a particular view of educational efficacy which emphasizes co-construction of knowledge as a means of demonstrating learning (Moccozet, Opprecht, & Leonard, 2009).

Business Intelligence

Business intelligence refers to the use of large data sets to improve some aspect of a business (Goldstein, 2005). The concept of business intelligence and its components have increasingly appeared in institutions of higher education to, among other things, analyze recruitment and enrollment data (Goldstein, 2005).

The relationship between learning analytics and the field of business intelligence is highlighted by comparisons that are often made in learning analytics literature between

education and private industries and the desire to improve various aspects of financial performance or productivity (Dyckhoff et al, 2012; Greller & Draschler, 2012). For example, Arnold (2010) states that “applying the principles of business intelligence analytics to academia promises to improve student success, retention, and graduation rates and demonstrate institutional accountability.”

Big Data

The colloquial term “big data” has been used in relation to learning analytics in both scholarly (i.e., peer-reviewed journals) and non-scholarly contexts (e.g., popular magazines, blogs, and opinion pieces) (New, 2014; Wise & Shaffer, 2015). In 2013, Siemens characterized the use of “big data” in education research as, “another approach, or cognitive aid, that can be applied to assist scientists, researchers, and academics to make sense of the connective structures that underpin their field of knowledge” (p. 1381). Siemens and Long (2011) also characterize the broader sense of what “big data” refers to describing the digital traces or “footprints” left by digital actions and interactions: “every click, every Tweet or Facebook status update, every social interaction, and every page read online can leave a digital footprint” -- recontextualizing this concept for education, the authors continue, stating that “online learning, digital student records, student cards, sensors, and mobile devices now capture rich data trails and activity streams” (p. 17). Such imagery implies that collecting data about where a student has been (their digital “trails,” or “footprints”) both digitally and physically (as student cards might indicate what buildings or rooms a student has accessed and when) may lend insight into what Siemens and Long (2011) call the “learning process” (p. 17). Another characterization of big data defines it as “large and complex datasets collected from digital and conventional

sources that are not easily managed by traditional applications or processes” (Reyes, 2015, p. 75); Reyes (2015) goes on to suggest there is potential benefit in combining available student data contained in academic systems like an LMS with the “exceptional amounts of digital data about the interest and activities of learners becoming more accessible” (p. 77). It is presumed this data about interests and activities could be harvested from social media platforms, browsing history, and the like. Wise and Shaffer (2015) refer to “Big Data” in the title of their article (the full title is “Why Theory Matters More than Ever in the Age of Big Data”), but the authors do not attempt to define nor even mention the term “big data” in the body of their article; instead, one is to assume that indirect references to “unprecedented quantities of learning-related data” (p.5) effectively characterizes the volume or just how “big” the data in question may be. This treatment of “big data” as an elusive, ill-defined, yet common sense phrase often appears in learning analytics literature.

Some theorists propose that with the advent of new and voluminous sets of data, in any enterprise, whether it be education or advertising, we are entering a new era of empiricism or a “new paradigm” of science (Kitchin, 2014). This new or “fourth” paradigm, as demarcated by the advent of “big data” is characterized as being “data-intensive” and whose nature is “exploratory” as opposed to prior paradigmatic eras that were “experimental” (during the Renaissance), “theoretical” (before computers), and “computational” (before big data), respectively (Kitchin, 2014, p. 3). Anderson (as cited in Kitchin, 2014) posits the bold claim that with the enormous volume of data “correlation supersedes causation, and science can advance even without coherent models, unified theories, or really any mechanistic explanation at all” (p.4). Claims like

these imagine data (and science) as being infallible, deterministic, and objective; the data in this imagined paradigm does not require human interpretation. While the methods of analysis themselves are derivative from much earlier forms of statistical analysis, the promise and optimism surrounding the use of machine learning techniques (like artificial neural networks) in concert with these large data sets inspires the types of grand theorizing present in the aforementioned “fourth paradigm” claim. Education, in this paradigm, is simply another field in which “big data” has the potential to “disrupt” with its ever-(self)-improving capacity to represent and manipulate reality in some pure objective form (Kitchin, 2014, Zuboff, 2015).

Educational Data Mining

As data has purportedly increased in volume and scale, new language to describe how to analyze these larger data sets has introduced terms (in fields besides education) such as “data mining.” Prior to the dominant use of “learning analytics” the term “educational data mining” (or EDM) was often used to describe the statistical analysis of large sets of education data (Abdous, He, and Yen, 2012; Hung, Hsu, and Rice, 2012; Pistilli and Arnold, 2010). Educational data mining is described by some as a subset of learning analytics, others use it synonymously with learning analytics, and a third group considers EDM to be adjacently related but separate from learning analytics. Abdous et al (2012) describe EDM both as a convergence of “computer science, artificial intelligence, statistics, and biometrics” (p.77) and later, in the same article, as a research method that combines “computer science, statistics, and psychometrics.” (p.78). The authors further describe how data mining is being used in higher education, “to assess students’ learning performance to provide feedback and adapt learning recommendations based on students’

learning behaviours, to evaluate learning materials and web-based courses, and to detect atypical students' learning behaviours.” (p.78). The suggestion that learning analytics should be used to provide adaptive feedback and recommendations to individual students while simultaneously detecting the behaviors of “atypical” students seems self-contradictory. This paradox of competing concepts is not unusual in the discourse of learning analytics-- that learning can and should be custom-tailored to the needs and styles of each individual, while at that same time analytics can diagnose students who are “off track” or deviating from some predetermined or generalized goal. The deviations are inferred by patterns in large statistical sample sizes.

Adaptive Learning

An example of how analytics can be used to personalize learning is the emerging field of “adaptive learning.” Adaptive learning describes educational tools (often software or web-based environments) which presents students with content as well as exercises or activities in which the students solve problems or answer questions. These tools and systems contain programming logic that provide specific content, feedback, or problems and activities that correspond with the input it receives as students engage with the tools and systems. Comparable programming logic can be found in custom news feeds in social media sites that are based on what a person clicks or interacts with or targeted advertising in web browsers that are based on prior searches and browsing history. According to Kerr (2016) adaptive learning is “a way of delivering learning materials online, in which the learner’s interaction with previous content determines (at least in part) the nature of materials delivered subsequently.” Kerr (2016) describes the key components of adaptive learning as “automated, dynamic, and interactive” (p 88).

Institutions may use adaptive learning as a means to provide content or practice exercises that are tailored for each individual student as he or she learns new skills or concepts (Ekowo and Palmer, 2016; Kerr, 2016). The concept of custom-tailored or individualized methods of learning with mechanisms for immediate reinforcement and feedback for an individual learner has can be said to have its origin in the context of behaviorist strategies for machine teaching for decades (Skinner, 1968; see below). Behaviorism is the psychological theory that all human activity can be understood in terms of observable responses to environmental stimuli which are reinforced by consequences (Skinner, 1968). Software providers such as Knewton and Dreambox draw from the behaviorist approach to education research in what they call “adaptive platforms,” with the latter company providing their own description of adaptive learning and its origins in behaviorism:

Adaptive learning has been with us for a while, with its history of adaptive learning rooted in cognitive psychology, beginning with the work of behaviorist B.F. Skinner in the 1950s, and continuing through the artificial intelligence movement of the 1970s. (Dreambox, n.d.)

According to Kerr (2016) adaptive learning refers to technology systems rather than methods of research or practice. In one study, an attempt to take “static content” and offer it in a personalized manner led to the adoption of adaptive learning technology, which the study describes as a “system developed to accommodate a variety of individual needs and differences” (p. 6481). In the above passage, Dreambox readily admits its behaviorist origins.

Precursors and Parallels to Learning Analytics

Concepts associated with learning analytics can be directly traced to 20th Century behaviorist psychology research. Behaviorist psychology assumes that people behave as animals or objects according to predictable, natural laws. Behavior, in this view, is manipulated and controlled by conditioning or reinforcing mechanisms. Early behaviorists such as Pavlov and Thorndike observed predictable patterns when animals were exposed to a “reward” (often in the form of food). B.F. Skinner expanded these views in his radical behaviorism which understood human action in terms of operant conditioning and variable schedules of positive reinforcement. Learning and education were framed by these researchers as cause and effect relationships according to identifiable variables and laws (Logan & Wagner, 1965). The goal and promise of behaviorist psychology was to determine which variables and stimuli were most significant so the “learning process” could be understood and optimized. Echoes of these sentiments are present throughout the literature of learning analytics. As illustrated in the previous section, one of the aims of learning analytics is to make learning more efficient or even automate certain educational tasks where possible. The assumption that data and technology can lead to more efficient forms of education is not new; notions of efficiency and social control coincided with the emergence of education being treated as the subject of scientific research in the early part of the 20th Century (Lagemann, 2000). This new “science of education” was expanded and concretized in the 20th Century with Skinner’s radical behaviorism, as Skinner himself stated that “education is perhaps the most important branch of scientific technology” (1968, p. 19).

Skinner held the belief that educational efficiency could be improved. The reason education was inefficient to begin with, according to Skinner (1968), was due to the classroom model wherein many students were being taught by only a single teacher does not allow for rapid individualized feedback. Notions of student learning communities or of the academic spirit suggested by colonial higher education institutions had no place in behaviorist conceptions of learning and education. The behaviorist model of education is predicated on the assumption that learning is achieved on an individual level through positive reinforcement (Skinner, 1968). A common assumption of behaviorist education models, whether mechanical or digital, is that learning and education may be best achieved when an individual uses a device that can provide immediate reinforcement thus rendering the role of teacher unnecessary and obsolete (Skinner, 1968). As Skinner (1968) claimed, “. . . as a mere reinforcing mechanism, the teacher is out of date” (p. 22). Or as Solomon (1986, as cited in Saettler, 1990) writes, “the teacher’s job (assumed by the computer) is to present increasingly harder exercises” (p. 308).

In this next section I will discuss selected inventions, research studies, and approaches to education and learning with technology that have led to the types of programs and research methods that have inspired the research conducted in the vein of “learning analytics” today.

Programmed Instruction and Teaching Machines

Behaviorist education models emerged at a time when American higher education was growing in both size and scope. Many new higher education institutions were forming, and they were accepting new types of students in droves. This rapid expansion led to concerns about “scalability” and “efficiency.” Behaviorist researchers

like Skinner (1968) believed in the possibility that most (if not all) forms of instruction can occur most efficiently through a pupil's engagement with some non-human program or device that automatically responds to a student's inputs and provided the necessary feedback to optimize learning. Specific examples of automated instruction include "teaching machines" and "programmed instruction" (Saettler, 1990). These approaches and devices can be traced to the late 19th century, with Halcyon Skinner's (no relation) filing a patent for a rudimentary spelling device in 1866 (Benjamin, 1988). It is up for debate whether this early spelling device may be considered a "teaching" machine, because while it did provide a mechanism to input letters corresponding with an image as a way to practice spelling, it did not provide any feedback or indication of whether the spelling was correct or incorrect (Benjamin, 1988). Assuming that feedback is a criterion for what constitutes a "teaching machine," a better example may be Herbert Aikins' 1911 patent for another spelling device that did provide feedback (as to whether answers were correct or incorrect). Aikins' device was cited as being based on psychological research; namely, the research of his contemporary, Edward Thorndike (Benjamin, 1988). Thorndike's research was based on the assumption that stimulus-response approaches were the most effective way for humans to learn (Benjamin, 1988). Another early inventor of teaching machines who was inspired by Thorndike's psychological theories was Seymour Pressey who developed machines for intelligence tests (filing for patent in 1928). Benjamin (1988) describes the design and function of Pressey's first teaching (and testing) machine:

A large drum with paper attached rotates and exposes typed or written material in a narrow window. The typed material is essentially a multiple choice question with four alternatives labeled 1 through 4. The four keys at the right correspond to the four answers, and one of those is depressed by the subject. The machine had two modes of operation, one labeled "test" and the other "teach." In the test mode the subject chose an answer and depressed the corresponding key. The machine recorded that response and advanced automatically to the next question where the subject again responded. A counter on the back of the machine recorded the total number of correct responses. To use the machine in the teaching mode, a small lever on the back of the machine was raised. This action prevented the machine from advancing to the next question until the previous question had been answered correctly. That meant that the subject could make multiple responses on each question, until the right answer was chosen. (p. 705)

Pressey's research and corresponding devices delivered information to students in preset steps, and the devices adjusted the pace and content being delivered based on whether correct or incorrect answers were entered by students. The devices and research approaches were intended to demonstrate how "automated instruction facilitated learning by providing for immediate reinforcement, individual pace setting, and active responding" (Saettler, 1990, p. 432).

Despite these earlier forms, "teaching machines" are often associated with the research and inventions B.F. Skinner. Skinner (1968) and his teaching machines catapulted the public popularity of behaviorism in education and the fundamental

argument that learning was simply a form of stimulus-response behavior that could be managed by identifying and controlling environmental variables and by programming the positive reinforcement that allegedly leads to learning. Skinner asserts this viewpoint in his 1968 book, *The Technology of Teaching*:

We have made sure that effects *do* occur under conditions which are optimal for producing the changes called learning. Once we have arranged the particular type of consequence called a reinforcement, our techniques permit us to shape the behavior of an organism almost at will (p. 10).

The dominance of behaviorism in education is considered to have peaked in the mid-20th Century (Saettler, 1990). The interest and attraction toward behaviorist theories coincided with the era of management and measurement in higher education in the early decades of the 20th Century. I argue in this study that behaviorist principles have persisted or returned in many of today's technological systems for learning and education. In fact, both educational technology companies (Dreambox, n.d.) and learning analytics researchers (e.g., Cope & Kalantzis, 2015) cite Skinner as being influential or "foreshadowing" the types of technological systems and programs advocated by these companies and researchers. As stated, Skinner's (1968) behaviorist education research agenda was driven in part by what he felt were inefficiencies in educational environments--not only the fact that there was only one teacher assigned to many students but also the limitation that individual feedback could not be provided immediately if students were producing incorrect answers to problems (again, viewing teachers as "mere reinforcing mechanisms"). Skinner's own teaching machines encouraged students to enter answers and compare them with correct answers via viewing

mechanisms that presented prompts and correct answers in sequential steps (Benjamin, 1988). The teaching machines were built based on the assumptions that a very narrow and incremental series of stimuli (or “frames”) would create optimal learning systems to minimize the likelihood of students ever getting a wrong answer, and that the techniques would minimize the need for teachers (Skinner, 1968; Benjamin, 1988).

A notable research study in education that used teaching machines was the “Roanoke experiment,” which Saettler (1990) calls “one of the most extensive field tests of programmed instruction” (p. 432). The study compared three type of classes in the Roanoke Schools eighth and ninth grade mathematics courses. In one type of class (the control groups in the experiment) algebra instruction was delivered with a teacher but without the assistance of teaching machines. A second type of class used only teaching machines (a specific model of teaching machine called a “Foringer machine” named for its manufacturer) and no teacher. A third type of class used a combination of teaching machines and teachers. There was early promise that the combined model improved student performance, but the experimental methods were inconsistent and deemed unreliable, and the results of the study were considered “inconclusive” (Saettler, 1990).

The “Klaus and Lumsdaine Study” compared the instruction of physics delivered via programmed instruction devices with a variety of other content delivery modalities (Saettler, 1968; 1990). Among the conclusions of the Klaus and Lumsdaine study were that students who used self-paced programmed instruction devices performed better on standardized tests than their classmates who did not use these devices. Yet, overall achievement in a course was the same (or differences were statistically non-significant) between groups of students.

From Machines to Computers

Ultimately, the popularity of mechanical forms of programmed instruction and teaching machines waned and began to be replaced by tools and approaches that used electronic computers rather than analogue machines. These new tools and techniques were called “Computer-Assisted” or “Computer-Aided” Instruction, with “CAI” being the catch-all acronym for these terms (Saettler, 1990). Just as the teaching machines that predated them, CAI initiatives were built upon the behaviorist assumptions that human experience is only to be understood as observable action, and that learning is simply a form of stimulus-response activity. However, a characteristic of CAI that was unique when compared to prior teaching machines was that CAI systems used some type of branching or randomization in the sequencing of exercises and content. This “personalization” of content and sequencing was inspired by Norman Crowder’s “intrinsic programming” which emphasized the use of corrective feedback only when students needed it; the concept was built upon by Gordon Pask, who proposed divergent branches of problems for each student, depending on their performance in earlier problems:

In assessing learner style, the machine considers several components including types of correct response, error rates on particular types of question, and response time. To improve learning rates, the machine varies the level of question difficulty, prompts are used in varying degrees as indicated, and questions are asked about smaller or larger amounts of material. To accomplish this, simple mechanical devices would need electronic enhancements. (Niemic & Walberg, 1989, p. 269)

Considered among the first major CAI initiatives, Stanford researchers Richard Atkinson and Patrick Suppes acquired funding from the National Science Foundation, the U.S. Department of Education, and the Carnegie Foundation, and worked with IBM to develop drill-and-practice systems for math, spelling, reading, logic, and Russian language in the 1960's (Saettler, 1990). Atkinson and Suppes later formed the for-profit Computer Curriculum Corporation (CCC) to develop more computer-based drill-and-practice learning systems in math and language arts (Saettler, 1990). CCC continued to flourish, developing drill-and-practice software throughout the 1980's and 90's before ultimately being acquired by Pearson Learning in the 2000's. Despite the apparent success of CCC, research findings that studied the use of CCC products and systems yielded no measurable improvement in student learning in reading and language and small to moderate increases in student performance in math and computational skills (Saettler, 1990).

Another notable CAI project was PLATO (Programmed Logic for Automatic Teaching Operations) which provided a range of "tutoring programs," drill-and-practice exercises, educational content, and educational games. PLATO was developed with a \$10 million investment from the National Science Foundation, and it was inspired by IBM's interest in developing computer simulations of teaching machines (Dear, 2017). The PLATO project ambitiously aimed to have a PLATO system in every school in America. However, the program yielded no significant difference in impacting student achievement:

The general conclusion from this research was that no significant difference was found among treatment comparisons, and when significant differences were obtained, they seldom agreed with other findings on the same problem (Saettler, 1990, p. 431).

In general, there was a dearth of affirmative research findings that showed the value of CAI and machine learning in terms of student performance. CAI projects such as PLATO are considered “failures” for these reasons. Feenberg (2001) offers a reason as to why these teaching machines, CAI systems, and even video instruction have failed, stating “educational technologies that lack an interactive component, such as televised courses and computer-aided instruction, have never succeeded in displacing teachers from the front of the classroom” (p. 83). Feenberg (2001) is speaking of human interaction (as opposed to human-computer interaction) in this quote, as he goes on to suggest that the affordances of things like programmed instruction and even online education may have the potential to replace some functions of teachers/teaching, but he presumes that any efforts to do so are largely driven by cost saving motivations rather than altruistic or humanistic motivations. Feenberg (2001) warns against reducing human interactions with automation.

The Mind is Like a Computer/The Computer is Like a Mind

As long as the domain in question can be treated as a game, i.e., as long as what is relevant is fixed, and the possibly relevant factors can be defined in terms of context-free primitives, then computers can do well in the domain. (Dreyfus, p. 27, 1993).

Emulating human activity with machines has inspired both technological advancements and the human imagination throughout history. Since ancient Greece, people have been fascinated by the concept of replicating human characteristics within machines, as evidenced by mythological automata like Talos, the fictional bronze man who patrolled the coast of Crete (McCorduck, 2004). The cognitive revolution of the 1950's and 60's displaced behaviorism with arguments that people were not like animals responding to natural, environmental stimuli in primal urges to eat and survive, but instead that the brain was like a computer program, processing information as inputs, mental states, memory storage and outputs. The teleological model of consciousness and learning had transcended beyond models that lumped humans with animals and objects to futuristic metaphors that compared human brains with computers. The new field of artificial intelligence captured the spirit of this new “information processing” model of consciousness.

Artificial intelligence refers to an assumption and its corresponding research agenda that machines and software code can mimic human consciousness and activities that are considered unique to humans, such as language interpretation, or learning, for example (McCorduck, 2004; Sullins, 2005). Artificial intelligence was both coined as a popular phrase and established as a research program at a computer science conference at Dartmouth in 1956 (Sullins, 2005). Some contemporary learning analytics researchers cite “artificial intelligence” as a field that informs their methods and approaches to education research (e.g., Abdous et al, 2012).

Phenomenologist philosopher, Hubert Dreyfus (1993) traces the origins of AI to the 19th Century, describing the invention of Boolean algebra--the syntagmatic logic of

“and,” “or,” “true,” and “false” -- as being the genesis of computer technology and subsequent artificial intelligence research. Boolean or “binary” logic provides the foundation for all digital technology (Dreyfus, 1993). Digital computers calculate things based on “digits” or discrete units of measurement. In 1835 Charles Babbage created what he called an “analytic engine” based on these Boolean principles (McCorduck, 2004). The analytic engine was capable of performing mathematical calculations as well as storing data in “memory,” thus it represented an early example of applying metaphors of the human mind to early devices that directly led to the development of today’s computer technology (Dreyfus, 1993; McCorduck, 2004). Dreyfus (1993) describes Babbage’s digital analytic engine as being able to “mak[e] logical decisions along the way based upon the results of its previous computations.” A 1937 MIT student Claude Shannon argued in his master’s thesis that Boolean logic could be applied to electronic circuits, thus giving rise to the assembly languages that laid the foundation for modern computers (Kaplan, 2016). Machines and technologies based on Boolean and digital principles, no matter how sophisticated, are confined to perform tasks according to rule-based systems. Metaphors that compare minds with machines are compelling to some, but others contend that human minds do not operate according to rule-based systems (Dreyfus, 1993; Feenberg, 2001; Kaplan, 2016; Weiser, 1999).

