University of Kentucky College of Education

# INCREASING EXPECTATIONS FOR ENTRY

## Analyzing Changes in Labor Market Entry-Level Education Requirements Over Time with Potential Implications for Credential or Degree Inflation and Returns-to-Education

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ABSTRACT

The dissertation asks the following question: Have occupations increased academic degree requirements over time?

The literature review provides background on the origin and criticisms of the concept of a “knowledge economy.” It addresses economic “signaling theory” and sociologic “credentialism.”

The methodology relies on a trend analysis using the Bureau of Labor Statistics (BLS) *Occupational Outlook Handbook* and the occupations’ Standard Occupational Classification (SOC) system and its predecessor the Dictionary of Occupational Titles (DOT). In order to address whether occupations have increased academic degree requirements over time, this dissertation will compare entry-level education requirements for BLS SOC occupations that today are assumed to require Associate degrees, Bachelor’s degrees, and Master’s degrees.

The results will reveal that, generally, entry-level formal degree requirements for occupations identified by the BLS have increased over time.

This dissertation notes that the results presented are descriptive only and apply to the whole “economy.” While the results from this dissertation cannot claim that every occupation identified by the BLS is experiencing “credential inflation” or “degree inflation,” the dissertation will discuss implications of the results that are of relevance to the assumptions behind “credentialism” and “credential inflation.” Implications of the results for “returns-to-education” also are discussed.

KEY WORDS: Knowledge Economy, Credentialism, Credential Inflation, Degree Inflation, Signaling Theory, Returns to Education

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*For My Family*

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# CHAPTER 1: INTRODUCTION

"…The means of moving upward in status and of maintaining high status now include some years in college, and a college education is a prerequisite of the better positions in business and the professions. The trend is toward an ever tighter connection between higher education and higher occupations, as increased specialization and professionalization ensure that more persons will need more preparation. The high-school graduate, seeing college as essential to success, will seek to enter some college, regardless of his record in high school.

"A second and allied source of public interest in unlimited entry into college is the ideology of equal opportunity. Strictly interpreted, equal opportunity means selection according to ability, without regard to extraneous considerations. Popularly interpreted, however, equal opportunity in obtaining a college education is widely taken to mean unlimited access to some form of college…To deny access to college is then to deny equal opportunity…

"Many other features of current American life encourage college-going…The United States, a wealthy country, is readily supporting a large complex of colleges, and its expanding economy requires more specialists…[A] national concern that manpower be fully utilized has encouraged the extending of college training to more and different kinds of students. Going to college is also in some segments of society the thing to do; as a last resort, it is more attractive than the army or a job. Thus ethical and practical urges together encourage the high school graduate to believe that college is both a necessity and a right…"

--- Burton R. Clark, "The 'Cooling-Out' Function in Higher Education" (1960)

"Growth in the proportions of the population that have access to higher education raises a number of questions central to the issue of the nature and functions of higher education…When the proportions of an age group going into higher education were very small, the political issue of equality in educational opportunity was centered much more on higher primary and secondary education. But the higher the proportion of the age group going on to higher education, the more the democratic and egalitarian concerns for equality of opportunity come to center on the increasingly important sector of tertiary education. …The more important access to higher education becomes for the life chances of large numbers of students, the stronger the pressures become. The persistent tendency of intellectually elite institutions such as the universities to be both the home and the source of the social and economic elite is a major source of tension between the institutions of higher education, still in principle meritocratic, and the increasingly strong egalitarian values of Western society. The irony of course is that while universities in Western democracies became increasingly meritocratic during the 20th century, especially after WW II [World War II], the societies around them became increasingly egalitarian…As more students from an age cohort go to college or university each year, the meaning of college attendance changes – first from being a privilege to being a right, and then, as was true first in the United States and now in the EU [European Union], to being something close to an obligation for students in some class and ethnic groups..."