Those who believe that the human mind is not only like a machine or computer but that the mind does in fact behave exclusively along rule-based patterns believe in the possibility of “strong” artificial intelligence, or a digital “consciousness” that fully mirrors and functions like a human mind (Sullins, 2005). Others who believe that human consciousness is unique in some ways argue that a “weak” artificial intelligence will

forever be the boundary of what AI is capable of achieving (Sullins, 2005). Weak AI acknowledges that while computers can mimic humans within rule-based systems, there are facets of human consciousness that cannot be replicated by non-humans. Weak AI is what is used in systems that have some “self-learning” or “self-training” component (Sullins, 2005).

In 1943 Researchers from Harvard and MIT Arturo Rosenblueth, Norbert Wiener, and Julian Bigelow wrote a seminal paper titled “Behavior, purpose, and teleology,” which is considered to have had a strong influence on the establishment of the information processing model of the brain and on linking the tenets of behaviorism with the cognitive revolution that was soon to follow (McCorduck, 2004). In the article, Rosenblueth, Wiener, and Bigelow (1943) developed a taxonomy of behavior that, according to them, “. . . reveals that a uniform behavioristic analysis is applicable to both machines and living organisms, regardless of the complexity of the behavior” (p. 22). In this model, behavior was viewed in terms that borrowed from the electronic computing technology of the time--as inputs and outputs--rather than just stimulus and response of physical, external actions. The authors admit the model is philosophically and technologically deterministic, meaning all events can be accurately predicted before they occur, and that technological advancements are inevitable and self-driven. It is this optimism, determinism, and even hubris that defines much artificial intelligence research. The misuse of the term further conflates attempts to interrogate whether non-human devices can in fact behave like humans, or as Ian Bogost (2017) writes in *The Atlantic*, most “AI” applications are really “just software.”

Even if computer programs only *seem* to think and act like humans, it may not matter to education researchers and technologists who advocate for computerized or “intelligent” tutoring systems, for example. Alan Turing’s (1950) famous “Turing Test” asks whether machines can “think” i.e., whether they can believably imitate humans when engaged in a dialogue. Turing played a large role in inspiring the field of artificial intelligence, the sub-field of machine learning, and the conception of human brains as functioning like machines or digital computers (Cope & Kalantzis, 2015, Turing, 1950). Turing suggested that machines can learn when they are able to recognize patterns and self-correct. He posited that human brains could largely be described in “purely mechanical terms.” And he acknowledged the centrality of punishment and reward in teaching and learning. Turing’s seminal article, “Computing Machinery and Intelligence” provides evidence that the cognitive revolution in psychology and education was not necessarily just a departure from behaviorism as is often suggested by those who cite Chomsky’s (1959) rebuttal of Skinnerian “verbal behavior” as the definitive turn in the psychological paradigm, but in some ways, cognitivism was an expansion and continuation of behaviorist beliefs. External, “observable” responses to stimuli in the behaviorist model became internal mental processes and causal relationships at a neurological or synaptic level (eventually becoming “observable” via fMRI scans) in the cognitivist model. In either case, Thorndike’s “Law of Effect” applied to actions and reactions occurring in the body (independent from the mind) in the behaviorist model or the mind (independent from the body) in the cognitivist model.

Critiques of Learning Analytics

Critiques of learning analytics from within the discipline typically run along two lines: those that raise concerns about *ethics* and those that question the *efficacy* of learning analytics strategies. Concerns about ethics relate to things like student privacy or whether data is being constructed and interpreted in ways that are discriminatory. The concerns about efficacy cite the fact that there is a dearth of affirmative findings in the growing body of research literature about learning analytics (Ferguson et al, 2016). From a quantitative research perspective there is indeed a problem of positive findings in learning analytics research as much of the research on data-driven interventions yields “no significant difference in student performance” (as measured by course grades) between control groups and those that do not use interventions based on learning analytics data (Ferguson & Clow, 2017).

Modern moral frameworks typically fall under one of three categories: teleological, meaning morality is assessed in terms of observable consequences; deontological, meaning actions are universally or intrinsically right or wrong as in a sense of duty; and virtue, which emphasizes innate character and values (Spinello, 2011). Where learning analytics are focused on predictions, interventions, and outcomes, ethical concerns are often discussed from a teleological perspective.

Some literature within the field of learning analytics uses ethical frameworks to justify the use of learning analytics and call for more effective and expanded implementations of this technology. For example, Willis, Campbell, and Pistilli (2013) cite well-known ethical theories and maxims (Aristotle’s “golden mean,” Kant’s “categorical imperative” and Mill’s “principle of utility”) in order to justify the use of

predictive algorithms; the creation of predictive models of student behaviors in their “ethical model” are already presupposed and beyond ethical consideration. The underlying assumption is that learning analytics are taken for granted while ethical concerns are only raised in relation to the execution or outcomes of learning analytics data and systems. In another example, Greller and Draschler (2012) discuss what they call “softer” issues related to learning analytics which include, “. . . questions of data ownership and openness, ethical use and dangers of abuse, and the demand for new key competencies to interpret and act on learning analytics results” (p. 43). Greller and Draschler (2012) are most concerned with *how* learning analytics are carried out, as opposed to whether or why such efforts are seen as appropriate in the first place. Such concerns that consider the ethical ramifications of learning analytics yet which do not question the existence or use of learning analytics itself are predominant in the literature about learning analytics ethics. Another example is how Pardo and Siemens (2014) frame the ethical considerations surrounding learning analytics largely as privacy concerns; they ask that institutions should revisit and revise their privacy policies to accommodate the use of new forms of student data. The authors (Pardo & Siemens, 2014) caution against considering the use of personal student data to address institutional needs as being more important than the use of said data to provide insight into the “learning process” of individuals, though “learning process” is not defined nor explained in this article. The ethical problem they put forward is that privacy should be respected while not being allowed to stand in the way of the use of student data to produce measurable positive learning results (Pardo & Siemens, 2014). For example, the authors argue that data collected while “track[ing] learners” can be used to “understand and improve the quality

of a learning experience” (Pardo & Siemens, 2014, p. 438). Pardo and Siemens (2014) argue that “with the capability of *observing* students while they work on an activity, it is possible to deploy new assessment techniques that measure more accurately *the right* achievements” (p. 438; emphasis added).

Dringus (2012) raises ethical questions by somewhat disingenuously characterizing learning analytics as “considered harmful.” “Considered harmful” is a computer science term that hyperbolically draws attention to computer programming code that may be considered sloppy or inefficient; in this context it references the Association of Computing Machinery’s code of ethics, which itself borrows from the well-known Hippocratic oath asking physicians to “do no harm” in research or medical experiments performed on human subjects (Miles, 2004). Dringus (2012) advocates that in order to avoid being harmful, learning analytics data must be transparent or made accessible to the people whose data is being collected “to deter potentially wrongful uses” (p. 89). However, Dringus’ (2012) argument is articulated from a perspective that is concerned about inaccuracy, incorrectness, or ineffectiveness. Dringus (2012) advocates for such things as “good algorithms” and that learning analytics “MUST inform *process* and *practice*” (p. 89) meaning the data should inform things like curriculum redesign or improved delivery of instruction, according to the author. The central criticism is not about the use of learning analytics data as a performative or operational instrument itself; instead, the argument is that any such operational implementations should not mishandle (in a very narrow sense) or misinterpret data. Dringus admits the use of the phrase “considered harmful” is not a wholesale indictment of learning analytics and predictive algorithms in education, but it is used as a rhetorical alarm bell or as an “attention

grabber” (p. 89). Such “criticism,” it appears, is merely a call to the careful and consistent processing so that it might have a positive impact on instruction—rather than a critique of analytics in any substantive sense.

As West, Huijser, and Heath (2016) correctly surmise, “grappling with ethics in relation to learning analytics has only just begun” (p. 904). Indeed, there is a broad range of ethical issues presented by learning analytics. Some researchers within the field of learning analytics reflect on ethical considerations related to the deployment and execution of processes and policies for learning analytics projects (Scholes, 2016; Slade and Prinsloo, 2013). Such literature discussing the ethics of learning analytics written by scholars within the field offers a conception of institutional purpose that is focused on quantifiable metrics. For example, Slade and Prinsloo (2013) offer three options for institutional purpose:

At some point, all institutions supporting student learning must decide what their main purpose really is: to maximize the number of students reaching graduation, to improve the completion rates of students who may be regarded as disadvantaged in some way, or perhaps to simply maximize profits. (p. 6).

The authors elaborate on this point by stating that “positive relations” with students are also at stake, declaring that “the ways in which students perceive such surveillance will also vary in accordance with their own understanding of the institution’s purpose” (Slade & Prinsloo, 2013, p. 6).

Some learning analytics researchers admit a separation between learning analytics practices and what they describe as educational aims and goals. For example, Ferguson, et al (2016) claim that “much of the current work on learning analytics concentrates on

the *supply side* – the development of tools, data, models and prototypes. There is considerably less work on the demand side – i.e. on how analytics connect with education. . .” (p. 9, emphasis added). It is interesting that this self-criticism is articulated in economic or distribution language of supply and demand. Additionally, the statement represents how technology (“tools, data, models, and prototypes”) are presented as solutions to problems that are not clearly articulated. The presence and use of these types of metaphors may represent a particular way of framing educational value as a private economic benefit (Pasque, 2014).

Speaking from the perspective of a learning analytics researcher, Clow (2013) acknowledges that there are problems with framing education as “. . . as an economic activity and [as opposed to] conceptions of education and learning that are concerned with the development of meaning and the transformation of understanding” (p. 683). Clow quickly retreats from such broad-reaching sentiments and dismisses them as what he calls “purely theoretical concerns” focusing instead on the “practical, concrete” concerns related to practice and implementation. Clow (2013) justifies the predominance of quantitative research in education because, he argues, quantitative methods are “supported by theory” (using theory in a different sense than earlier and implying that qualitative methods are not supported by theory) and because there have been dramatic increases in available data that researchers should take advantage of.

Some research that raises questions about the ethics of learning analytics goes beyond consequentialist ethics and considers learning analytics from a deontological perspective. Focusing on methodology, some researchers (e.g., Scholes, 2016; Perrotta and Williamson, 2018) posit that the techniques of cluster analysis or categorizing

student populations, especially based on demographic or identity attributes, may be considered inherently discriminatory or objectifying. Scholes (2016) makes the case that by reducing a student to a collection of risk indicators based on aggregate data, decisions made about and acted upon students from these data sets and techniques may be done in a way that negates each student's agency as an individual. Scholes (2016) argues that much of the literature about ethical concerns related to the use of data in education have to do with institutional considerations in terms of adhering to policies. Scholes attempts to go beyond policy concerns, focusing instead on "the concept of categorizing students according to the statistical risk that can be attached to them" (p. 942). Scholes (2016) finds the conception of student agency as implied in the dominant literature about learning analytics problematic, stating that student agency is typically addressed in a way that privileges the institution, or, as Scholes states, to simply "inform students that learning analytics are used and get their consent" (p. 942). The argument that Scholes (2016) makes in her article is that philosophical positions on discrimination should be considered in relation to the enacting of differential treatment to students based on statistical clustering or predictability of behavior.

Perrotta and Williamson (2018) further criticize cluster analysis as being limited or biased in how it attempts to describe "nebulous and open-to-interpretation" phenomena such as learning. The underlying argument put forward by Perrotta and Williamson (2018) is that research methods and devices or apparatus' of measurement are themselves involved in the co-construction of a version of reality stating that, "the interaction between forms of educational expertise, interests and algorithmic techniques is leading to a new form of unquestioned educational consensus around educational data

science” (Perrotta & Williamson 2018, p. 2). Williamson (2017) builds upon this sociologically-based criticism by analyzing “educational data science” as a “field of power” wherein educational data science promulgates its ideology through the articulation of “sociotechnical imaginaries,” or visions of technology-enabled educational futures that are embraced and mobilized via the creation and acquisition of social, economic, and cultural “capital.”

Roberts-Mahoney, Means, and Garrison (2016) describe how the “corporate reform movement” in higher education is enthusiastic that “integrated digital platforms such as big data mining, algorithmic computation, learning analytics, and adaptive learning systems can support and enhance educational quality and efficiency through ‘personalized learning’” (p. 407). The problem, according to these authors, is that narratives of personalized learning and learning analytics, at least as they are configured in the texts that were studied, privilege the commercialization of pedagogy and minimize or remove curricular and pedagogical concerns from public institutions and from teachers. The effect of this is not only a shift towards privatization, but also a form of “demoralization” of both students and teachers:

This standardized customization not only reframes education as a narrow private good oriented primarily toward efficiently preparing students for twenty-first century global economy, it also serves to re-render complex characteristics of human beings into discrete ‘skills’ that are transformed into data points subject to the authority of a computer algorithm outside the control of the individual student, the school, or the community. (pp. 416-417)

In an article in the *Journal of Learning Analytics* (one that is unusual compared to the types of studies that typically populate the journal) Mireille Hildebrandt (2017) writes about freedom and democracy as contrasted against learning with machines:

To the extent that a person is reduced to inferences about her machine-readable behaviours, and targeted based on such inferences, her freedom from unreasonable constraints (liberty) to construct her identity (dignity) may be violated. (p. 7)

Where Hildebrandt (2017) discusses in the article the pitfalls related to the modification of behavior through algorithmic conditioning, she also intimates much broader tensions related to freedom and power.

General Criticisms and Concerns about “Big Data”

Public concern about the misuse and abuse of web-based platforms, big data, and predictive algorithms has increased in recent years as there have been a raft of scandals involving global Internet platforms such as Facebook and Google. Facebook faced public disapproval when they experimented with people’s moods (David, 2016). After news broke of their unethical research, the company has since been accused of leaking data to third parties, exacerbating genocide in Myanmar, and playing a role in election tampering in the U.S. election in 2016 (Mozur, 2018; Miller, 2018). In each of these instances, company spokespersons, including CEO Mark Zuckerberg, demur when asked whether they or their company have any responsibility in such activities (United States Senate Judiciary Committee, 2018). In a similar vein, Google’s leadership have denounced concerns about privacy as the company has been found to violate the privacy rights of individuals with their various services and platforms related to web search and

geolocation (Zuboff, 2015). In Europe new legislation called the General Data Protection Regulation (GDPR) has been created as a comprehensive set of policies to protect consumers against unlawful or unethical use of personal data (EUGDPR.org, 2018). The GDPR contains language about a person's "right to be forgotten" or one's right to have personal information like photographs be removed from web services like Google. These types of policies have existed in other countries prior to the GDPR. However, these or similar policies do not exist in the United States. The Family Educational Rights and Privacy Act (FERPA) provides limited protections to things like "directory information" (U.S. Department of Education, 2018), but comprehensive laws that deal specifically with digital data privacy have yet to be written. How data is managed, handled, and monetized is articulated in each company's terms of use or end user license agreements.

Technology companies tend to avoid taking responsibility for their tools' and services' capacity to "do harm." Meanwhile their databases and algorithms are prone to bias, discrimination, and the inequities that exist in the human societies, companies, and programmers that create the tools and services (O'Neil, 2016; Noble, 2018). Speaking as a mathematician working for a hedge fund during the housing market crash of 2008, Cathy O'Neil eloquently captures the problems of large scale statistics:

The math-powered applications powering the data economy were based on choices made by fallible human beings. Some of these choices were no doubt made with the best intentions. Nevertheless, many of these models encoded human prejudice, misunderstanding, and bias into the software systems that increasingly managed our lives. Like gods, these mathematical models were opaque, their workings invisible to all but the highest priests in their domain:

mathematicians and computer scientists. Their verdicts, even when wrong or harmful, were beyond dispute or appeal. And they tended to punish the poor and oppressed in our society, while making the rich richer. (p. 3)

In a similar vein, author and scholar Shoshana Zuboff (2015) characterizes big data as a new form of “surveillance capitalism,” in which the “logic of extraction” and accumulation converge and transcend into the commodification of reality itself as predictive and personalized advertising take advantage of ubiquitous computing and the ubiquitous collection of human data that it affords. Big data, in Zuboff’s (2015) economic model, is “heterogeneous, unstructured, trans-semiotic, decontextualized, [and] agnostic,” and it supports the “corporate strategy’s formal, deductive, inward-focused, and positivistic conventions.” Zuboff’s (2015) version of big data is one that is both ever-present and exploitative. Ultimately, questions about the use of large data sets, automation, and “intelligent” forms of analysis, prediction, and intervention should be considered against the educational purposes they allegedly support.

Summary of the Literature Review

Education is a complex field. There are many historical influences and modern viewpoints that make education, specifically higher education, the site for much debate, disagreement, conflict, optimism, and speculation. In this chapter, I provided overviews of two educational topics: “American higher education” and “learning analytics.” In the section about American higher education, I provided a brief history of American higher education (and its European predecessors) from the formation of colonial institutions to modern tensions and ideologies. The literature strand on American institutions shows how educational ideologies are formed and framed alongside historical trends and events.

The historical events that underpinned the ideologies of American higher education are characterized by themes of imitation, optimism, competing interests, and multiple aims. From the first colleges to the formation of public universities there have been champions from all forms of governance that these higher education institutions provide moral development and the acquisition of useful skills. As higher education adapted to new post-industrial environments in the late 1800's, educational leaders reinforced the values of freedom and self-determination, drawing heavily on the reforms that occurred in Germany during the earlier part of that century. These represented the liberationist ideals of the Enlightenment. However, soon after these values were declared by the leaders of America's preeminent colleges and universities, a wave of scientism and managerialism swept across all types of public, private, and social organizations, with higher education being no exception. The modernist period that spanned across the first half of the last century was marked by conformity, efficiency, and regulated capitalism. Behaviorism in psychology emerged as a reflection and reproduction of modernist concepts that people can be sorted and controlled using sophisticated scientific methods.

The postmodern era of art, literature, and philosophy was ushered in by the cultural revolutions and civil rights movements of the 1960's. This period was defined by diversity, creative expression, and relativism. These themes persisted and have been reconfigured throughout the 20th Century as the country went through profound social and geopolitical events (from world wars to civil rights movements) that, among many other effects, dramatically changed the profile of college and university students. Universities became more "diverse" not only in the demographic composition of their students, but also in the multiple projects, programs, and services they began to provide.

It is important to note that for much of their history, narratives about higher education were constructed by and for wealthy, white men while claiming to promote freedom, liberty, and access for all.

Through examples and evidence, I have reiterated the claim I made in the introduction: that there is a widely-held belief that higher education's primary purpose is framed in economic rather than democratic or humanistic terms. This belief is held not only by pundits and politicians, but it is also held by the increasingly large and diverse body of students. Scholars from the Carnegie Foundation for the Advancement of Teaching (the same Carnegie Foundation that invented the credit hour only to criticize it a mere three decades later) found this to be true in their case for moral and civic education:

A trend that has contributed to the decrease in attention to education's moral and civic goals is the widespread sense among students that they are in college solely to gain career skills and credentials. . . many undergraduates view general education --the courses most often associated with moral and civic learning--as hurdles to get over on the way to preparing for that career. (Colby et al, 2003, p. 40)

The new field of learning analytics includes a menagerie of different methodologies, disciplinary jargon, and its own terminology. Many terms used in the learning analytics literature are not well-defined, nor are there consistent approaches to how learning analytics techniques should be implemented. Much of the literature produced by learning analytics researchers is focused on the gathering and interpretation of educational data, "the supply side" as described by Ferguson and her colleagues

(2016). The learning analytics community advocates for “better results,” yet even these ambiguously defined results are typically not realized in the types of experiments conducted by proponents of learning analytics (Ferguson & Clow, 2017). Furthermore, there is inconsistency in describing what results should be attained. Complex concepts like “learning,” and “knowledge” are taken for granted in these articles. Another concern is the way in which much learning analytics research is steered (or not) by ethical or philosophical principles. The narrow definition of student performance in this body of literature is often behaviorist in nature or focuses on memory recall. In this narrow context, ethical discussions often conclude that needs to be more learning analytics initiatives in order to effect more positive behaviors or “measurable” results. Broader concerns about privacy or racial discrimination are trivialized (e.g., Cope & Kalantzis, 2015).

Learning analytics spawns from a lineage of positivist education research and is related to adjacent fields like artificial intelligence. The literature review shows how positivism has persisted throughout various trends in education and technology during the 20th century, from teaching machines to artificial intelligence. This prevalence of positivism began in the early part of the 20th Century when the trajectory of education research could have gone in one of two directions: on the one hand, the pragmatic, experiential, and democratic theories of education associated with the likes of John Dewey, and on the other hand the more clinical, reductionist, and mechanistic views of behaviorist psychologists like Edward Thorndike (Lagemann, 2000). Thorndike’s scientific approach overshadowed humanistic alternatives to the extent that behaviorist “stimulus-response” conceptions of education, coupled with technological analogies for

learning and the mind, dominated education research paradigms throughout the early half of the 20th Century (Lagemann, 2000). As educational technologies evolved from simple multiple-choice machines to software programs with multiple branches, the underpinning logic that learning can occur by an individual interacting with some kind of device (rather than a person) persisted through each of these eras as cognitivist thinking displaced (or rather built upon) the behaviorist notions before them (Friesen, 2009; Saettler, 1990).

Positivist education research is often undergirded by the information processing metaphor for the mind (Friesen, 2009). This model has its critics. Hubert Dreyfus (1993), in his critique of colleagues at MIT who were doing research on artificial intelligence, refutes any model which considers the human mind to be like a computer or a machine that is simply a series of inputs and outputs. In his critique of these assumptions, Dreyfus (1993) challenges any model of consciousness that presents it as machine-like, reductionist, or “formalizable” (p. 189). In his critique, Dreyfus (1993) also explains how popular conceptions of the brain and cognition have mirrored technological advancements throughout history, including the telephone, switchboard, and computer. These analogies have led to popular conceptions of the human mind where activities like thinking, learning, even consciousness are now described in terms of computer processes, where thinking supposedly consists of discrete and atomized “units” of thought that are received or transmitted (Friesen, 2009). Very few scholars present questions or concerns about whether data should be used to restrict or narrow educational experiences or whether interventions based on data might be considered covert forms of manipulation and control. The narrowness, the methodological confidence in positivism and technology, and the language about surveilling and manipulating people in learning

analytics represents a new form of Fordist ideology. Fordism sought to turn humans into “abstract, calculable, uniform things, mere objects in a totally rationalized system controlled by and for others” (Gartman, 1998, pp 122-123). This return to Fordism in the tech sector was described by Richard Barbrook and Andy Cameron in 1995 as the *Californian Ideology*, marked by technological optimism, libertarian individualism, and the infallibility of machine logic in both organizational management and human affairs. Common among economic sociological theories like the California Ideology, *neo-Fordism* (see Hodkinson, 1997; and Stevens, 1996), and Sennett’s (2006) “New Capitalism” is the belief that efficiency is inherently valuable as a means to increase productivity and consumption.

Learning analytics researchers such as Ekowo and Palmer (2016) advance neo-Fordist ideologies as they describe the potential value of learning analytics as being able to “help instructors more precisely pinpoint students’ learning deficits and customize the academic experience so they are aligned with how they learn best,” adding that learning analytics “can help students *accelerate* their learning by allowing them to *move quickly* through content . . .” (p. 6, emphasis added). Efficiency has been a predominant trope in many dimensions of American life including education since the early 1900’s (Callahan, 1962). Scientific approaches to education research as well as to the administrative management of educational institutions were embraced by education leaders throughout the 20th century (Callahan, 1962; Lagemann, 2000). This “efficiency motive” supported by scientific inquiry, continues to influence the goals and methods of educational researchers and practitioners. The focus on efficiency and productivity influenced the aims of higher education by refocusing the institutions on throughput and financial

growth. This produces an administration that is focused on self-preservation, or as Douglas (1992) states, “the hallmark of the university, then, is no longer unfettered inquiry but rather bureaucratic mechanisms.” However, it is not universally accepted by contemporary scholars that efficiency itself, nor the adjacent objectives of profit or “cost/benefit” are or should be the exclusive aims of an educational enterprise. In opposition to claims about speed, optimal alignment, and management, Hansen (2012) proposes practices and principles of liberal arts education that all citizens should embrace in order to become what the author calls “liberated consumers.” The first of these principles suggests that students engage in curriculum that is characterized by “complexity, difficulty, and *slowness*” (p. 69). Hansen’s (2012) characterization exemplifies the contrast between scientific and business logic on the one hand and liberationist, humanist pursuits on the other hand; the latter aims being more in line with what the leaders of the early colonial American higher education institutions envisioned (Douglas, 1992; Thelin, 2004).

While it would be convenient to simply paint these ideologies as dichotomous and incompatible, much of the literature on higher education advocates for *both* professional “training” as well as broad exposure to a range of ideas and moral development (regardless of the speed at which it occurs). The conflict, struggle, and attempts at reconciliation among concepts like “liberal” and “useful” is a recurring pattern in the history of higher education. Cheit (1975) characterizes the pattern of changes and struggles in higher education:

Virtually every instructional field has had to fight its way into the curriculum.

Medieval philosophers struggled to exclude the humanistic disciplines; classicists were determined to keep out science, and the useful arts too had to fight to gain a foothold in the academic community and struggle for grudging acceptance. (p. 19).

What motivated the relatively recent additions of professional programs with such speed and public support, and their increasing popularity over humanities or liberal arts programs may correspond to societal shifts brought about by the industrial revolution and the rise of “big business” (Drucker, 1946). Callahan (1962) describes public education as perennially vulnerable to public criticisms that question the economic value provided by public schools. Throughout the first half of the 20th Century, educational administrators were influenced by the popularity of the types of management and accountability practices that were invented and popularized by Frederick Taylor in the steel manufacturing industry and Henry Ford in the automobile manufacturing (Callahan, 1962). The rise of professional disciplines like management and engineering and their popularity among students exploded in the latter half of the 20th Century. Dan Berrett (2015), writing for the *Chronicle of Higher Education*, recounts what he considers another point in time when the popular discourse of higher education shifted sharply towards an emphasis on jobs and employment and away from an emphasis on liberal education. According to Berrett (2015), this shift occurred on February 28, 1967, when California Governor Ronald Reagan criticized the types of courses and curriculum (e.g., “cultural studies”) that were being offered by the University of California System. Reagan stated that taxpayers should not “subsidize intellectual curiosity” (Berrett, 2015)

proposing instead that Universities should provide the training and skills that are desired of employees in profitable industries. Two years later, Raegan sent riot police to Berkeley to quell yet another student protest rally. University of California System President Clark Kerr and the Berkeley faculty voted on a resolution that supported free speech and free expression among students, including the types of rallies in which Reagan forcefully intervened.

This literature review, the selected texts that are analyzed, and this study as a whole grapples with these notions of conflict, struggle, and dialogue between and among disciplines, purposes, and ideologies in educational discourses. Beneath these discourses are power struggles between freedom and control.

CHAPTER THREE: METHODOLOGY

Introduction

This chapter provides a summary of the method of analysis used in this study. First, I will describe some of the disciplinary influences on Critical Discourse Analysis, and I explain how this study utilizes a particular combination of CDA techniques—a novel amalgamation of methods articulated by two leading authors of CDA, namely, Norman Fairclough (1989, 1995, 2003) and James Paul Gee (2011, 2012). I explain with specific examples how three phases of analysis will be carried out through a microanalysis, mesoanalysis, and macroanalysis. The analysis will move from descriptions of specific words and grammatical structures contained in each text (microanalysis), to interpretations of how these elements serve as representations of identity and practice (mesoanalysis), and finally, to explanations of how ideology, politics, and power underpin the forms of social language represented in each text (macroanalysis) (Fairclough, 1995; Gee, 2011).

The concept of immanent critique informs the overarching heuristic and structure used in the analyses; therefore, I will explain it briefly and make explicit how it is connected to this study. I also describe in this chapter the data or sample texts that were selected, and how I selected them—as well as the original context or setting of each text. I acknowledge the criticisms and limitations of CDA as well as its strengths and suitability to address the research questions in this study. The chapter concludes by discussing the strengths and limitations inherent in the bias or “positionality” of the researcher. This

chapter is comprised of the following sections which detail the method and process of analysis:

1. Critical Discourse Analysis as it is Applied in this Study
2. Microanalysis (Description): Sign Systems and Significance
3. Mesoanalysis (Interpretation): Activities, Identities, and Relationships
4. Macroanalysis (Explanation): Politics and Connections
5. Immanent Critique
6. Data collection
7. Strengths and/or limitations

Critical Discourse Analysis as Applied in This Study

Critical Discourse Analysis (CDA) is multidisciplinary (van Dijk, 1995), meaning it combines theoretical and methodological tools and concepts from a variety of disciplinary traditions. In particular, CDA is related to both Critical Theory, which as outlined above is a branch of sociological and philosophical study (Buchanan, 2018), and to Discourse Analysis, which is a methodology that emerged from the fields of linguistics and psychology (Schiffrin, Tannen & Hamilton, 2003; Wodak & Meyer, 2001). While there are varying approaches to CDA, a common element among each of them is an interest in socio-cultural phenomena (Wodak & Meyer, 2001).

The terms “critical” and “discourse” have various meanings and uses, so I will briefly describe how these terms are interpreted and applied within a Critical Discourse Analysis. Critical research is different from other forms of positivist, experimental, and qualitative research. The term “critical” in CDA refers to a specific orientation toward analyzing and “criticizing” ideological claims. There are limits and constraints of purely

quantitative research when applied to certain types of human phenomena (Benton and Craib, 2001; Creswell, 2013; Strydom, 2011). Any critical research, including this study, seeks to illuminate power dynamics or to be emancipatory through the examination of dialectical relationships, tensions, biases, historical influences, and contradictions (Bronner, 2002; Wall, Stahl, & Salam, 2015). Natural science focuses on prediction and control while critical theory promotes reflection and interpretation while considering cultural phenomena and personal experiences (Habermas, 1971). Critical researchers analyze dominant or authoritative voices (i.e., the groups which hold power) in social contexts (Rogers, et al, 2005). This study focuses on education, which is a social institution, and this study uses interpretation to analyze social meaning as it is (re)produced in text form. It looks at expressions of power-holders, institutions themselves and researchers driving an ambitious and well-funded agenda for analytics research.

“Discourse” in a very broad sense refers to the use of language to communicate (van Dijk, 1998). This study will employ Gee’s (2012) definition of discourse as “social language” or more specifically, “a socially accepted association among ways of using language, other symbolic expressions, and artifacts, of thinking, feeling, believing, valuing and acting . . . (p. 158). Discourses are evident in speeches, interviews or any verbal utterances; they are also evident in written text, images and graphics, videos, as well as symbols and icons (Fairclough, 2003). These artifacts project certain understandings, practices, and characteristics of social groups (e.g., education researchers, students, or academic leaders). In this study, the discourses analyzed exist in the form of texts (and their contexts) produced by proponents of learning analytics and in

the form of public declarations of purpose by institutions of higher education. These texts articulate the purposes and aspirations both of institutions and of learning analytics providers, intimating within these articulations what education is, what education does, and what education should be according to the respective entities.

This study combines elements of Fairclough's (1995) phases of analysis with Gee's (2011) building tasks of discourse. As mentioned above, Fairclough (1995) proposes a three-step approach to Critical Discourse Analysis: a microanalysis, or description; a mesoanalysis, or interpretation; and a macroanalysis, or explanation. In each of Fairclough's (1995) phases, Gee's (2011) *building tasks* will serve as tools for analysis. Gee identifies seven building tasks that construct reality: significance, sign systems, identities, activities, relationships, politics, and connections. The relationship between these building tasks and phases of analysis is represented in the following table:

Table 3.1 Phases of Analysis, Building Tasks, and Supportive Techniques and Questions

Fairclough's (1995) phases of analysis	Gee's (2011) building tasks	Techniques and questions
Micro (description)	significance and sign systems	Frequency of words, types of nouns, noun phrases, grammatical structures, etc., use of modifiers to emphasize key terms, use of jargon
Meso (interpretation)	activities, identities, and relationships	Description of the actors, what they are doing and the relationships between/among actors and other entities? How these are represented rhetorically, e.g., via the use of transitivity or nominalization.
Macro (explanation)	politics and connections	How are public and private interests represented? Individual vs. social aims? How is <i>power</i> expressed and animated by these texts? How are these themes "built" by elements in the prior phases? What other discourses are these texts connected to and how?

Ideology plays a central role in this study; I will therefore elaborate on the meaning of the term and how it is incorporated into critical approaches to research. This research study will employ van Dijk's (1998) concept of ideology as the "basis of the social representations shared by members of a group" (p. 8). Making a connection between discourses and ideologies, van Dijk (1998) further posits that discourses are "ideologically based social practices" and the "most crucial" in the "social reproduction" of ideologies. As it pertains to the critical aspect of this study, I also consider Eagleton's (1991) discussion of the relationship between ideology and power, as he states that ideology legitimates the "power of a dominant social group or class. . . A dominant power may legitimate itself by *promoting* beliefs and values congenial to it; *naturalizing* and *universalizing* such beliefs so as to render them self-evident and inevitable" (p. 5). Exposing the ideologies and the politics embedded in texts is what makes a critical approach to research emancipatory. Understanding that ideologies exist or are dominant is foundational to an emancipatory agenda; discovering and articulating *why* these ideologies have become dominant is a goal of the analysis.

Microanalysis

In the microanalysis, words, parts of speech, and grammatical and rhetorical structures and devices are listed and described (Fairclough, 1989, 1995). This description phase of the analysis is concerned with the "formal properties of the text" (Fairclough, 1989, p.26). Subjects, verb phrases, subjects within subordinate clauses, and characteristics and conditions (e.g., adverbs, prepositional phrases) will be identified. The microanalysis considers how key terms are emphasized e.g., via the use of modifiers, word order, word frequency, hyperbolic language, or juxtaposition of terms and concepts

(Machin & Mayr, 2012; Wodak & Meyer, 2001). Attention is given to jargon or specialized language as these, along with the syntactic and semantic elements described above, are examples of how significance and sign systems are built by language (Gee, 2011). These lay a foundation for the mesoanalysis, or interpretation phase, as the mesoanalysis begins to illuminate what these syntactic and semantic elements may imply about actors and their actions as more elaborate linguistic elements are explored (Fairclough, 1995).

Mesoanalysis

The mesoanalysis allows the researcher to show through interpretation how the grammatical and linguistic elements in texts offer insight into what the producers believe or wish to convey about activities and identities (Gee, 2011; Fairclough, 1995, 2003). The presence of grammatical elements such as transitivity, nominalization, presupposition, and action verbs will indicate how the texts produce and reproduce assumptions about what identities and practices are valued or prioritized (Machin & Mayr, 2012). In this study, *practice* is defined as a “socially recognized and institutionally or culturally supported endeavor that usually involves sequencing or combining actions in certain specified ways” (Gee, 2011 p. 18). *Identities* enact ways in which people speak and act that are associated with particular circumstances, contexts, and moments in time (Gee, 2011). Below are definitions and examples of some of the linguistic configurations, how they are used to “build reality” and how they might be analyzed in this study (Gee, 2011).

Transitivity is a grammatical property that shows the relationship between verbs and direct objects (Heffernan, Lincoln, & Atwill, 2001). Transitive verbs are present

when there are complex sentences that include subordinate clauses (Fairclough, 2003). Machin and Mayr (2012 p. 104) describe the presence and analysis of transitivity in Critical Discourse Analysis as it applies to human actors:

Transitivity is simply the study of what people are depicted as doing and refers, broadly, to who does what to whom, and how. This allows us to reveal who plays an important role in a particular clause and who receives the consequences of that action. A transitivity analysis of clause structures shows us who is mainly given a subject (agent/participant) or object (affected/patient) position. (p. 104)

Besides relational processes (where or how things or people are positioned in relation to each other), the other types of transitive actions that can be conveyed by verbs are *material* (actions with concrete results or consequences), *mental* (thoughts or ideas), *behavioral* (human activities), *verbal* (utterances or communication acts), or *existential* (properties or characteristics) (Fairclough, 1989; Machin & Mayr, 2012).

Nominalization occurs when actors or actions are diminished or obscured by converting verbs into noun forms. Machin and Mayr (2012) describe nominalization as a device which “replaces the verb process with a noun construction, which can obscure agency and responsibility for an action” (p. 13). An example of nominalization can be found in the University of Texas at Austin’s (2017) mission statement. The noun forms as they appear in “development,” “dissemination,” and “commercialization” remove any individual actor from the statements in which these words occur. In practice it could be “faculty members,” “researchers,” etc. who are the specific people performing these actions, but in the mission statement, the nominalized forms of these activities create a sense that the “university” is a collective entity performing these actions.

Presupposition is another device whereby a statement is made in such a way that it assumes the reader already knows about or agrees with whatever claim is being made. Presupposition is evident in the Lonsdale and Bush (2017) example I provided previously in which the authors made claims about university accountability and the need for job training. As Machin and Mayr (2012) state, presupposition, “. . . has to do with what kinds of meanings are assumed as given in a text” (p. 153). Presupposition does not have to be covert nor subtle; it can be stated explicitly and utilized to build the foundation of an entire argument (Machin & Mayr, 2012). When presuppositions are present in a text, the reader is encouraged to maintain a certain degree of suspended disbelief in order to make sense of what is being read (Fairclough, 1989). Another example of presupposition is found in one of IBM’s (2017) web pages about cognitive computing in education, in which it states, “the rapid digitization of the education industry and the emergence of cognitive systems is already happening in parallel.” In order for a reader to follow the logical structure of this statement, the reader must go along with or take “as given” assumptions about what concepts like “digitization” in the education “industry” mean or entail, let alone the fact that they are happening “rapidly” or “in parallel.” By making the reader complicit in entertaining such assumptions, the text (re)produces and/or perpetuates ideologies that undergird them (Fairclough, 1989).

Identities are not just present in the text. The reader or “recipient” of a text also has an identity, or an identity the writer wishes the reader to have. Fairclough (2003) explains the concept of what he calls “*recipient design*” or “position design” where language and representation assumes or attempts to shape certain beliefs and identities in the recipient of the writing or speech (2003, p. 8)

We sometimes actively try to entice [our readers] to be who or what we want or need them to be. We try to “position” others to be and do what we want them to be and do. . . We might write in a way that tries to get readers to be more liberal or conservative or more religious or less religious than they may actually be. We entice listeners and readers, if only for a while, to take on a new or different identity that may lead to new or different beliefs or actions. We seek to persuade, motivate, change, and even manipulate others. (p. 8)

Who the recipient is intended to be and what the producer of a text wants their audience to pay attention to, believe, or do, begins to expose the producer’s potential political and ideological motivations (Althusser, 1984).

Macroanalysis

The macroanalysis focuses on politics and connections (Fairclough, 1995; Gee, 2011). The relationship between individual texts and broader social meaning is elucidated through a process of “explanation” (Fairclough, 1989, 1995, 2003). Explanation seeks to “portray a discourse as part of a social process, as a social practice, showing how it is determined by social structures . . . sustaining them or changing them” (Fairclough, 1989, p. 163). Fairclough (1989) posits that this stage of analysis explains relations of power and social struggles. The macroanalysis discusses ideologies that are perpetuated by the texts. Topics that may be discovered and discussed in the macroanalysis are how the discourses frame individuality as contrasted with a sense of community, or how market forces influence the economic discourse of efficiency and scale contrasted with concerns about substance, quality, or philosophical aims related to freedom and justice. These things are political and connected with other discourses (Gee, 2011).

The macroanalysis builds upon the prior phases of analysis. Statements about activities and identities as gleaned from and combined with what the producer of a text wants to emphasize (from the mesoanalysis) via signals and word choices (from the microanalysis) will begin to show ideological intentions of the text producers (the macroanalysis). Connecting this analysis with the literature review, the ideological themes are mapped to the types of frameworks and continua that show political and economic views of education.

Immanent Critique

Immanent critique is a philosophical term derived from the dialectical methods along Hegelian and Marxist theoretical traditions (Antonio, 1981; Sabia, 2010). As a tool for analysis, it seeks contradictions within social constructs (Antonio, 1981). Immanent critique asks why such contradictions exist and in whose interests they may serve (Friesen, 2009). The purpose of immanent critique is to expose myths and hypocrisies contained within *dominant* discourses particularly (Antonio, 1981). Immanent critique focuses on claims or abstract truisms about society that are presented as obvious facts or common sense knowledge (Antonio, 1981; Friesen, 2009; Sabia, 2010). An immanent critique analysis historicizes and demystifies concepts by revealing their origins and who benefits from their continued existence (Sabia, 2010). Immanent critique not only questions the rationality of what a particular group considers to be fact or common sense understanding but it does so with language that is intrinsic or familiar to the audiences whose claims are being challenged (Sabia, 2010). The analysis is conducted within the constructed reality of the texts themselves. By revealing the sources of imaginary or

invented concepts and assumptions, immanent critique may enable emancipatory social change (Antonio, 1981; Friesen, 2009).

Data Collection

The individual texts analyzed in this study were chosen because of their social, economic, and cultural significance (Williamson, 2017). I selected web pages as the site of these texts because they are virtual contexts in which public representations of purpose and function are advanced by each entity (Butin, 2010; Leitch & Palmer, 2010). The different genres of texts add depth and richness to the insights of this study, or as Leitch and Palmer (2010) states, “it is through the analysis of both individual texts and the relationships between texts that CDA offers insights into social phenomena” (p. 1197). The following table lists the specific texts that are analyzed in this study:

Table 3.2 List of Texts Categorized by Genre

Genre	Producers
Commercial learning analytics provider	IBM Cognitive Computing for Education Knewton Higher Education Pearson Education
Public higher education	University of Texas - Austin University of Oregon Michigan State University

I selected each text using a *purposeful criterion sampling* technique (Creswell, 2013, p. 158; Palys, 2008). Criterion sampling identifies subjects that have certain characteristics or that meet some criteria (as the name implies) (Creswell, 2013; Palys, 2008). The companies whose websites I chose to analyze offer services to higher

education institutions. These services appear to address not only student “success” and retention but also the activities of teaching and learning. Each company is present in the literature about learning analytics and its history.

IBM is a large, transnational company that has been involved in positivist, behaviorist, and AI educational technology projects and experiments for nearly one hundred years (see Hughes, 1962; McCorduck, 2004; Saettler, 1990). Knewton was established in 2008 and has been popular in educational news publications for making bold claims about improving learning and institutional outcomes (e.g., Schaffhauser, 2019; Wolf, Armstrong, & Ross, 2018). In some cases, Knewton supplied analysis algorithms behind content delivery platforms such as Pearson Education (Wan, 2017). Pearson is the largest education company and largest book publisher in the world (Milliot, 2018). It began in 1844 as a construction company in the United Kingdom and became a publishing company in 1920; since then it has expanded its products and services to include a range of textbooks, web-based content, and educational software (including learning analytics) (Pearson, 2018).

I used purposeful criteria to arrive at the sample of higher education texts (Bauer, 2000). The AAU figured prominently in the formation of modern American Universities (see Geiger, 1986; Thelin, 2004). I generated a list of the institutions that are official members of that group. Seeking institutions that are connected to the ideological origins of modern American public higher education institutions (see Chapter 2), I filtered the list to public universities that were formed over one hundred years ago. That left me with thirty-six schools. In reviewing texts from each of these institutions, I considered whether the form and content of the mission statement language would help answer the research

question in this study (Bauer & Gaskell, 2000). For instance, some mission statements included many disparate components or had unique college-level mission statements but no overarching mission statement for the entire university. The texts I chose for analysis had similarities in that they represented a university-wide scope.

The texts I selected for this study were produced by institutions that have cultural capital and/or historical significance. The University of Texas at Austin has the largest endowment of any public university in the United States (University of Texas at Austin, 2017). Michigan State University is the first “land grant” institution funded by the Morrill Act (Michigan State University, 2018). The University of Oregon is a member of the AAU and is classified as the top-tier “Very High Research Activity” by the Carnegie Foundation (University of Oregon, 2017). The University of Oregon’s mission statement web sites also links to additional information describing the process of how the mission statement was revised. These texts provide a rich reservoir of content that will answer the research question(s) of this study (Altheide & Schneider, 2013).

In sum, the educational technology company texts meet the following criteria: they are notable in terms of media recognition, size, or historical significance; they offer products or services that use learning analytics; they have web pages that explain what products or services their companies provide for education in broad, subjunctive language; the length of these texts is fairly homogeneous as compared with each other and as compared with university mission statements.

The criteria used to determine university mission statement texts include the following: they are public universities; they are members of the AAU; they have some notability in the form of endowment size or historical significance; they are the highest

Carnegie classification (large doctoral research institutions); they have some type of mission or vision statement that represents the entire university; and their mission statements are fairly similar to one another in length.

I compared and contrasted texts from two different genres: commercial learning analytics providers and public higher education missions (Altheide & Schneider, 2013; Swales, 1990). The commercial texts analyzed in this study are The IBM Cognitive Computing for Education page, “The Classroom Will Learn You” A web page from Knewton about products and services geared toward higher education, a website describing Pearson Education’s products and services related to data, analytics, and adaptive technology. The higher education texts are a University of Oregon web page about mission, vision, and values, the University of Texas Austin Mission statement web page, and the mission statement from Michigan State University.

During the analysis, I compared side-by-side pairings of university texts alongside technology company texts (see Appendices). Doing so helped me see the differences in tone between each type of text. I color-coded parts of speech to help me see how these elements were situated in the texts (thus enabling the interpretive process described earlier in this chapter and again in Chapter 4). Using the phases of analysis and research questions as guides, I wrote copious notes in the margins of each set. These were refined and transferred to sticky notes which I placed on the wall of my home office. I grouped the sticky notes according to themes. This activity provided a baseline for some of the sections in Chapter 4.

Strengths and/or Limitations of the Study

As a researcher, I am in dialogue with the texts. I revisit and revise my own assumptions and interpretations. As this study is interpretive, my bias will manifest in the selection and omission of texts to be analyzed, literature to be reviewed, and conclusions to be drawn. This bias is reduced somewhat through the phases and techniques of analysis as outlined above. In sharing my interests and orientations, I am making myself vulnerable to disagreement, criticism, and dialogue.

CDA itself has been subject to some critique; and in the interests of showing the relationship between this critique and my own use of CDA, I summarize this briefly. Machin and Mayr (2012) admit that some critics of CDA will argue that quantitative linguistic analyses are more rigorous than CDA. I strengthen my application of CDA by using quantitative or in this case, “quasi-statistical” techniques; for instance, I conduct word frequency analyses (Crabtree & Miller, 1992). Other critics suggest that researching the readers or recipients of texts would yield more significant meaning than a purely text analysis (Machin & Mayr, 2012). To address this, I do consider my own interests and experiences (see Background and Role of the Researcher) as they influence my interpretation. Lastly, CDA is interested in insights as opposed to generalities. If this study asserts general claims about some aspect of education, it does so by first seeking to explain the meaning of specific language as it occurs within specific examples of discourse (Lehtonen, 2000).

CHAPTER FOUR: FINDINGS

Introduction

This study asks what ideological assumptions about the purpose of higher education are advanced by commercial entities as compared to those advanced by higher education institutions. In order to answer this question, I analyzed six texts: three higher education mission statements and texts from three commercial learning analytics providers. I applied three levels of analysis to each text. These levels combined Fairclough's (1995) phases of analysis with Gee's (2011) building tasks as outlined in Chapter 3. Each phase builds upon the other beginning with a microanalysis of word choices, emphasis, and signaling, moving to a mesoanalysis of identities, activities, and relationships, and culminating in a macroanalysis that explores political and interdiscursive connections expressed in each text. In some cases, the findings from each level will overlap and intermingle with each other, as it is difficult to isolate each element in practice. The research question and supporting sub-questions provide a scaffolding for the analysis. They are re-stated here: What ideological assumptions about the purpose of higher education are advanced by education companies as compared to those advanced by higher education institutions?

- How are signs and significance represented in texts from each organization (Gee, 2011, 2012)?
- How are activities and identities represented in each text (Gee, 2011, 2012)?

- How are politics and connections implied by the use and configuration of language in the texts (Gee, 2011, 2012; Fairclough, 1995, 2003)?

Overview of this Chapter

A brief description of each institution that produced each text, including a description of each website from which they were captured, will establish the *setting* (Bloomberg & Volpe, 2016). Connecting the setting to the microanalysis, I discuss the formal elements of design, imagery, word count, and parts of speech. I expound on examples of each of these to characterize the differences between each type of text. The rest of the chapter provides general findings from all of the texts, arranged by genre, and organized according to the research questions (and the phases of analysis). Quotes and evidence from the texts illustrate how the ideological assumptions are present and advanced by the texts and their respective producers (Bloomberg & Volpe, 2016). Note that I use the following abbreviations in this chapter: University of Texas at Austin is “UT,” Michigan State University is “MSU,” and the University of Oregon is “UO;” IBM Cognitive Computing for Education is abbreviated “IBM,” Knewton Higher Education is “Knewton,” and “Pearson Education” is simply “Pearson.”

Overview of the Data

The settings of each text include organizational, institutional, and situational factors (Bloomberg & Volpe, 2016; Leitch & Palmer, 2010). Unique features and significant people from each institution influence the types of messages being conveyed. Design elements and visual components reinforce, supplement, and “texturize” the messages contained within each text and will also be discussed briefly in the following

sections (Altheide & Schneider, 2013). I begin with descriptions of the technology companies.

Knewton

Knewton is an educational technology company specializing in adaptive learning software. Knewton's founding CEO, Jose Ferreira, worked previously at Kaplan Education, a company that was founded in the 1930's offering preparation services for the then new SAT exams. Ferreira was facetiously called "the antichrist" by ETS (Electronic Testing Services) executives, because he "cracked" (reverse engineered) the scoring algorithms for the GRE (Graduate Record Examination) (Bloomberg, 2019). Knewton has supplied analysis algorithms behind content delivery platforms from Pearson, although in 2015, Pearson ended their partnership with Knewton and later selected IBM for its machine learning algorithms. In 2019, it was announced that the Wiley publishing company would acquire Knewton (John Wiley & Sons, Inc., 2019). Meanwhile, Knewton has been both lauded for improving course grades and completion rates (Upbin, 2012), and criticized for "selling snake oil" (Feldstein, 2015), or being "corrosive" to quality education (Warner, 2019).

The Knewton text analyzed in this study is from a web page, which was retrieved from knewton.com/higher-ed on July 24, 2017. At the time of retrieval, the page contained promotional language targeted towards institutions of higher education. The banner at the top of the page contained the phrase, "A Path for Every Student." To the right of this statement was an image of a laptop with various numbers and graphs seemingly popping out of the laptop screen. Below the banner there are three sections with similar platitudes: "1:1 for Your College Students" is situated next to a photo of a

bearded man talking to a woman. The man evokes stereotypical notions of a sage-like professor. The man seems to be gesturing towards what may be a laptop screen. There is a mug between the two individuals. They are both smiling. “Improving Outcomes” appears next to an image of African American male wearing a cap and gown, hugging an older African American male. This advertisement is exploiting the fact that African Americans are historically underserved and thus implying that their software will help improve graduation rates among those “in need” of such improvements. “A Tried-and-True Platform” appears next to a picture of a woman wearing glasses and professional attire. She appears to be demonstrating something to a younger man (who is presumed to be a student) on some type of electronic device. Below these images and phrases, there is a section with the heading “Tell us what you’re looking for so we can help.” Below this last heading there are four items that guide readers to further information: “Learn more about Knewton for my higher ed course;” “Real-world examples of how Knewton helps students;” “Find out the available courses;” and “Build with Knewton for my business” (Knewton, 2017). Lastly, the page includes logos of Knewton’s “partners” including businesses like technology company HP and publishing company Houghton Mifflin Harcourt.

IBM

In 1911, American financier Charles Flint coordinated a merger between several companies in the business of tabulation and timekeeping. The companies being merged were the Tabulating Machine Company, the International Time Recording Company, the Computing Scale Company of America, and the Bundy Manufacturing Company (IBM, 2013). The newly merged company was first called the Computing Tabulating Recording

company. Thomas Watson (the namesake of their modern AI division) was hired as the company's manager in 1914; then, in 1924, in an effort to reflect the (real and aspirational) global reach of their business, Watson renamed the company International Business Machines (IBM). IBM remains the company's name today (IBM, 2013). Acquisition and global expansion have remained cornerstones of IBM's strategy. IBM owns more patents than any technology company in the U.S. (IBM, 2013). Among IBM's patents are UPC codes and the magnetic stripes common on ID and credit cards. The employee time-clock was one of IBM's first patents; it was developed during the height of Taylorism. The time-clock symbolized how productivity was viewed as primarily measured in time increments (Callahan, 1962). IBM has been involved in large data projects for over 100 years. The company provided the technology used to manage the U.S. Social Security program, which succeeded at assigning unique identifying numbers to all U.S. citizens (IBM Archives, 2019). IBM has been at the forefront of the latest resurgence of AI in the public consciousness with game-playing computers like "Deep Blue" beating chess champion Gary Kasparov in 1997 and "Watson" beating Jeopardy champions in 2011. IBM has been and continues to be involved in many educational technology research projects. For example, IBM's Watson machine learning technology underpins Pearson's adaptive content delivery applications (Wan, 2017).

The IBM text analyzed in this study was part of a broader campaign of web pages, videos, and infographics each with the common title, "in five years, the classroom will learn you." The url from which the text was collected was "research.ibm.com." Despite the connotation of academic or scientific rigor implied by the word "research," here it is used as part of a promotional strategy. An embedded YouTube video functions more like

a commercial than a research presentation as the video describes (with cartoon-like animation, and catchy background music) how, in five years, “the classroom will learn you.” This phrase serves as an overarching theme for the other content throughout the campaign.

Pearson

Pearson is the largest for-profit education company in the world with annual revenues exceeding five billion dollars (Macrotrends, 2019). According to a Reuters (2019) company profile, Pearson was first founded in 1897. The company provides a range of educational products and services to private, NGO, and government clients around the world. Beyond textbooks (both hardcopy and digital), Pearson’s portfolio includes adaptive applications called MyLab and Mastering which offer “videos, simulations, interactive assignments, and more” for a range of higher education disciplines (Pearson MyLab and Mastering, 2019). Pearson has also made an effort to digitize their catalog of textbooks. This is for two reasons: they can increase profit by reducing the overhead associated with print publishing, and they can harvest data about access and reading habits among students.

The Pearson (2018) website, “Data analytics & adaptive learning” features two non-white people smiling and looking at something that is beyond the image. Dividing the text on the page are horizontal sections providing links to resources, testimonials, and product pages.

The University of Texas at Austin

The University of Texas at Austin was founded in 1883 after decades of state legislative bodies calling for a “first class” university to be established in Texas (University of Texas at Austin, 2017). The University of Texas at Austin has the largest endowment of any public university in the U.S., and it is awarded over half a billion dollars in grants and sponsored programs each year (University of Texas at Austin, 2017).

On the top of the page that contains the University of Texas at Austin’s mission statement, there is an image of a seal carved in stone. The seal includes a Latin phrase, a book, a star, and branches. The Latin phrase is “Disciplina Praesidium Civitatis” which according to the University of Texas System’s website is “the late Dr. Edwin W. Fay's terse Latin rendering of the famous quotation from Mirabeau B. Lamar, ‘a cultivated mind is the guardian genius of democracy’” (University of Texas at Austin, 2017). According to the same website, the branches are olive and oak, but the significance of these species is not articulated. Olives are native to the Mediterranean, so the olive branch may represent Greek historical origins of education and democracy. Oak is a dense hardwood symbolizing strength and resilience, connoting longevity and steadfastness of a large university. The book represents academia and knowledge, and the star signifies Texas, “the lone star state.”

The web-page on which the mission statement is housed is sparse. The page contains a heading called “mission statement,” under which is the phrase, “Serving the state, nation, and world since 1876.” Besides the mission statement, there are three other blocks of text on the page under the headings “purpose,” “vision,” and “values.”

The University of Oregon

In 2014, The University of Oregon, directed by the state's Higher Education Coordinating Commission (HECC), embarked on a lengthy, iterative process of revising their mission statement. The process included multiple rounds of input and revisions from the public, trustees, campus employees, and students via various meetings, forums, and other opportunities to provide comments on websites or through surveys. Part of the process included comparing the University of Oregon's mission statement with that of "AAU benchmark university mission statements." An approval process consisting of executive leadership, the Board of Trustees, and the state HECC were required to ratify the approved mission statement (University of Oregon, 2017).

The University of Oregon website describes the necessity of having a mission statement as meeting external expectations, providing an anchor for a strategic plan, providing a commonality of purpose to a large organization, differentiating the institution, and providing a roadmap to leadership. Particularly in reference to differentiating itself, the website makes explicit connections to conventions in the private business sector:

It is extremely common in business to differentiate an organization from its peers at the level of the mission statement. Differentiation is a cornerstone of successful competition and higher education institutions often engage in active competition. (Branding - another word for differentiation - is now common in higher education and should tie to mission.) (University of Oregon, 2017)

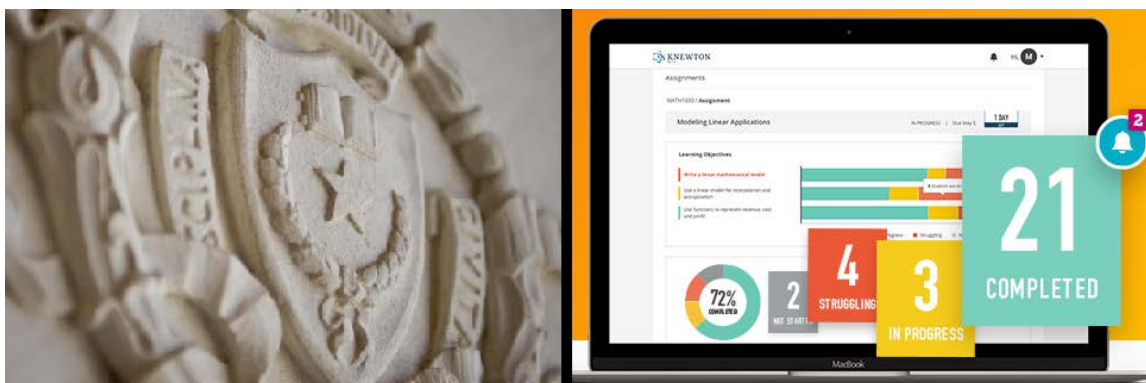
Michigan State University

Michigan State University was the prototypical land-grant institution founded in 1855, seven years prior to the Morrill Act. It was founded as an “Agricultural College,” adding “Applied Science” to its name in 1925, then dropping both these monikers to become “Michigan State University” in 1964. The site from which the mission statement text was retrieved resides on a subdomain with the prefix of “president³” implying the president is the owner and curator of the university’s mission. The page itself is sparse, containing text on a white background. The banners at the top and bottom of the page are included in the template for the university site. A footer on the page states that, “The MSU Mission Statement was approved by the Board of Trustees on April 18, 2008.” (Michigan State University, 2017).

Differences in Form

Differences between commercial learning analytics provider texts and university mission statement texts begin to take shape in the formal elements of the texts and their contexts. In terms of design, the commercial sites focus more on form elements like having an attractive layout and prompts to go deeper into the site, while the design of the university sites draw attention to the content itself. Images are present in some of the texts; these images also convey the differences between each type of text.

³ president.msu.edu/advancing-msu/msu-mission-statement.html



Picture 3.1 The UT-Austin Seal and a Knewton Graphic

The image on the left is a photograph of the UT seal and Latin motto carved in stone. The picture appears at the top of the University of Texas at Austin’s web page about “Mission & Values.” The image on the right appears at the top of the Knewton web page. The Knewton image appears next to the headline, “A Path for Every Student.” It is an image of a laptop with graphs and numbers that seem to leap out of the computer screen. The UT image connotes concepts related to history and tradition. The Knewton image connotes concepts related to computer technology, measurement, and quantifiable outputs.

Word Frequency and Parts of Speech

The grammatical and clause structures in each of the texts also show how form and structure illustrate differences in the goals and audiences of each text. Analyzing word count shows what terms and concepts are emphasized in each text. Frequent recurrences of certain words, or *overlexicalisation*, shows how texts attempt to *persuade* readers into believing claims (e.g., “our product is the best”) or into performing some action (“buy our product”) (Machin & Mayr, 2012). This word frequency analysis is what Crabtree and Miller (1992) refer to as a “quasi-statistical” approach that helps evince key themes and concepts. Parts of speech (nouns, verbs, modifiers) and how words are

configured shows how actions, actors, and objects are being regarded or acted upon in the texts (e.g., whether they are subordinated or prioritized). Modifiers (adjectives and adverbs) will show instances of emphasis and specialized terminology. Specific nouns will reveal signs and symbols present in a text, while nouns and verbs will both show how identities and activities are presented and configured syntactically and rhetorically. Deconstructing and organizing the text artifacts in this way helps the researcher to identify how patterns and techniques advance ideologies. The Pearson Education web page contains examples of how word frequency and grammatical structure can be interpreted as representing ideological assumptions as I will demonstrate. Here is the full text of the Pearson artifact that was used in this analysis:

Looking at the big picture helps us personalize a learning path for every student.

Data, Analytics, & Adaptive Learning

The importance of using data and analytics in education is growing rapidly; the power of data is fundamental to improving the performance of individual students. Educators make important decisions every day. Using our technology and services to connect infrastructure, instruction, and assessment, we can create holistic views of the student, classroom, and institution that can be used to make a measurable impact on student learning and success. Our capabilities in data, analytics, and adaptive learning — and our leading efficacy research — enable us to design a smarter, adaptive learning path for every student.

Evidence of impact on learner outcomes

We're focused on developing products and services that have a measurable impact on improving students' lives through learning. Each year, more than 11

million students use our learning technologies worldwide. Over the past decade, we've worked closely with students and educators to track learning gains, holding ourselves accountable for not just the products we make but also for the learning gains we help make possible.

In the Pearson text, the word “student” appears eight times. Each instance of the word appears as a subordinated object, where some other dominant actor or agent (usually “Pearson” as represented by the word “we”) is performing some action on or for the students. Students are positioned in a way where they are not only subordinated in the text but their role is further relegated to one that benefits Pearson (e.g., Pearson “works with students” to improve Pearson products). The only instance where the word “students” is the subject of a sentence is when the text boasts that 11 million students “use” Pearson products. In this example, the positioning of nouns and verbs communicates to readers certain identities, activities, and relationships pertaining to students and Pearson; namely, that students are both *consumers of* and *means to improve* Pearson products.

In another example, the following excerpt from the University of Texas at Austin’s mission statement is compared alongside an excerpt of similar length from Knewton:

Table 4.1 Comparison of Excerpts from UT-Austin and Knewton

University of Texas at Austin mission	Knewton Higher Education
The university <i>contributes</i> to the advancement of society through research, creative activity, scholarly inquiry and the development and dissemination of new knowledge, including the commercialization of University discoveries. The university <i>preserves and promotes</i> the arts, <i>benefits</i> the state’s economy, <i>serves</i> the citizens through public programs and provides other public service.	Our intuitive dashboard <i>gives</i> you all the data you need to see to inform critical decisions: what should you teach today? What do your students need most from you to succeed? <i>Intervene</i> Faster Knewton <i>offers</i> you easy to understand and actionable analytics so you can quickly identify struggling students and what they need to succeed. You also <i>receive</i> daily notifications informing you which students or topics need immediate attention.

In the UT excerpt, the primary subject is the “university” (emphasized in **bold**) while the main verbs are “contributes,” “preserves and promotes,” “benefits,” and “serves” (emphasized in *italics*). The clause structures of these sentences position the recipients of these actions as things like “society,” and “citizens.” The excerpt from Knewton’s website lists the main subjects and verbs: “**dashboard** *gives*,” “[**you**] *intervene*,” “**Knewton** *offers*,” and “**You** *receive*,” respectively. In both texts, some entity (the university and Knewton) is providing or giving something to others. In the case of the university, the university is giving things to society or the public writ large. In the case of Knewton, their product (a dashboard) is giving something to “you,” and it is assumed or implied that “you” are a teacher or someone who works in education--i.e., a potential consumer. The importance of “you” is reiterated through repetition.

The order of nouns in the first sentence of the Knewton excerpt places “dashboard” as the predominant subject, followed by “you” (presumably a teacher), and lastly, “students.” Later in the full passage, a similar structure is employed, though students are positioned alongside [educational] “topics” (with the article “or” connoting

equal stature between both “students” and “topics”). Throughout each text, these grammatical structures suggest the level of agency or importance that different subjects have. The anthropomorphism of “Knewton” and “dashboard” in the Knewton text positions these non-human entities as the primary and most important subjects in relationships among subjects.

As shown, significance and importance are apparent through the emphasis that is placed on certain terms and concepts via word counts, speech parts, and sentence structure. Performing an iterative analysis of this type of all the texts selected for this study revealed common themes within each genre -- university mission statements and technology company websites-- which are further elaborated in the following section.

Signs and Significance in University Texts

Universities Have Limitless Scope

The public universities analyzed in this study describe their scope of programs and activities as being broad and boundless. Universities are multi-faceted institutions as they support undergraduate programs, graduate programs, professional programs, public services, the arts, and a range of educational (and non-educational) outreach initiatives. University mission statements capture this breadth of scope within their academic disciplines using words like “interrelated” (UT), “comprehensive” (UT), “cross-” and “inter-disciplinary” (MSU), “connected” (MSU), and “encompassing” (UO), to describe areas of study. Universities support both the liberal and useful arts as they are described in those specific terms, and as they implied by disciplinary categories of “science” (MSU, UO), “humanities” (MSU, UO), and “professions” (UO) or “professional programs” (MSU, UT). The diverse functions of a university include “teaching” (UO) “research”

(MSU, UO, UT) and “service” (UO, UT) which are emphasized by modifiers like “excellent” (UO, UT) and “exceptional” (UO).

Universities are Exceptional

Universities frame themselves as exceptional and prestigious. This is evidenced in their use of modifiers “excellent” (UO, UT), “superior” (UT), “preeminent” (OU), and “outstanding” (MSU). Such language is used to differentiate each institution, as they exist in competitive environments. Universities tout their distinguishing features such as membership in the AAU (MSU), the year the institution was founded (MSU, UO), or notable majors and disciplines. The implication is that these things are compelling and attractive to potential students, potential donors, and members of the public. This self-image is similar to American exceptionalism⁴, or the belief that the United States is a unique and superior model for other countries to emulate and not subject to the standards by which other countries are judged.

Signs and Significance in Commercial Learning Analytics Providers Texts

“Learning” is Something to be Measured and Improved

The data and systems described in the technology company texts exist to promote efficiency and outcomes as ends in themselves, irrespective of any overarching purpose. As an illustrative example, a subsection of the Pearson text has the heading “Evidence of impact on learner outcomes,” yet the text beneath the heading does not offer any specific characteristics of “evidence” or “outcomes.” The Knewton text contains a high number of terms associated with quantitative measurement and statistics (e.g., “dashboards,”

⁴ Ironically, this term was first coined by Alexis de Tocqueville (1835/2004) as a criticism of American consumerism and their preoccupation with “practical objects.”

“reports,” “analytics”) thereby signifying education is a purely quantitative endeavor. Indeed, Knewton’s founder once stated his goal for the company was “to create individual, psychometric profiles that would presume to say, with statistical authority, what students know and how they learn” (Kolowich, 2013). Phrases like “better outcomes for more students” (Knewton) connote language of accountability and scale. The word “learning” is used frequently in each of the technology company texts. It often occurs as a nominalized noun form or as an adjective modifying “experiences” (IBM, Knewton), “style” (IBM), “path” (Pearson) “gains” (Pearson), and “outcomes” (Knewton). The configuration of learning as anything but a noun obviates the need to align the activity of learning with any specific aims or values. Learning is expressed as an end-in-itself that is unquestioned and ill-defined.

Data and Technology Systems are Inevitable and Essential

Commercial learning analytics providers offer imaginative visions of technocratic educational scenarios. They emphasize what they call the “big picture” (Pearson) “fully integrated” (Knewton) or “holistic” (Pearson) approaches to education. For commercial providers, notions of scale or of the “big picture” encompass interconnected or “fully integrated” technology systems that benefit the individual consumers and what they “need,” even over the course of many years (e.g., IBM). The texts also suggest that with enough data, a technology program or system can completely encompass *everything* that matters educationally and pedagogically (offering what students and teachers need to succeed or make decisions). Commercial learning analytics providers remind readers of the importance and necessity of technology with the frequent repetition of terms like “technology,” “data,” and “systems” in their texts. Presupposition is present in the texts

as “data” and “analytics” are described as “important” and “power[ful]” without qualifying how or why this is so (Pearson). “Rapid digitization” (IBM) and “rapid growth” (Pearson) of data and technology systems is described as happening on its own. These syntactic configurations imply the ideology of *technology determinism*, or a belief that technology evolves inevitably on its own without the need for independent human actors (Kelly, 2010). Technology determinism purports the absurd claim that technological progress could not have happened otherwise and that it will continue to happen according to a predestined script (Kelly, 2010).

Activities and Identities in University Texts

Universities are Inclusive Communities

The ideological assumption that universities are inclusive communities is exemplified in Michigan State University’s mission statement in the phrase, “we are an inclusive, academic community . . .” The use of the plural, first-person pronoun, “we” implies inclusivity. The frequent use of the collective “we” also suggests a unified community in the UO mission statement. The UO mission statement includes the phrase “Diversity, equity and inclusion,” which is phraseology often connected with progressive politics and social justice movements.

Universities highlight collectivism, community, inclusivity, and the multi-disciplinary aspects of their organizations in their mission statements. These represent humanistic values and social solidarity, or values that are concerned with human experiences and well-being above all else. By The frequency of words like “public” (MSU, UO, UT) “society” (MSU, UT) and “service” (UT, UT) denote an emphasis on the public good.

The word “individual” only occurs once in the University of Texas at Austin text (as a modifier of “opportunity”). The full phrase “Individual Opportunity” occurs as a kind of subheading; it is qualified by references to “many options” and “diverse people” thus qualifying what would otherwise be the only instance of a word or phrase that explicitly suggests private, individual benefit. In similar fashion, the Michigan State University text mentions individuals in the phrase “individuals *and* communities.” In the texts, universities support the humanistically and existentially connoted realms of “life” (MSU), “lives” (MSU, UT), “home” (MSU), “world” (MSU, UO), and “society” (MSU, UT).

Universities Benefit Everyone

The universities analyzed in this study claim to provide value for everyone in the world; this is evidenced by phrases such as “global society” (UO), “around the world” (MSU), and “Texas and beyond” (UT).

In an example of rhetorical omission, where certain themes or topics that are noticeably absent in a text, the University of Texas at Austin mission statement does not mention the acts of teaching or learning. Emphasis is instead placed on the broader societal benefits of the institution to peoples’ lives, to the public, and to the world.

The scope and reach of Michigan State University’s mission is all-encompassing as expressed via syntactical dualisms, e.g., the institution’s scope is both “local” and “global,” its location spans from “home” to “around the world;” and it serves both “individuals” and “communities.” The repeated use of the conjunction “and” signifies inclusivity and integration.

The University of Texas at Austin describes itself as “a caring community.” Overall, the primary actor in the text is “the university.” The nature of its actions are progressive and serve everyone. The recipients of the university’s actions are “society,” “public,” and “Texas and beyond.” Texas and geopolitical regions are invoked to signify the financial interdependence and political relationship the university has with its state government.

According to its mission statement, the University of Texas at Austin provides benefits to the public in the following ways: to the state through economic benefit and positive change, to citizens through public programs and other services, and to society as a whole by transforming lives through research, creative activity, and scholarly inquiry. Some of these benefits are economic. For instance, the University of Texas at Austin describes the value of “commercialization” of its research. The language of “commercialization” in the University of Texas at Austin text implies the use of patents or copyrights in order to produce private property. This is in some ways contradictory to its commitment to disseminating knowledge for the public good.

The University of Oregon promotes the “success of students” in its mission statement. Additionally, the text advances the goal of “enrich[ing] the human condition.” The University of Texas at Austin has a similar goal in “the advancement of society.” These concepts are vague, and far-reaching, but altruistic in the broadest sense.

Michigan State University’s mission statement claims that the institution has a purpose of “advancing knowledge.” This expression is a popular trope in the discourse of higher education (Geiger, 1986). The activities that Michigan State University is involved in are generative, e.g., “providing,” “creat[ing],” and “expand[ing].” Words like

“preserve” and “promote” in relation to “the arts,” and “knowledge” frame higher education institutions as stewards and champions of cultural artifacts. Universities support the “discovery” (UO, UT) “advance[ment]” (MSU) or “dissemination” (UT) of knowledge through research and other academic efforts. As an example of how expansive activities like advancing knowledge for the benefit of all people can be grounded in humanistic values, the University of Oregon mission statement includes the phrase, “we work at a human scale to generate big ideas.”

Activities and Identities in the Texts of Commercial Learning Analytics Providers

Individualism is Important

Individualism is a common theme in the commercial texts. The companies place an emphasis on individual growth and achievement and doing so efficiently. Students are common (although subordinated) subjects in the technology company texts. “Student” is preceded by the qualifier “individual” in both the Knewton and Pearson texts. “Each student” (Knewton) “every student” (Pearson) or “students at all levels” (IBM) require custom-tailored learning experiences in order to reach their full potential. The data and technology systems can provide the necessary means to maximally support individualistic endeavors. Machine analysis in the form of an observant “smart” classroom can allegedly determine individual learning styles⁵ (IBM). These “personalized classrooms” (non-human concepts/entities) will “motivate and engage” (IBM) learners. Teachers need information provided by technology systems in order to “personalize” (IBM, Knewton,

⁵ The theory of learning styles has been widely criticized yet it remains popular in behaviorist and AI education literature (Riener & Willingham, 2010)

Pearson) learning experiences. Dashboards and systems will improve learning according to these texts.

Technology is the “Quick Fix” for Slow Learning

The commercial learning technology provider texts describe learning in medicalized administrative language of “interven[ing]” (IBM, Knewton) with “at risk” (IBM) or “struggling” (IBM, Knewton) students. The interventions include “what type of content to give” and “the best way to present it” (IBM). In the world imagined by commercial learning technology providers, a child with private economic career aspirations would struggle to learn math concepts, and the data and technology “systems” would somehow “find out” what to do in order to assist that student; namely, the systems would assess the student’s learning style and develop plans of effective interventions that would lead the students to a lucrative career in finance as adults (IBM).

Teachers (or other unidentified actors) access vital student information via “data” (IBM, Knewton, Pearson), “dashboards” (Knewton), and “actionable analytics” (Knewton, Pearson) to make decisions (Knewton, Pearson) (evidently all manner of educational decision). The reader and potential actor in these imagined scenarios would make decisions “quickly” (Knewton). A primary subject in each of the technology company texts are the technology companies themselves. Again, the activities performed by the technology systems are “interventions” of various forms. The recipients of actions are “you,” “teachers,” and “students.”

Data identifies when students are “struggling” (IBM, Knewton), suggesting that issues in educational performance can be diagnosable by data inputs (rather than human teachers) and that educational processes are riddled with deficiencies and problems to be

solved. The commercial texts declare that data, technology, and systems can help teachers teach better, and they imply that technology--rather than teachers--can help students learn more efficiently.

The technology company texts refer to their own size and scale as compelling characteristics that make their products better, more accurate, or more effective. The Pearson text mentions that the company serves “more than 11 million students . . . worldwide.” This number is intended to be impressive on its face, but the subsequent sentence states that Pearson has also “track[ed]” what they call “learning gains.” The juxtaposition of these two statements implies that Pearson has a sample size of millions with which to perform their data analysis, as “tracking” is indicative of the type of algorithmic, quantitative processes associated with big data analytics. The final clause of the Pearson text mentions how the company holds itself “accountable” perhaps in an attempt to preemptively allay privacy or data breach concerns. However, this can also be interpreted as yet another term associated with “quantifiability” and measurement and with the values of contemporary corporate culture.

Knewton uses language of speed and efficiency: e.g., “quickly,” “faster,” “immediate,” and “real time.” There is an overall sentiment of urgency and needfulness in the tone of the texts technology company texts with phrases like “you need,” “students need,” etc. (IBM, Knewton). Knewton boasts that its product is a “fraction of the cost” compared to “traditional course materials” assuming readers will have a common conception of what the latter phrase includes. Cost and speed are associated with the ideology of technocratic efficiency.

Words like “success” (Pearson), “outcomes,” (Knewton), and “gains” (Pearson) are not defined in the texts, implying that these are already known or taken for granted. These concepts are intended to signify some form of positive, measurable results. The technology company texts describe these unsubstantiated “results,” “gains” and “outcomes” in subjunctive language using modal auxiliaries “would” (IBM), “could” (IBM) and “can” (Knewton, Pearson). The commercial texts intentionally describe their value in general or ambiguous ways, as if to suggest that whatever it is the consumer wants, these systems will provide it and make it better.

Different Beneficiaries in the Two Genres

In the microanalysis and mesoanalysis, differences between how texts in each genre identify and frame beneficiaries becomes increasingly apparent. The university texts describe the many varied activities carried out by institutions of higher education. The scope of a university in these texts is broad and expansive. In contrast, commercial learning analytics providers focus on a narrow conception of learning that is applied to students and optimized by data and technology. The themes and concepts that are foregrounded in university texts are social, communal, and “disseminative” qualities of the institutions. The themes and concepts that are foregrounded in the texts from commercial learning analytics providers are the necessity and inevitableness of technology and data systems and an emphasis on *learning* as the predominant or exclusive activity in education.

Just as universities claim to offer gifts to the entire world they also welcome all people to feel welcome and included in their spaces. This is contrasted by commercial learning analytics providers claim to improve each individual student. Universities create

spaces for a diversity of people and ideas to commingle with the goal of shared, expanded, and disseminated knowledge. Commercial learning analytics providers isolate the needs of individuals in order to achieve ambiguously defined outcomes as quickly as possible.

Politics and Connections in University Texts

Universities are a Public Good

As “caring communities” (UT) concerned with “diversity,” “equity” and “inclusion” (UO) and “contribut[ing] fully to society as globally engaged citizen leaders” (MSU) universities’ function as a *public good* (Pasque, 2014). Specifically, universities are public goods that include private interests in an *interconnected advocacy* frame (Pasque, 2014). The interconnectedness of public and private interests with an emphasis on the public good is exemplified in an expert from the University of Texas at Austin’s (2017) statement that connects “individual opportunity” with “many options, diverse people and ideas, one university.” This statement is reminiscent of the Latin phrase found on U.S. currency *e pluribus unum* which Pasque (2014) uses as a way to symbolize the interconnected advocacy frame of higher education, connoting the unification (unum) of many (pluribus) individuals. As another example of this dual aim of helping individuals to help society is present in Michigan State’s mission statement which suggests that the institution both prepares [individual] students to contribute to society and that as an organization the university addresses society’s needs. As mentioned in the microanalysis, university texts contain a high frequency of words and terms that are symbolic of the public good. A longer phrase that illustrates this inclusive public good function is found the University of Oregon’s mission statement: “We value our shared charge to steward

resources sustainably and responsibly.” Here, language associated with responsibility and stewardship suggests a commitment to conservation. This statement is in contrast to Pearson’s own value statement of “accountability” wherein the company holds itself accountable for “not just the products we make but also for the learning gains we help make possible.” In this excerpt, taking responsibility is meant not in some ethical or dutiful sense, but is instead expressed as taking credit for something.

Universities are Connected to the History of American Higher Education

Michigan State University, in its mission statement, references the fact that the institution is a member of the AAU, and it lists the year in which the institution was founded: 1855. These are each representative of how the institution intentionally draws connections to its history and by proxy to the history of American public higher education. Notably, Michigan State University is seen as a prototypical land grant university for the legislation which was enacted seven years after the founding of the university.

The importance of free expression is emphasized in the university texts. The texts also emphasize broad, liberal studies. University texts advance the importance of both liberal and practical disciplines. Disciplines and professional programs are described as “traditionally strong” and universities such as MSU describe themselves as known for a “liberal arts foundation.” Michigan State University references its funding as a land-grant institution. The University of Oregon values its “history.” The University of Texas at Austin has a duty to “preserve” the arts. Each of these are foundational concepts in the history of American (and global) higher education (see Chapter 2 for a summary).

Politics and Connections in Commercial Learning Analytics Providers Texts

Commercial Learning Analytics Providers Benefit Consumers and Themselves.

Education is viewed as an “industry” (IBM). Commercial learning analytics providers want to create new efficiencies by ushering in the end of grades and syllabi and the beginning of self-paced, personalized, experiential learning. Technology companies promote personalized content-centric educational delivery models with the assumption that learning can happen informally, “anywhere, anytime,” thus decentering the space of a classroom and deskilling the profession of a professor (Hodkinson, 1997).

Commercial learning analytics providers are self-interested. These companies purport to conduct research in statements that are embedded in or juxtaposed with advertising language. Fairclough (2003) states that “the incorporation of corporate advertising into a local authority genre can be seen as a form of prospective interdiscursivity - the local authority anticipating the practices of business within which it hopes its publicity will be taken up” (p. 35). This refers to the blurring of facts and fiction, news and entertainment, and is considered by Fairclough (2003) to be a reflection of postmodernity. The use of the implied “you” in the Knewton text suggests a prospective reader who is in a purchasing position. This person could be a teacher or a school administrator. Commercial learning analytics providers position students as being central to the success of the products and services sold by the companies.

The slogan “the classroom will learn you” is not only an example of syntactic ambiguity, but it is also a garden path sentence, or one that intentionally “trips up” the reader because of the awkward phrasing causing interpretive disfluency. Using “learn” as a transitive verb anthropomorphizes the “classroom” suggesting that the classroom will

learn about “you.” This further suggests that artificial intelligence and machine learning have ambient qualities and are capable of covertly “learning” or “teaching themselves” about those who are in their presence. “Learn” can also be read as the archaic verb form meaning “to teach” suggesting that the classroom, again anthropomorphized, will teach “you.” The polysemic use of the word “learn” in the IBM text creates a sort of a pun, common in advertising slogans. Beneath the “cute” veneer of such language are deeply concerning implications about building educational environments with omnipresent technological devices that are intended to observe, interpret, and alter the behaviors of human students.

Commercial Learning Analytics Texts are Connected to the Discourses of Behaviorism and AI

The language used in technology company texts is mired in terminology and symbolism associated with behaviorist psychology and artificial intelligence research, for example the references to “smart” systems.

The assumption advanced by the Knewton text is that teachers are underprepared and ineffective when they do not use data and technology. The Knewton text further advances an ideology which reduces the degree to which teachers or instructors have freedom. The dashboard actively makes decisions about what to teach and how to interact with students.

The IBM text advances a behaviorist ideology as it suggests that “digital education” occurs in the form of “test scores, attendance, [and] behaviors:”

All of this digital education creates a tremendous amount of data about all aspects of teaching and learning. And it's not only test scores, but also information about student behavior on digital learning platforms, attendance, and more. (IBM, 2017)

Not only is this rhetoric similar to Skinner's reductionist and mechanistic conceptions of teaching and learning, but it mixes this with contemporary language associated with digital platforms and where things like behavior and attendance are algorithmically defined and automatically tracked.

The adaptive learning platforms being developed by these companies are connected to AI research in the same way that large social media and technology companies such as Google, Facebook, and Amazon are leveraging AI techniques in their personalized sales and advertising strategies. Additionally, behaviorist forms of AI are leveraged to encourage customers and users to want to continue to use the services. These tactics occur in the form of automated notifications and messages that use operant conditioning and positive reinforcement. AI strategies have enabled these companies to be among the most successful businesses in the history of the world (Galloway, 2017; Webb, 2019). It is also noteworthy that the research literature on learning analytics is connected to the same discourses of behaviorism and AI.

Summary of Findings

Each phase of analysis revealed key themes. The ideological assumptions in each text and each genre are distilled and listed according to the phases of analysis:

Table 4.2 Ideological Assumptions Found in Each Phase of Analysis

	Universities	Commercial providers
Signs and significance	Universities have limitless scope	“Learning” is to be measured and improved
	Universities are exceptional	Data and technology systems are inevitable and essential
Activities, identities, and relationships	Universities are inclusive communities	Individualism is important
	Universities benefit everyone	Data and technology systems optimize learning efficiency
Politics and connections	Universities support the public good	Technology companies support private economic benefits for individuals and for themselves
	Universities are connected to the history of American higher education	Technology companies are connected to discourses of behaviorism and AI

Arranged in this way, the contrast between the texts at each level is apparent. While universities have limitless scope and benefit everyone, technology companies are narrowly focused on individual learning. And while universities are a public good and promote public goods and services, technology companies are private enterprises and promote private goods and services.

As previously mentioned the university texts represent what Pasque (2014) calls an *interconnected advocacy* frame. This frame suggests that there are public and private beneficiaries of higher education. The interconnected advocacy frame acknowledges the interdependence between private and public realms. The frame further advocates for civic

engagement, diversity, and democracy as means by which a public/private interdependence can be equitable and emancipatory (Pasque, 2014). For example, the University of Texas at Austin promotes both knowledge for the public good as well as private intellectual property.

The technology company texts illustrate the predominance of what Michaels (2011) calls *economic monoculture* or the notion that our current age is dominated by the hegemony of economic interests. More specifically, the commercial providers advance the economic ideology of *neo-Fordism*, which is discussed in Chapter 5 (see also the Definition of Terms for a brief summary). These providers extract capital and resources from reified individuals only to sell new recombined forms of “value.” I created the following figure to visually illustrate how these ideologies are different.

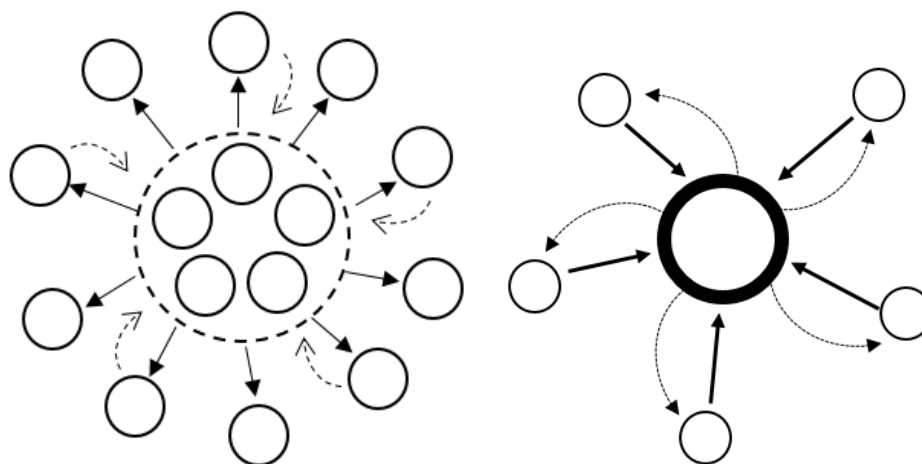


Figure 4.1 Beneficiaries of Universities and Private Companies

The figure on the left represents a university as an altruistic community with perforated boundaries, benefiting everyone through education, research, and myriad public programs and services. Universities are “enclosed” in that they are single organizations, but the perforated boundary represents how they are open to all, they let anyone participate in

their environments, and they are reflective and responsive to the communities around them (and within them). Some financial value is given to the universities from external parties in the form of tuition, endowments, etc. The figure on the right represents how corporate learning analytics in neo-Fordist organizations extract capital and resources (in the form of behavioral data) from individuals in a tightly controlled, closed system, and redistribute the resources in recombined forms through technical products, services, and systems. The thick circle represents how companies have proprietary data and algorithms (“black boxes” to use the industry jargon). It also represents how the companies are insulated from their competitors. The commercial learning analytics providers extract value from the students (which is then amalgamated in the form of proprietary algorithms) with the promise of returning the value to consumers who are not only students but also teachers and educational administrators. In this schema the students are clearly exploited.

Universities describe themselves as communities, while commercial providers have what individuals (often referred to as “you”) “need” to be successful and productive. Universities provide mostly public social benefits and some private economic benefits. The public social benefits include creativity, leadership, and expanding human knowledge. Private companies provide value to students on an individual level. These companies claim to provide some value to teachers, though this is de-emphasized compared to the value provided to individual students and to the companies themselves. For private companies, value occurs in the form of “supporting decisions” and providing data analysis that can prescribe “appropriate” actions.

The ideologies advanced by universities and technology companies are misaligned with each other. Universities represent the altruistic ideals and traditions of higher education that embrace freedom, unfettered scholarship and research, and the public social (and economic) good. Software companies represent a neo-Fordist conception of education that deconstructs the individual, that reduces the social aspects of education, and that devalues traditional roles and configurations of educational materials, teachers, and classrooms. Universities are focused on liberal education, broad experiences, inclusivity, diverse perspectives, and community. Software companies are focused on achievement, predetermination, predictability, management, and measurable results.

The themes from the findings can be distilled even further into very simple dialectical polarities as they relate to sociological and philosophical ideological concepts as illustrated in the following table:

Table 4.3 Contrasting Sociological and Philosophical Ideologies in University Mission Statements and Commercial Learning Analytics Provider Texts

	Universities	Commercial Learning Analytics Providers
sociological ideologies	community	individual
	public	private
philosophical ideologies	humanism	behaviorism
	freedom	determinism

According to the texts analyzed in this study, universities embrace sociological ideologies like community and public service, while commercial learning analytics providers embrace individualism and privatization. On a philosophical level, universities advance ideologies of humanism and freedom, while technology companies advance behaviorism and determinism. Universities advance the ideology of altruism while technology companies advance the ideology of neo-Fordism.

CHAPTER FIVE: ANALYSIS AND DISCUSSION

Introduction and Overview of this Chapter

In this chapter, I expand on the findings from Chapter 4, and I offer further interpretations suggesting *why* certain ideological assumptions are present in the discourses of higher education. I explore why there are differences between the genres of university missions and technology companies offering educational products and services. These interpretations are made in relation to the research questions and literature review in this study.

The research question asks what ideological assumptions about the purpose of higher education are advanced by commercial learning analytics providers as compared to those advanced by American public universities? The findings show that American public universities advance ideological assumptions associated with the public good and altruism. These are supported by themes of freedom, advancing knowledge, transforming lives, and benefiting all people in various ways. Commercial learning analytics providers advance ideological assumptions that learning benefits individuals (and the companies themselves) and is something to be continuously measured, monitored, and improved. Themes of efficiency, scale, and personalization characterize the texts from commercial learning analytics providers. It is

I propose that the ideology of neo-Fordism and privatization is an overarching paradigm that is not only advanced by the commercial learning analytics providers analyzed in this study but that it is also one that permeates, even dominates, other facets

of life in our current time. I offer reasons why this may be problematic in a general sense. Next, I explore problems related to freedom, individualism, equality, pedagogy, and research and practice as they exist within the neo-Fordist paradigm. These topics integrate and are connected with to the ideological assumptions described in Chapter 4. These sections also tie together the genre strands of the literature review with the central theme of ideological misalignment and immanent critique.

Neo-Fordism

A national preoccupation with wealth and economic growth is advanced through mass media and popular discourse in the United States. As shown in the introduction and literature review of this dissertation, this economic ideology appears in the discourse(s) of higher education. This preoccupation with economic concepts leads to distorted beliefs about social values and potentially exploitative practices, as I will show in this chapter.

As illustrated in Chapter 2, the story of American higher education is and always has been intermingled with the story of American business. From Harvard being established as the first American corporation, to the big business magnates founding and endowing marquee American universities, to the looming presence that Andrew Carnegie had and still has on American higher education. Due to mass immigration and population growth in the early part of the 20th Century, Universities and corporations both faced the same challenges related to rapid expansion and growth. As the scale of organizations increased, so too did the tendency to regard people as objects or numbers (Sale, 1980). The same scientific principles and theories of efficiency and management were embraced to varying degrees in higher education and in private industry alike. From the late 1800's through the early 20th Century, during what Heilbroner and Singer (1999) call "the Age

of the Businessman,” people were increasingly being seen in terms of profits or losses, efficiencies or inefficiencies. In some organizations, activities were to be tracked, measured, and improved (as defined by some organization). The Ford Motor Company and its innovative work structures and assembly line processes became representative symbols of this managerial thinking.

The application of science and technology toward human activity is related to and driven in part by economic motivations. F.S. Michaels (2011) makes a compelling case that *economic monoculture* is the dominant ideology of our current era, what the author calls the Economic Age. In Michaels’ periodicity, this economic monoculture began in the late 20th Century and was directly preceded by the Age of Science (which itself was sparked by the rationalism that emerged in Age of Enlightenment) and before that, an age of Religion (marked by the dominance of religious ideology from the Middle Ages to the Enlightenment). This delineation of major historical eras is simplistic, but Michaels (2011) provides convincing evidence of the predominance and preoccupation of financial, monetary, and market ideology that permeates many aspects of society today--including education. Michaels (2011) argues that this Economic Age is characterized by individualism and independence, rational and goal-oriented decision-making, efficiency, self-interest, insatiable wants, unending productivity, unregulated industry, market competition, and transactional relationships. These characteristics are problematic in educational contexts.

The contradictory notion of applying industrial and economic logic toward individual growth and development in education reached a peak during the wave of Taylorism in early 20th Century America. In fact, increasing the “scale of

personalization” in education was deemed the primary “business problem” *of* education by William Bagley in 1907. For Bagley, the problem was one of quantity rather than quality.

Today’s Economic Age is further fueled by the unprecedented growth and adoption of digital media. The Internet and World Wide Web has created new media and environments in which billions of people are interacting, sharing, learning, and communicating daily. Combined with ubiquitous smartphones and smart devices we now have a substrate upon which economic forces manifest themselves in new ways. Large technology companies like IBM strategically invest in these new digital environments while behemoth publishers like Pearson explore digital media as a way to expand their portfolios and to protect themselves against the risk that hardcopy books may someday be “disrupted” by web-based texts. Start-ups like Knewton attempt to capitalize on the opportunity to disrupt the “industry” of education. Education institutions are seen by all the aforementioned organizations as potential customers, or, more egregiously, as competitive enterprises whose archaic and traditional practices should themselves be disrupted and displaced entirely by new technology (Christensen, 1997; 2011). Scholars and critics have used the terms neoliberalism, late capitalism, new capitalism, and post-Fordism, to describe the more recent conditions and reconstructions of the economic narrative within a contemporary context that combines the militaristic and industrial elements of modernism with the relativistic and individualistic elements of postmodernism (Hodkinson, 1997; Sennet, 2006; Stevens, 1996). I use the term neo-Fordism to capture the activities and characteristics that are being animated in new *digital* and *online* environments. While modernism coincided with Fordism and new forms of

mass production, and postmodernism coincided with post-Fordism and new forms of individualism, our current era of Neo-Fordism combines these elements and attempts to mass produce individualism through technology. Neo-Fordism frames individuals as workers and consumers, emphasizes short-term over long terms gains, views relationships as transitory and transactional, and promotes the deskilling of professionals and experts (Hodkinson, 1997; Stevens, 1996). Organizationally, neo-Fordism supports a shift toward authoritative, centralized production and control (Hodkinson, 1997; Stevens, 1996). The logic of assembly line production is recapitulated and reapplied toward the extraction and aggregation of fine-grained digital data about individuals. The individuals are thereby reified as both producers and consumers via electronic applications and interfaces. These ideological assumptions about individuals and their behavior are evident in the texts of commercial learning analytics providers; they are also present in some of the practices being carried out in higher education institutions.

One aspect of neo-Fordism is that it views individuals as units that contain capital resources, and it disregards the sustained well-being of a group or community (Hodkinson, 1997). This distorted form of *individualism* is overtly present in the language of educational data systems, especially those that are created and sold by private companies. This distorted conceptions of individualism reduces the agency and decision-making ability for both learners and professional practitioners at a local level.

Even while they make public declarations about academic freedom and social solidarity, universities themselves are adopting and building structures that support neo-Fordist ideologies, in contradiction to their own stated aims. For instance, the University of Texas at Austin (2017b) posted a job for a learning analytics specialist who would be

responsible for “the design of systematic processes for determining the merit and value of faculty approaches to teaching learners.” Giving one person or office such a responsibility reduces the ability of professionals such as faculty members to exercise their “academic freedom, creative expression, and intellectual discourse” that are supposedly cornerstones of the university’s mission (University of Texas at Austin, 2017).

These contradictions are found elsewhere among prominent public universities. Georgia State University uses systems in which student data like grade history is used to predict future performance and send any number of 800 automatic notifications to advisors. One example of an automatic notification is “an advisor is notified if a student signs up for a class not relevant to that individual’s major” (Ekowo and Palmer, 2016, p. 3). In addition to warning advisors about students exploring different subject areas, the system also informs students their likelihood of succeeding in that class based on profile data compiled from prior student activity. The assumption is that students, empowered (or discouraged) by this information, would then chose a different course or major in order to improve their likelihood of succeeding. A statistical model that suggests what classes students should take or avoid reinforces its own reliability. Further, the premise of such a program runs counter to the spirit of freedom and exploration that is foundational to the values of American higher education. These systems also inhibit the freedom of faculty to design curriculum when statistical indicators of student performance influence decisions about what activities, courses, or programs exist at an institution of higher education. The *automation* of notifications reduces opportunities for humans to interpret or discuss situations before assumptions about them are made and acted upon. In another

example, the Ohio State University's mission statement echoes the altruistic themes found in the mission statements analyzed in this study, listing "comprehensive programs," "diversity," and "creating and discovering knowledge" among the institution's hallmark features. Meanwhile, the Ohio State University has invested in seed grants for learning analytics and "predictive methods" to ensure excellent "retention and timely graduation of its students and optimization of their educational trajectories" (The Ohio State University, 2015). These examples show how universities are not impervious to the allure of economic instrumentalism and neo-Fordist ideologies.

Rather than yielding to economic pressures, universities could instead be sites for critical inquiry and debate *about* potential problems and issues related to technical rationalism, neo-Fordism, and how these ideologies may or may not align with the value and purpose of public higher education in a democratic society. The collection and use of personal data is already ubiquitous in many areas of communication, entertainment, and information sharing applications external to educational institutions. Universities should position themselves as sites to critically interrogate the indiscriminate practices related to the collection and use personal data in these applications. Universities and academic researchers are just starting to wrestle with the complexity of issues like discrimination in learning analytics systems, but these issues are often considered after learning analytics systems have already been implemented. It invites comparisons to the practices Google and Facebook use when they deploy invasive data collection, sharing, and utilization tactics and "ask for forgiveness" later (or simply pay a fine and continue to conduct their problematic activities) (Galloway, 2017).

Freedom

Freedom is a recurring theme in public higher education mission statements. It is specifically mentioned in terms of academic freedom and freedom of expression.

Freedom is also implied in references to research, creativity, and innovation. The concept of academic freedom is often interpreted as a protection for faculty to profess opinions that may be politically unpopular; however, the true spirit of academic freedom may also apply to students being able to pursue whatever disciplines, instructors, or projects they wish. Another definition of freedom has to do with the philosophical question of free will as contrasted with determinism.

Radical behaviorism is a form of determinism. Skinner (1971) wondered whether it was better for a person to have an illusion of free will or to be aware of the fact that they were enslaved by environmental causes. As behaviorists/determinists believe that people and environments can be predicted and controlled, they also subscribe to the circular logic that at any given time there are a very limited number of choices a person can make which in turn leads to a limited (and easily predicted) set of possible actions. In corporate environments these limitations are intentionally designed to increase the predictability and efficiency of customer behavior. A customer with a limited number of fast food menu options will make predictable choices (while the restaurants use ironic slogans about personalization and individualism like “have it your way,” “made to order” etc.). Customers will use the drive through, or, if they dine in, they will leave quickly. Even “off-menu” requests (like extra pickles) are anticipated and measured. Everything about the fast food environment is designed for customers to behave in ways that maximize efficiency, increase sales, and reduce costs for the business (Ritzer, 1996).

Adaptive learning technology uses these same techniques to throttle the choices and “pathways” available to students while contradictorily claiming that their systems increase the personalization, flexibility, and agency of individuals.

As mentioned earlier, some implementations of learning analytics systems predict the likelihood of whether or not a student will pass a class based on identifying characteristics or performance in earlier courses or exams (see Ekowo & Palmer, 2016; and Fritz, 2017 for examples). These predictions are acted upon in ways that are intended to increase efficiency for both the student and the institution. To this end, students may be encouraged to take classes in which they will have a higher likelihood (based on the statistical probability generated by prior students) of succeeding, and they will be discouraged from taking classes in which they are predicted to fail. Using predictive data based on aggregate statistics to encourage or require individual students to enroll in or avoid courses is incompatible with academic freedom as it applies to students, and it raises concerns about how data contributes to the imbalance of power at an institution (i.e., when the use of data prioritizes institutional outcomes like graduation rates over student interests like freedom and exploration).

Freedom is described by some scholars as an important component of education. Biesta (2010) describes freedom as a facet of the interpersonal dimension of education:

We should not think of freedom as sovereignty, that is, of freedom as just doing what you want to do [but] rather. . . a ‘difficult’ notion of freedom, one where my freedom to act, that is, to bring my beginnings into the world, is always connected with the freedom of others to take initiative, to bring their beginnings into the world as well so that the impossibility to remain ‘unique

masters' of what we do is the very condition under which our beginnings can come into the world.

John Henry (sometimes cited as “Cardinal”) Newman advocated for liberal education that promoted “*freedom, equitableness, calmness, moderation, and wisdom*” (1852/1996, p. 77). Carr and Kemnis (1986) advocate for freedom in terms of professional practice in education:

The professional autonomy of teachers must be extended to include the opportunity to participate in the decisions that are made about the broader educational context within which they operate and facilitate collaborative discussion within the teaching profession as a whole about the broad social, political and cultural context within which it operates. (p. 9)

For higher education institutions to align themselves with their own ideology, they must consider these notions of freedom in contrast to the diluted and distorted conceptions of freedom advanced by technology companies.

The use of technology can also be employed to preserve power. Standardized curricula combined with algorithmic guidance further compounds the inability for someone to criticize, to make decisions, or to consider knowledge from within or in relation to a localized context. Swenson (2014) asks important questions about who should be given power to make decisions about statistical models and interventions in education and who can legitimize and validate some student knowledge and data over others. By transferring this power to external providers, institutional administrators are absolving themselves from accountability of having to deal critically with potentially harmful consequences or ethical issues. Economic efficiency may not be worth the

consequences associated with transferring power to private interests. Even Dewey himself (1916) cited “social efficiency” as an aim of education, though he issued the prescient caveat that there is “grave danger that in insisting upon this end, [because] existing economic conditions and standards will be accepted as final” (p.119).

Individualism

As mentioned, viewing individuals in economic terms, i.e., as individual consumers, is a characteristic of neo-Fordism. This viewpoint is overtly represented in the discourse of technology companies who offer data systems and services for use in education. Michael Apple (1982), in his seminal *Education and Power*, asks a poignant rhetorical question about what such a contradiction might mean in educational contexts:

what kind of subjectivity, what kind of ideology, what kind of individual may be produced [in school]? The characteristics embodied in the modes of technical control built into the curricular form itself are ideally suited to reproduce the possessive individual, a vision of oneself that lies at the ideological heart of corporate economies (p. 153).

Apple was criticizing aspects of formal education in a general sense, but the cautionary reference to “technical control” built into curriculum can be applied to modern data systems reproducing and calcifying the problems associated with limited agency and concentrated power.

In 1885, Daniel Coit Gilman, who was the first president of both University of California and Johns Hopkins University, gave a rousing rebuttal against what he saw as an emerging focus on measurement and results in U.S. higher education. It is worth quoting at length:

Let me protest against the common method of estimating intellectual work by numerical standards alone. . . I have known the expenses of an institution made a dividend and the number of scholars the divisor, the quotient representing the cost of each pupil. All this is wrong, absolutely wrong. If such a standard were allowable, the largest number of scholars taught by the cheapest teacher would be the greatest success. It is not the number but the quality of students which determines the character of a high school⁶. It is important to count; it is better to weigh. Having spoken of what the university does for individuals, let us consider its second function. It benefits society as well as individual men. It renders services to the community which no demon of statistics can ever estimate, no mathematical process ever compute. (as cited in Menand, Reitter, & Wellmon, 2017, p. 172).

The tendencies towards and arguments against viewing higher education in economic and “mathematical” terms is a very old and still ongoing debate. Today, the “cheapest teachers” are software applications. What is new and compelling about today’s commercial learning analytics providers is the fact that they are using similar techniques as some of the largest and most successful companies in human history (e.g., Facebook, Google, and Amazon). These companies’ business model *is* the quantification of individuals (or more accurately, the deconstructed and re-aggregated characteristics of individual activity). Beyond advertising and sales of specific products and services, these companies broker in personal data about preferences, behaviors, and activities (Webb,

⁶ At the time “high school” referred to any education beyond grammar school, which included college and university education.

2019). These preferences, behaviors, and activities, are captured via Internet applications that provide information, communication, commerce, security, navigation, and entertainment services. We are just beginning to understand the risks and consequences associated with the measurement, monetization, and extraction of our identities as they occur in these media.

Equality

Issues related to race, gender, and economic disparity are reproduced and reconfigured in modern technological systems (Noble, 2018). Because they reflect and perpetuate the social facts of our world, data systems have the potential to not only discriminate against individuals based on identity characteristics, but the systems can also reinforce the structural inequities that may exist in American institutions (Gregg, Wilson, & Parrish, 2018).

According to their mission statements, universities strive to be inclusive environments, celebrating diversity and difference. On the one hand, increasing diversity, inclusivity, and support programs is a positive thing not just for marginalized students but for all students at an institution (Harper, 2008). On the other hand, the collection, use and corresponding practices (predicting tendencies, carrying out interventions, etc.) that are based on identity attributes could be a form of racial profiling and discrimination (Scholes, 2016). Adaptive behavioral systems and automatic predictive models exacerbate the risks of negative consequences. Data that is decontextualized or reinforced via bureaucratic process could undermine the ethical sensitivities associated with diversity and inclusion. If data systems are constructed and executed without taking such sensitivities into account, or if demographic information is simply ignored in the

statistical models, harmful practices could become inadvertently integrated into the structures and processes of an institution. For instance, if an institution ignores racial data, but it denies applicants into certain programs based on performance or other factors that are correlated with race, the institution could inadvertently be perpetuating racist activities. As Hodkinson (1997) says, in neo-Fordist systems, a “focus on ‘efficiency’ and ‘value for money’ deflects attention away from more intransigent problems of social inequality.” Furthermore, many data models and AI systems are built by individuals who themselves are members of homogenous identity groups which increases the likelihood of racial bias and discriminatory elements being promulgated in their models and applications, whether intentionally or unintentionally (Webb, 2019). If racist elements are covertly built into technology systems in this way, it makes it difficult to identify and correct such problems later. Universities that value diversity and inclusion should consider how using AI systems, predictive models, or automatic interventions could support or hinder these aims, especially when they are promised by commercial providers. Technology companies are self-interested and motivated by profit and growth. Even the appearance of altruistic activities can be associated with market forces. For example, when IBM first introduced diversity initiatives within the company they primarily did so in order to attract new customers (Thomas, 2004). Diversity initiatives at private companies are often created to bolster the brand and increase profit.

Neo-Fordism advances the “myth of meritocracy” in which it is implied that everyone is given an even playing field in life and that one’s own “grit” and determination are the biggest contributing factors to a person’s success or failure. Privilege and advantage associated with race, gender, or wealth are not factors in the

myth of meritocracy (Heintz & Folbre, 2000). This myth is embellished by the claim that a college degree will lead to higher lifetime earnings. Meanwhile, there is a proportional relationship between those who attend college and their family income, suggesting that the salary earnings argument is supported by correlation more than causation (Heintz & Folbre, 2000). Further, even if a college degree leads to higher lifetime salary earnings, it does little to address other financial aspects of racial inequality such as building and sustaining wealth over multiple generations (Jones, 2017). Yet, claims of serving underrepresented groups and minorities is often the subtext of what technology companies can do (for under-resourced institutions). Warner (2013) points out the contradiction in this claim that technology companies pretending to support equity are in fact perpetuating inequality: “Students with access to ‘elite’ universities will continue to be taught by humans while the rest will be trained by computer software.” The argument is that being taught by other people (particularly experts in their fields) is a superior (and more expensive) form of education. Learning with software is less expensive and more easily scaled. The types of deep, transformational experiences and insights gained from having discussions and interactions with scholars and experts is supposedly not a luxury that society can afford to give to people from lower socioeconomic backgrounds. The IBM text analyzed in this study claims that AI systems will allegedly determine what a child or “8th grader” wants to be or should be in terms of a career and that the systems will develop a learning path that will lead to the child’s eventual entering into their desired career in adulthood. If someone is or is not exposed to the kinds of social cues and norms associated with social class or other demographic factors, AI-powered education systems might exacerbate socioeconomic differences.

As the working class, women, and people of color attended American colleges and universities, the discourse of higher education responded by imposing new quality checks, new ways of moving students through their academic career as quickly as possible, and new professional programs to give different student populations very specific types of jobs. Prior to the era of mandatory elementary education in the 1800's in America, school and post-secondary education was reserved for the socioeconomic elite. Education reproduced the privileges afforded to the already-privileged class. As public higher education became available to the masses (as outlined in Chapter 2), it led to an increased demand for economic accountability, in turn leading to a dominant narrative of higher education being responsible for job placement and skills training. As working class, poor people, women, and people of color began to attend institutions that were previously reserved for the wealthy and white, many institutions began to “tailor” their educational experiences toward the characteristics and demands of these new types of “customers” from different socioeconomic backgrounds while at the same time creating ideal workers for corporations and industry partners. Technology is utilized to deliver this “training” in uniform, scalable ways.

As a contemporary example of the connection between offering diluted educational experiences for marginalized people while serving the interests of private industry, Southern New Hampshire University's competency-based “College for America” tries to recruit “historically underserved” students, while at the same marketing itself to industry partners as “employer-focused.” The front page of their website includes a prominent button “for employers” and includes the text, “The College for America program lets SNHU put its mission of expanding access to education to work for your

organization” (College for America, 2018). This Southern New Hampshire “model” is now synonymous for the type of large-scale, flexible, online modality that leverages corporate partners and targets “non-traditional” students.⁷

The institutions that readily adopt commercial learning analytics and adaptive learning software often do so out of (perceived) financial necessity. They are public or non-profit universities that are facing declining state funding and/or declining enrollments. They are enrolling historically “underserved” populations of poor people and people of color who are “underprepared” for the college experience. Or, in the case of Arizona State University, they are calling themselves the “new American University” a moniker which entails scaling attendance to unprecedented levels and replacing general education courses with adaptive software (Kolowich, 2013). Hiring more instructors (especially full time professors) is too costly, so these institutions are outsourcing the important act of teaching to private technology companies.

It is not a coincidence that research on higher education retention (e.g., the seminal research of Vincent Tinto in the 1970’s) in the United States began shortly after more students of color and students from lower socioeconomic backgrounds began attending higher education in higher numbers (after *Brown v. Board of Education* and the Civil Rights Act of 1964 guaranteed them federal protections to do so). Enrollment and retention research also emerged during an economic recession which added financial pressure for institutions to recruit and retain more students. The narrative posited by the College for America suggests that the best intervention for historically underserved

⁷ A partnership between Maryville University and Pearson to expand online programs has been called the “next Southern New Hampshire” (McKenzie, 2018)

people is to make them employable. This mirrors the disproportionately high interest in professional programs with promises of high post-graduation salaries among these same populations in the 1970's (Cheit, 1975). The "traditional" higher education experiences are reserved for the wealthy and white (Ashkenas, Park, & Pearce, 2017).

Socioeconomic disparity is reinforced and reconstructed in this narrative. Contemporary examples promote technology as a way to optimize the speed at which students will graduate with job skills. The recent popularity of technology systems and learning analytics in education appeared after an economic recession, continued reductions in state funding, and a national decline in high school graduates.

The contradiction of promoting education for "all" while segregating some students is not new. Education has always been stratified. Certain types of skills training have always been available to the lower classes of society. As Good (1959) writes about the history of formal education, "Education was a privilege except for orphan and pauper children who were apprenticed and compelled to acquire a trade" (p. 6). Beyond skills and trades, education presents opportunities for people to develop as citizens in our democracy who engage critically and discursively about the facts of our world. It is not simply a means to move people quickly through "work-relevant" training as proposed by the College for America (2018) or even our current U.S. Department of Education (2018). An altruistic mission that promotes inclusivity and that benefits all people should not separate the types of educational experiences afforded to members of certain socioeconomic categories.

Pedagogy

One way to achieve a more inclusive democratic vision of public higher education is to allow for educational decisions about curriculum and teaching techniques to be made in local contexts with maximum agency among participants (Dewey, 1916/1997). The design and selection of what to include in the curriculum is inherently value-laden, biased, and ideological. When these decisions are relegated to large national or multinational corporate entities, the capacity for local control is reduced. When students are only able to interact with a software program, their capacity to engage critically with the curriculum or content is reduced. The student's role, despite the marketing (and largely disingenuous) rhetoric of students being "empowered" or having more personal agency, is relegated to one of navigating software systems with varying degrees of proficiency. The "personalization" occurs in the form of pre-determined behavioral adjustments.

It is unclear how pedagogical practices enacted by educational data systems as they are currently described by the commercial learning analytics providers analyzed in this study might support altruistic aims. If technological rationalism becomes the dominant driver of educational experiences thereby inhibiting the role or agency of professional educators, then education becomes a site for commoditization and exploitation. In speaking of the problems associated with educational methods that focus primarily on efficiency, Apple (1982) reminds us that these methods "had their roots in industry's attempts to control labor and increase productivity, in the popular eugenics movement, and in particular class and status group interests" (p. 12).

Another challenge with educational data systems is that they tend not to define learning in the first place. Instead of orienting education toward ethical or democratic ends, “continuous improvement” becomes its own self-perpetuating ideology. The assumption is that *any* changes in behavior are sufficient measures of success. Whether these changes are positive, negative, ethical, or unethical is irrelevant. This disregard for purpose and value is similar to neuroscientific conceptions of “learning” as physiological changes occurring in the form of new neural pathways, ignoring the nature or quality of what is being learned. Biesta (2010) considers these glib conceptions of learning part of a “technocratic model in which it is assumed that the only relevant questions [are] about the effectiveness of educational means and techniques, forgetting that what counts crucially depends on judgments about what is educationally desirable” (p. 32). Even as early as 1803, philosopher Immanuel Kant (trans. 1960) distinguished between educational activities performed based on *inclination* as opposed to *duty*. A sense of duty in students and in citizens is more important than doing things out of preference or inclination. The kind of educational experiences designed and implemented by AI and data personalization --and economic neo-Fordism-- will appeal to a sense of inclination but not a sense of duty, especially not in any altruistic sense.

From a pedagogical and curricular standpoint, it is unclear how educational data systems will help create and disseminate new knowledge and to what degree they will promote or inhibit academic freedom, assuming these are important to higher education institutions. As they are currently framed (in this study), educational data systems impede rather than promote opportunities for critical dialogue and new knowledge creation. Once a student logs in to a system, it tells the students “what they know, what they don’t, and

where to spend their time studying” (Pearson My Lab and Mastering, 2019). For instructors, the system advertises uniqueness and agency (“teach your course your way”) only to immediately follow this sentiment with an offer to “save time with our prebuilt assignments.”

Recommendations

The findings and interpretations from this study represent only one perspective. Arguably, this study was limited in the scope of the sample used to generate findings about ideological assumptions in education. Further research might expand the scope of texts or agencies that are compared. The contrast between dualities like science and the humanities, quantitative and qualitative education research, and even political principles is timeless and can easily be found in a variety of discourses. Drawing out contrasting and contradictory ideological assumptions is valuable in demystifying commonsense knowledge and exposing what groups may be either dominated or subordinated. For instance, a study could be carried out in which the researcher interviews workers or executives at educational technology companies to learn about these individuals’ values and beliefs. Further research might analyze whether the findings in this study are similar or different in other countries or if they are unique to the U.S., among community colleges or private colleges, or with other types of commercial providers like student information systems. A meta-analysis of scholarly literature might identify the ratio of quantitative or positivist research as compared with qualitative, phenomenological or ethnographic research in education.

To best align with their own stated missions universities themselves would position themselves as authoritative sites for scholarly discourse, dialogue, and critical

inquiry about topics like the use of personal data by large corporations in education and in society in general. A plurality of voices and perspectives will strengthen our shared understanding and attitudes about these topics. New methods in data extraction and machine learning have the potential to change our world in some positive ways but also in many ways that are concerning or exploitative. What is being impacted, how they are impacted, and what underlying conceptions, ideologies, forces, and powers influence these things must be critically examined. A company like Facebook can help people connect and communicate with one another; yet it can also exploit personal data for commercial purposes. Worse, the data from Facebook can be extracted, shared, manipulated, and exploited for unethical or criminal purposes. If public higher education wants to leverage data, they should do so with careful consideration of ethical and privacy concerns, but also think broadly about the diverse viewpoints on the nature of learning and knowledge and the purpose of education for individuals, communities, and the world.

Learning analytics research is more closely aligned with the ideologies of privatization and economic paradigms. Lagemann and Lewis (2012) warns that “in the absence of public engagement in discussions of purpose, private purposes tend to trump public purposes” (p.3). As economic narratives dominate the discourse of higher education, universities are vulnerable to corporate overreach. The difference in political views about the function and value of higher education exacerbates this dynamic. A 2018 Pew Research study asked Republicans and Democrats about their attitudes on whether they felt higher education had a positive or negative effect on “the way things are going in this country” with 72% of Democrats saying colleges and universities had a positive

effect, (and 19% saying it had a negative effect) as opposed to only 36% of Republicans saying colleges and universities had a positive effect on our country and 58% of Republicans saying colleges and universities had a negative effect on our country (Brown, 2018). For many conservatives, jobs and the economy are the primary pursuits in American society, and they view universities as either supportive of this function or useless. Taking this position further, using corporate software to educate citizens would both increase private capital and reduce the public expenditures on higher education institutions. To protect themselves against this lopsided distribution of funds, universities would benefit by better communicating and promoting their many values for all citizens. The vital role of a university transcends political ideologies. If universities provide public and benefits (including economic benefits) for their communities, states, and the entire world, a more logical response from state leaders would be to direct more funding toward higher education institutions, so the institutions are not forced to rely on technology systems to improve efficiency. As a result, institutions of higher education would not have to charge students more for tuition thus widening the socio-economic gap between those who attend college and those who cannot afford it.

“Learning Sciences” programs and disciplines that are computationally and quantitatively focused⁸ would benefit from having required courses and curriculum in ethics and critical viewpoints. Such courses, if included at all, are often offered as optional electives (Webb, 2019). In fact, more diverse course offerings and required curriculum will strengthen degree programs in AI, Computer Science, and Education.

⁸ See Carnegie Mellon for example <https://www.hcii.cmu.edu/research-areas/learning-sciences-and-technologies>

Students who are exposed to a variety of topics and viewpoints, including those that are critical or oppositional, are likely to develop a more nuanced understanding of their primary field.

Gregg, Wilson, and Parrish (2018) offer principles that higher education professionals should use when considering learning analytics applications: that the institutions should emphasize their values when initiating conversations with corporate partners, that learning analytics should exist alongside alternative qualitative interpretations of educational experiences, and that local professionals should have agency in the adoption and implementation of learning analytics tools. Taking these principles into account, data and analytics could support things like trans-institutional analytics that measure public good outputs of institutional initiatives (see Vanderbilt University, 2018 for an example of this), analytical tools for self-understanding and reflection, and the co-development of institutional data systems and content with students as participants in the process. Learners could not only have access to the types of data collected about them, but they would help create specific personal reports and provide explanations of what their data may mean in educational environments.

Rather than using AI data systems to manage student behavior or to meet economic goals, it would be more in line with the mission of public higher education if universities were to use these systems to better understand and improve their own internal processes and inefficiencies as they pertain to the access and dissemination of their programs, services, and knowledge. As Stevens (1996) acknowledges, elements of industrialism and Fordism (and neo-Fordism) are likely to be present within any institution, but educationists should consider the *appropriateness* of *how* such elements

are applied. Academic analytics should be employed to improve administrative processes of higher education such as payment and registration processes or the availability and use of various campus resources. These types of initiatives would employ data analysis techniques to improve services and student experiences instead of or perhaps even in support of economic measures of efficiency and institutional outcomes.

As institutions work towards achieving more ethical and equitable learning analytics practices, they may find guidance in the IMS Global Learning Consortium's "Key Principles" which advocate for "clear policies" and "transparency" related to how educational data is used. Beyond these principles, the JISC organization in the United Kingdom proposes a learning analytics "code of practice" which recommends that students have mechanism for informed consent and opting out of their data being collected. The right "be forgotten" (have data erased from systems) is also being discussed and debated by these and other groups. In practical terms, such principles and policies should be explored and enacted by public universities.

Integrating scholarly research into the roles and duties of administrative positions at public universities might temper what is otherwise a predominantly managerial or executive approach to building and maintaining the bureaucratic structures within these institutions (Callahan, 1962). Such an emphasis would help articulate the values and qualities that are most important in public higher education. The works of Biesta, Pasque and others cited in this study offer helpful frameworks for thinking about and assessing what is good and valuable in public higher education. As this research was carried out, examples have emerged which show how more critical voices are shaping the discourse

of learning analytics and technology in higher education like the new Digital Sociology⁹ program at Virginia Commonwealth University. Even as universities like Michigan State University (the producer of one of the texts analyzed in this study) are creating centers and “hubs” for learning analytics projects and programs, recent publications from these groups show a perspective that is more considerate of ethical concerns and cognizant of the opportunity to change institutional practices rather than to change student behaviors through systematic or algorithmic means. For example, a recent blog post on MSU’s (2019) website describes a “vision for learning analytics” which includes goals to “uncover unintended barriers to student success,” and “challenge the myths on which our curricula, our policies, and our practices are based.” At my own institution, I have participated in campus-wide initiatives to implement learning analytics software and to explore intervention strategies. Collaborators in these efforts were thoughtful and considerate of students as individuals. The efforts sometimes began under the auspices of using analytics and data to target individuals who were considered “at risk,” but they often led to changes in institutional practices and support efforts rather than the creation of automated “nudges” or AI-based strategies.

Beliefs and assumptions are produced and reproduced in texts, in discussions among people, and in the practices and activities carried out by people. It is important for individuals and organizations to be reflective and to take responsibility for the ways in which they may advance certain ideologies.

⁹ <https://digital.sociology.vcu.edu/>

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APPENDIX A

Comparisons of Texts

Table A.1 Comparison of UT Austin with Knewton Texts

University of Texas at Austin	Knewton Higher Educationo
<p>Mission The mission of The University of Texas at Austin is to achieve excellence in the interrelated areas of undergraduate education, graduate education, research and public service. The university provides superior and comprehensive educational opportunities at the baccalaureate through doctoral and special professional educational levels.</p> <p>The university contributes to the advancement of society through research, creative activity, scholarly inquiry and the development and dissemination of new knowledge, including the commercialization of University discoveries. The university preserves and promotes the arts, benefits the state's economy, serves the citizens through public programs and provides other public service.</p> <p>Core Purpose To transform lives for the benefit of society.</p> <p>Core Values Learning — A caring community, all of us students, helping one another grow. Discovery — Expanding knowledge and human understanding. Freedom — To seek the truth and express it. Leadership — The will to excel with integrity and the spirit that nothing is impossible. Individual Opportunity — Many options, diverse people and ideas, one university. Responsibility — To serve as a catalyst for positive change in Texas and beyond.</p>	<p>Save time. Intervene faster. See better outcomes.</p> <p>The Unique Advantage of Knewton Adaptive Learning Fully integrated adaptive courses that provide each student with a personal learning experience</p> <p>Save Time Planning Your Lectures Our intuitive dashboard gives you all the data you need to see to inform critical decisions: what should you teach today? What do your students need most from you to succeed?</p> <p>Intervene Faster Knewton offers you easy to understand and actionable analytics so you can quickly identify struggling students and what they need to succeed. You also receive daily notifications informing you which students or topics need immediate attention.</p> <p>Practice & Instruction of Pre-Requisites Knewton identifies if and when students are struggling with a pre-requisite and provides them with the practice and instruction they need, in real time, even if it falls outside of your course of discipline. In return, you get reports identifying which pre-requisites individual students need help with.</p> <p>Better Outcomes for More Students Knewton is a fraction of the cost of traditional course materials, so more students will have access to the material they need. And because their experience is personalized, you'll see better learning outcomes.</p>

Table A.2 Parts of speech in UT Austin and Knewton

	UT Austin	Knewton Higher Education
Nouns	University of Texas at Austin, university, public, knowledge, research, society, service, core, commercialization, responsibility, dissemination, understanding, opportunities, discoveries, opportunity, advancement, development, leadership, excellence, community, discovery, integrity, students, learning, catalyst, citizens, programs, benefits, activity, nothing, purpose, mission, benefit, options, economy, freedom, inquiry, Austin, levels, spirit, people, values, truth, areas, human, ideas, lives, arts	you, students, Knewton, experience, outcomes, course, time, pre-requisite, notifications, instruction, discipline, individual, analytics, material(s), advantage, dashboard, decisions, attention, students, fraction, lectures, reports, outside, student, courses, topics, today, time, cost, data
Verbs	provides, contributes, preserves, transform, promotes, helping, achieve, express, caring, serve(s), change, excel, seek, will, grow	need, struggling, intervene, succeed, save, see, identify(ies, ing), understand, informing, practice, provides, planning, receive, provide, will, inform, offers, access, return, falls, gives, help, teach, can, see, get
Modifiers	educational, one, undergraduate, baccalaureate, comprehensive, professional, interrelated, impossible, individual, including, expanding, scholarly, doctoral, positive, superior, creative, graduate, another, special, state's, diverse, beyond, many, new	learning, better, personalized, traditional, actionable, integrated, intuitive, immediate, adaptive, personal, critical, quickly, unique, faster, better, fully, daily, also, easy, real, even

Table A.3 Word frequency in UT Austin and Knewton

UT Austin	Count	Knewton	Count
University	4	you	12
public	3	need	7
education	2	students	6
knowledge	2	Knewton	4
provides	2	pre-requisites	3
educational	2	experience	2
research	2	struggling	2
society	2	intervene	2
service	2	learning	2
Texas	2	will	2
core	2	outcomes	2
one	2	material(s)	2
opportunity(ies)	2	instruction	2
		succeed	2
		better	2
		practice	2
		course	2
		faster	2
		time	2
		save	2
		see	2

Table A.4 Comparison of Michigan State and Pearson Texts

Michigan State University	Pearson Education
<p>Michigan State University, a member of the Association of American Universities and one of the top 100 research universities in the world, was founded in 1855.</p> <p>We are an inclusive, academic community known for our traditionally strong academic disciplines and professional programs, and our liberal arts foundation. Our cross- and interdisciplinary enterprises connect the sciences, humanities, and professions in practical, sustainable, and innovative ways to address society's rapidly changing needs. As a public, research-intensive, land-grant university funded in part by the state of Michigan, our mission is to advance knowledge and transform lives by:</p> <ul style="list-style-type: none"> -providing outstanding undergraduate, graduate, and professional education to promising, qualified students in order to prepare them to contribute fully to society as globally engaged citizen leaders -conducting research of the highest caliber that seeks to answer questions and create solutions in order to expand human understanding and make a positive difference, both locally and globally -advancing outreach, engagement, and economic development activities that are innovative, research-driven, and lead to a better quality of life for individuals and communities, at home and around the world 	<p>Looking at the big picture helps us personalize a learning path for every student</p> <p>Data, Analytics, & Adaptive Learning</p> <p>The importance of using data and analytics in education is growing rapidly; the power of data is fundamental to improving the performance of individual students.</p> <p>Educators make important decisions every day. Using our technology and services to connect infrastructure, instruction, and assessment, we can create holistic views of the student, classroom, and institution that can be used to make a measurable impact on student learning and success. Our capabilities in data, analytics, and adaptive learning — and our leading efficacy research — enable us to design a smarter, adaptive learning path for every student.</p> <p>Evidence of impact on learner outcomes</p> <p>We're focused on developing products and services that have a measurable impact on improving students' lives through learning.</p> <p>Each year, more than 11 million students use our learning technologies worldwide. Over the past decade, we've worked closely with students and educators to track learning gains, holding ourselves accountable for not just the products we make but also for the learning gains we help make possible.</p>

Table A.5 Parts of speech in Michigan State University and Pearson

	Michigan State University	Pearson Education
Nouns	we, community(ies), our, discipline, programs, foundation, sciences, humanities, professions, ways, needs, university, state of Michigan, mission, enterprise, knowledge, lives, education, students, them, society, leaders, research, questions, solutions, understanding, difference, outreach, engagement, development, activities, life, individuals, home, world	looking, picture, path, student, us, importance, data, analytics, education, power, data, performance, student(s), educators, decisions, day, technology(ies), services, infrastructure, instruction, assessment, we, views, classroom, institution, impact, learning, success, capabilities, research, evidence, outcomes, products, lives, year, decade, gains, ourselves
Verb	are, connect, address, funded, is, advance(ing), transform, providing, prepare, contribute, conducting, seeks, answer, create, expand, make, lead	looking, helps, personalize, use, used, using, is growing, is improving, make, connect, can create, enable, design, focused, developing, have, improving, use, worked, track, holding, make
Modifiers	inclusive, academic, traditionally, strong, professional, liberal arts, cross- and interdisciplinary, practical, sustainable, innovative, society's, research-intensive, land-grant, our, outstanding, undergraduate, graduate, promising, qualified, fully, globally, engaged, citizen, highest, caliber, human, positive, both, locally, globally, economic, innovative, research-driven, better, quality, around	big, learning, every, rapidly, fundamental, individual, important, holistic, measurable, student, our, adaptive, leading, efficacy, smarter, each, 11 million, worldwide, over the past, closely, accountable, not just, but also, learning, possible

Table A.6 Word frequency in Michigan State University and Pearson

Michigan State University	Count	Pearson	Count
university(ies)	4	learning	8
professional	2	students	8
innovative	2	we/us	7
globally	2	make	4
academic	2	impact	3
order	2	every	3
society('s)	2	data	3
community(ies)	2	use(d/ing)	3
advance(ing)	2	measurable	2
		improving	2
		analytics	2
		services	2
		adaptive	2
		products	2
		gains	2
		path	2
		can	2
		technology(ies)	2

Table A.7 Comparison of University of Oregon and IBM Texts

University of Oregon	IBM Cognitive computing
<p>Serving the state, nation and world since 1876 The University of Oregon is a comprehensive public research university committed to exceptional teaching, discovery, and service. We work at a human scale to generate big ideas. As a community of scholars, we help individuals question critically, think logically, reason effectively, communicate clearly, act creatively, and live ethically.</p> <p>Purpose We strive for excellence in teaching, research, artistic expression, and the generation, dissemination, preservation, and application of knowledge. We are devoted to educating the whole person, and to fostering the next generation of transformational leaders and informed participants in the global community. Through these pursuits, we enhance the social, cultural, physical, and economic wellbeing of our students, Oregon, the nation, and the world.</p> <p>Vision We aspire to be a preeminent and innovative public research university encompassing the humanities and arts, the natural and social sciences, and the professions. We seek to enrich the human condition through collaboration, teaching, mentoring, scholarship, experiential learning, creative inquiry, scientific discovery, outreach, and public service.</p> <p>Values We value the passions, aspirations, individuality, and success of the students, faculty, and staff who work and learn here. We value academic freedom, creative expression, and intellectual discourse. We value our diversity and seek to foster equity and inclusion in a welcoming, safe, and respectful community. We value the unique geography, history and culture of Oregon that shapes our identity and spirit. We value our shared charge to steward resources sustainably and responsibly.</p>	<p>In five years, the classroom will learn you The rapid digitization of the education industry and the emergence of cognitive systems is already happening in parallel. Over the next five years, the two concepts will link, and personalized classrooms will motivate and engage learners at all levels: from a kindergartener studying the alphabet to a physics PhD candidate studying the finer points of String Theory.</p> <p>The rise of the smart classroom Massive Open Online Courses (MOOCs) have made educational content widely available to anyone with an internet connection. Their publishers are also making the content more engaging and adaptive for classroom use, while mobile devices make it possible to learn anytime and anywhere. All of this digital education creates a tremendous amount of data about all aspects of teaching and learning. And it's not only test scores, but also information about student behavior on digital learning platforms, attendance, and more. IBM envisions educational institutions adopting cloud-based cognitive systems to collect and analyze all of this data over a long period of time — creating longitudinal student records that would give teachers the information they need to provide personalized learning experiences for their students. These systems would also help teachers identify students who are most at risk, why they are struggling, as well as insight into the interventions needed to overcome those challenges.</p> <p>The system could also couple a student's goals and interests with data on their learning styles so that teachers can determine what type of content to give the student, and the best way to present it. Imagine an eighth grader who dreams of working in finance but struggles with quadratic and linear equations. The teacher would use this cognitive system to find out the students learning style and develop a plan that addresses their knowledge gaps.</p>

Table A.8 Parts of speech in University of Oregon and IBM

	University of Oregon	IBM
Nouns	value (s), discovery, service, expression, collaboration, application, responsibility, sustainability, dissemination, aspirations, professions, resources, discourse, inclusion, diversity, wellbeing, outreach, informed, sciences, identity, pursuits, steward, purpose, freedom, inquiry, culture, passions, leaders, history, success, unique, spirit, reason, vision, equity, ideas, whole, scale, arts, university, generation, community, public, Oregon, students, participants, person, state, scholars, faculty, staff	content, publishers, connections, challenges, attendance, equations, emergence, candidate, interests, industry, behavior, overcome, concepts, insight, records, finance, aspects, couple, amount, string, points, dreams, styles, levels, theory, anyone, goals, years, gaps, plan, risk, time, type, IBM, PhD, teachers, students, educational, classroom, kindergartener, institutions, classrooms, knowledge, alphabet, learners, teacher, courses, physics, grader, period, test, MOOC's, system(s), data, information, digital, digitization, cloud-based, platforms, internet, devices
Verbs	mentoring, fostering, seek, work, communicate, think, live, help, question, generate, strive, enrich, charge, aspire, enhance, serving, research, teaching, learn	will, give, use, interventions, envisions, determine, motivate, experiences, identify, happening, struggling (struggles), engag(ing), creating, addresses, adopting, develop, imagine, provide, creates, analyze, collect, working, mak(ing), made, rise, need, find, help, link, learn, studying, teaching
Modifiers	creative, transformational, experiential, exceptional, effectively, comprehensive, innovative, encompassing, excellence, preeminent, critically, scientific, ethically, logically, welcoming, cultural, devoted, natural, committed, clearly, economic, physical, artistic, social, global	cognitive, personalized, longitudinal, tremendous, available, quadratic, parallel, possible, anywhere, adaptive, anytime, massive, already, present, needed, linear, online, widely, mobile, eighth, rapid, smart, finer, long, open, well, five, next, best

Table A.9 Word frequency in the University of Oregon and IBM

University of Oregon	Count	IBM	Count
we	11	learn(ing)	6
value(s)	5	education(al)	4
university	3	classroom	3
community	3	cognitive	3
public	3	teacher(s)	3
research	3	student(s)	3
teaching	3	content	3
Oregon	3	systems	3
discovery	2	data	3
world	2	five	2
nation	2	years	2
		personalized	2
		studying	2
		digital	2

APPENDIX B


Pictures of Commercial Learning Analytics Provider Web Pages

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KNEWTON

Picture B.1 Knewton Higher Education Web Page

The screenshot shows the IBM Research website. At the top, there is a navigation bar with 'IBM' logo and links for 'Industries & solutions', 'Services', 'Products', 'Support & downloads', and 'My IBM'. Below this is a search bar and a list of research areas: 'Cognitive computing', 'Machine learning applications', 'The cognitive system applications', 'Relational', 'Natural language processing', 'Computer vision', 'Polymer Kinetics', 'Simulation', 'Machine Learning', 'Fractals', 'Blue Gen', 'Extraction', 'Chemistry', 'Analytics', 'Cognitive Computing', 'Artificial Intelligence', 'Materials for Advanced Microelectronics', 'Processing Software', 'Statistical Polymers', and 'Extraction'. The main content area features a headline 'The classroom will learn you' with a sub-headline 'Cognitive systems will provide decision support for teachers'. Below this is a video player with the title 'Personalized Learning: 5 Future Technology Predictions from IBM' and a large graphic that says 'In five years, the classroom will learn you.' To the right of the video is a 'Meet the researcher' section featuring Chaitanyu Nelli, Director of Education Transformation, Thomas J. Watson Research Center. Below the video is a 'Peer-reviewed Journal Articles' section with several links to research papers. The bottom of the page includes a 'Share this page' section and a 'IBM & Cognitive In The News' section with links to recent news articles.

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The classroom will learn you
Cognitive systems will provide decision support for teachers

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Personalized Learning: 5 Future Technology Predictions from IBM

In five years, the classroom will learn you.

Meet the researcher
Chaitanyu Nelli
Director, Education Transformation,
Thomas J. Watson Research
Center

Peer-reviewed Journal Articles
Journal of Food Protection: [Impacts for Managing Microbial Risks in the Food Industry](#)
Science Direct: [A modeling framework to evaluate foodborne outbreak investigations](#)
Science Direct: [Genospatial Modeling of Human and Bacterial Diversity with City-Scale Metagenomics](#)

The rapid digitization of the education industry and the emergence of [cognitive systems](#) is already happening in parallel. [Over the next five years](#), the two concepts will link, and personalized classrooms will motivate and engage learners at all levels: from a kindergarten studying the alphabet to a physics PhD candidate studying the finer points of String Theory.
[View the story map](#)

The rise of the smart classroom
Massive Open Online Courses (MOOCs) have made educational content widely available to anyone with an internet connection. Their publishers are also making the content more engaging and adaptive for classroom use, while [mobile devices](#) make it possible to learn anytime and anywhere. All of this digital education creates a tremendous amount of data about all aspects of teaching and learning. And it's not only test scores, but also information about student behavior on digital learning platforms, attendance, and more.
IBM envisions educational institutions adopting [cloud-based](#) cognitive systems to collect and analyze all of this data over a long period of time — creating longitudinal student records that would give teachers the information they need to provide personalized learning experiences for their students. These systems would also help teachers identify students who are most at risk, why they are struggling, as well as insights into the interventions needed to overcome engaging and adaptive for classroom use, while [mobile devices](#) make it possible to learn anytime and anywhere. All of this digital education creates a tremendous amount of data about all aspects of teaching and learning. And it's not only test scores, but also information about student behavior on digital learning platforms, attendance, and more.
IBM envisions educational institutions adopting [cloud-based](#) cognitive systems to collect and analyze all of this data over a long period of time — creating longitudinal student records that would give teachers the information they need to provide personalized learning experiences for their students. These systems would also help teachers identify students who are most at risk, why they are struggling, as well as insights into the interventions needed to overcome those challenges.
The system could also couple a student's goals and interests with data on their learning styles so that teachers can determine what type of content to give the student, and the best way to present it. Imagine an eighth grader who dreams of working in finance but struggles with quadratic and linear equations. The teacher would use this cognitive system to find out the student's learning style and develop a plan that addresses their knowledge gaps.
In addition to the personalized syllabus, the content the student receives would be interactive with deep question and answering capability. For example, the content would also be automatically tagged so that the student would spend more time consuming the information they need, rather than trying to search for it. Depending on how the student is motivated, gamification elements could be incorporated so that student has a deep understanding of the concepts they are being taught, and have fun doing it. If the student wants to work in finance, the teacher could seek input from partnering financial services companies to ensure the student is developing skills that would be relevant in the workforce.

Working with clients: Gwinnett County Public Schools
IBM is working with the state of Georgia's [Gwinnett County Public Schools](#), the 14th largest school district in the U.S., to use [big data analytics](#) and cognitive technologies for population analysis of longitudinal student records. By identifying similarities in how students learn and predicting performance and learning needs, specific content and teaching techniques can be aligned to each of the district's 170,000 students to ensure the best learning experience.
[Learn how IBM is helping to make education systems smarter](#)

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Picture B.2 IBM Research Web Page

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Looking at the big picture


helps us personalize a learning path for every student

Data, Analytics, & Adaptive Learning

The importance of using data and analytics in education is growing rapidly; the power of data is fundamental to improving the performance of individual students.

Educators make important decisions every day. Using our technology and services to connect infrastructure, instruction, and assessment, we can create holistic views of the student, classroom, and institution that can be used to make a measurable impact on student learning and success. Our capabilities in data, analytics, and adaptive learning — and our leading efficacy research — enable us to design a smarter, adaptive learning path for every student.


Resources



Decoding Adaptive

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Products & Services




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CourseConnect

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Picture B.3 Pearson Education Web Page

APPENDIX C

Background and Role of the Researcher

I subscribe to a phenomenological view that human experiences are irreducibly complex and are best understood through interpretation rather than scientific generalization (Frankish & Ramsey, 2012). Within the reflexive/interpretive framework, bias and subjectivity do not degrade the validity of this type of research but instead offer authentic insights into social phenomena (Creswell, 2013). It is therefore important for the researcher to be reflexive and transparent about his or her experiences and biases in relation to the subject of his or her research. For this reason, I will describe my own experiences related to educational discourses and the topics of the texts I am analyzing (Creswell, 2013). Epistemologically, I agree with the post-positivist notion that “knowledge” is subjective, fluid, and influenced by a person’s biases, complexities, and preconception. I.e., while there may be an external reality, there is no objective nor complete way for human perception and language to comprehensively experience and represent that reality in its entirety. Diverse and unique perspectives paint a multi-faceted view of reality and experience.

Subjectivity is inevitable in any research. In Gee’s (2011) view, and in keeping with my post-positivist position, “truth” is seen as existing along a continuum defined by degrees of better or worse. My goal is that the internal soundness, transparency, and authenticity make my findings and analysis trustworthy. Each person’s experiences will influence how he or she interacts with and interprets the world. Because the topics of education and technology are central to this dissertation, I emphasize these in my account, below.

I was born in rural northern Wisconsin to parents who opted to live “off the grid” in a log cabin they built themselves without electricity or indoor plumbing. My father

was a seminary dropout who earned a G.E.D while living on his own as a teen in Chicago. Years later, after moving back to northern Wisconsin, he earned a Bachelor of Fine Arts degree from the University of Wisconsin-Superior. My mother graduated from her southern California high school a year early, and she also attended the University of Wisconsin-Superior as a Music Education major. She left after two years but later designed her own degree in Pastoral Studies, which she completed via distance education courses over dial-up Internet in the early 2000's. Both parents held jobs in social services, which has influenced my own interest in and commitment to public service.

I finished high school a year early with an adequate GPA, and my involvement in various clubs and organizations earned me several scholarships to help pay for college. I also received Pell Grants¹⁰, which are awarded to students based on financial need (as determined based on factors like family income). I earned my Bachelor of English Liberal Arts degree from UW-Superior after six years, several changed majors, and a failed attempt at designing a custom philosophy major. UW-Superior is one of the smaller schools in the University of Wisconsin System. UW-Superior is a self-described "Public Liberal Arts College," though in recent years, the university has cut many academic programs due to decreased enrollment numbers in those programs and at the university overall. The need to eliminate programs was exacerbated by net reductions in financial support for public universities by the state government over the past several years.

¹⁰ Pell eligibility is considered a strong "risk indicator" of academic failure in student retention models (Wei, Horn, and Carol, 2002)

After I graduated, a former professor of mine recommended me for a job at my alma mater's Center for Teaching, Learning, and Technology Development. In that role, I became responsible for the administration and support of various educational technologies like learning management systems, classroom clickers, and electronic portfolios. This experience led me to pursue an online Master of Educational Technology degree from Boise State University.

I am now a higher education administrator, the Director of Learning Technology Solutions in our Office of Information Technology at Boise State University, the same school for which I am writing this dissertation. My role affords me the ability to develop policies and practices as they relate to the implementation, adoption, and use of various technology systems. It is this capacity for influence that makes me acutely aware of how technology systems, settings, and practices can affect how these systems and practices are adopted and utilized (or not) by instructors and students, and how these technologies can covertly contain biases and constraints (stemming from both the people who manage them as well as the people who develop their features and code). I am also an adjunct instructor who teaches both online and in-person. I teach or have taught in the disciplines of Education, Information Science, and Leadership. My role as an instructor places me in situations where I consider the practice of teaching, its aims and its opportunities for student development, and the capacity for teaching to create social possibilities. One course I designed and taught for several years was called "Information, Computers, and Society." The course was housed in the interdisciplinary Information Science program at the University of Wisconsin- Green Bay. The course was described in the course catalog as "a survey of the social, legal and ethical impacts of computers on individuals and

society.” In this class, I tasked students with thinking critically about technological inventions and advancements that they may otherwise take for granted or have an uncritical attitude towards. In the course, students explored issues related to privacy, information literacy, ownership, communication, government regulation, globalization, and democracy, particularly as these things are influenced by and represented on the Internet.

Lastly, I am a doctoral candidate at the time of this writing. I have been a student in formal American public educational institutions for over twenty years. I have attended public universities, one of which claimed that the liberal arts was a cornerstone of its mission. I have advocated for and supported learning analytics products and initiatives. I have been quoted and published in educational technology trade publications, writing about things like “technology adoption cycles” and “change management” from an information technology management perspective. This research project has been developmental for me; it has allowed me an opportunity to contemplate, synthesize, and reconsider my experiences and attitudes about technology in higher education.

APPENDIX D
Glossary of Terms

Artificial Intelligence A concept and a field of study based on an assumption that aspects of human intelligence like learning can be replicated and/or simulated by machines (McCorduck, 2004).

Critical Theory A theory which upholds that research and human society is subjective, historical, and ideological (often in ways that are oppressive or that include “struggle” between groups or ideologies) (Buchanan, 2018).

Critical Discourse Analysis The application of a critical theoretical orientation toward the analysis of “texts” as forms of social language (Rogers, Malancharuvil-Berkes, Mosley, Hui & Joseph, 2005).

Discourse Forms of language and representation that signify the values, beliefs, and practices of a particular social group (Gee, 2011)

Genre A collection or category of texts, art, or communication associated with a particular discourse (Swales, 1990).

Ideology Beliefs, concepts, and norms that underpin social practices (van Dijk, 1995)

Immanent Critique Criticizing social constructs according to their own standards (Antonio, 1981)

Learning Analytics A field of study as well as the data or systems that focus on collecting, measuring, and analyzing educational data for the purpose of improving educational contexts and learner behavior (Long & Siemens, 2011, p. 34)

Liberal Arts A term often used to describe curriculum that exposes learners to a broad range of “classical” and “traditional” subjects from the arts and sciences. Sometimes it is used synonymously with “general studies.” The specific subjects, courses, and content

that are considered part of “liberal arts” have changed throughout history, yet this term is still widely used in higher education (Cheit, 1975; Hansen, 2012).

Neo-Fordism A combination of the assembly line logic of Fordism combined with the flexibility of postmodern, *post*-Fordism as well as new elements like narrowly centralized control of large-scale systems and a form of technical rationalism that views people as componentized, transitory, and means to some ends rather than as “whole people” (or ends in and of themselves) (Hodkinson, 1997).

Taylorism Named after the works of and corresponding practices inspired by early 20th Century engineer, Frederick Taylor, it is the view that work and production can be continuously optimized by measuring and improving the time it takes to perform physical activities. This basic model was applied to many fields and professions beyond engineering and manufacturing, and it laid the foundation for future business improvement models and practices.