--- Martin A. Trow, "Reflections on the Transition from Elite to Mass to Universal Access: Forms and Phases of Higher Education in Modern Societies since WWII" (2005)

It is generally accepted that the purchase of higher education is seen as "necessary" or "obligatory": In addressing "the instrumental role that school counselors play in promoting college and career readiness," Allison Paolini cites via multiple sources concentrated in literature on school counseling that "[m]ost careers today require that candidates obtain post-secondary degrees and possess the necessary technical and soft skills for personal and professional success…Ninety-five percent of high school seniors expect to attain some form of post-secondary education" (Paolini, 2019, pp. 4-5). Related, the American School Counselor Association (ASCA) sets for its members as one of its ethical standards that a school counselor should "provide opportunities for students to develop…an understanding that lifelong learning is part of long-term career success" (American School Counselor Association, 2022, p. 3). The aforementioned 95% statistic is raised separately by Sara Goldrick-Rab and Marjorie A. E. Cook (2011) in an article focusing on changes in student participation in higher education/undergraduate enrollment[1]: "College is a progressively more common part of American life, and this means that the characteristics of undergraduates are far different that they once were. Fully 95 percent of all high school seniors expect to have at least some form of a college education...There is relatively little variation in those expectations based on race or gender, and expectations are quite high (90%) even among children of low-income families" (Goldrick-Rab and Cook, 2011, pp. 255-256).

In the same article, Goldrick-Rab and Cook (2011) cite that there were 6.3 million undergraduates in America in 1970. By 1980, demand for higher education consumption increased to over 9 million undergraduates (a one-third increase). Between 1980 and 2000, the number of undergraduates increased by 26%. Between 2000 and 2008, the

[1] This dissertation would view "changes in student participation in higher education/undergraduate enrollment" as synonymous with changes in patterns of higher education consumption or in breadth of demand for higher education consumption.

number of undergraduates increased an additional 17% to 15 million undergraduates. At the time of the writing (i.e., 2011), the number of undergraduates was expected to increase to 17.5 million by 2018.

Still, it is an important caveat for introducing this dissertation that the above claim indeed does lack nuance. The motive behind the research proposed (and future research resulting) admittedly and willfully ignores a full and complete picture of the reality of higher education consumption in America. A full and complete picture notes or takes as given that stated policy will admit plainly that increasing (i.e., universalizing) college consumption does not imply degree completion. The above citation of Goldrick-Rab and Cook (2011) addresses only undergraduate enrollment. Senator Bernie Sanders (I-VT) and Representative Pramila Jayapal (D-WA)[2] reintroduced[3] on June 14, 2023 the "College for All Act" that seeks to expand the Higher Education Act of 1965 to "guarantee tuition-free community college for all students from single households earning up to $125,000 a year, and married households earning up to $250,000 a year" (U.S. Senate Sergeant at Arms, 2023, para. 5) and, generally, to increase funding for federal higher education access programs (i.e., Pell Grant awards, TRIO, and GEAR UP[4]). The College for All Act was reintroduced in 2023 under the assumption that it is higher education consumption, period, and not degree completion, per se, that confers unnamed but positive benefits for all consumers (and is "one of the keys to a successful democracy"): Senator Sanders quotes himself in the press release published on his official website that "[t]oday, this country tells young people to get the best education they can, and then saddles them for decades with crushing student loan debt…In the wealthiest country in

[2] Eight (8) additional United States Senators supported the "College for All Act."
[3] What became the "College for All Act" was originally introduced in 2015.
[4] GEAR UP is the acronym for "Gaining Early Awareness and Readiness for Undergraduate Programs".

the history of the world, a higher education should be a right for all…" (U.S. Senate Sergeant at Arms, 2023, para. 3).

Martin Trow was renowned for his prescience that resulted from his continual and lifelong revisitation of his models of higher education consumption and structure growth with then-current application[5]. Trow is renowned for his "elite-mass-universal access model" (or elite-mass-universal triptych) that predicted the development of higher education into three (3) stages (elite, mass or massification, and universal access). Each time Trow revisited the triptych, he would discuss the then-current implementation of this development and analyze issues and problems associated with the implementation of the development.

[5] For a collection of Trow's key texts, the editor, Michael Burrage, said of Trow: "There are few social scientists who single-handedly identify a social trend early in their careers; spend the best part of their working lives observing, analyzing, explaining, and debating its course and consequences; and, then, at the end of, find the trend not merely continuing but still a live issue in public policy debates and still inviting further research" (Burrage, 2010, p. 1). And in an article describing and analyzing Trow's work on the "elite-mass-universal access model," Peter Scott places in perspective: "As is well known, Trow never wrote a magnum opus in which the idea of mass Higher Education was fully and definitively developed…As a concept mass Higher Education was always work in progress, and perhaps much richer because of its enduring evolution" (Scott, 2019, p. 498).

Throughout his scholarship, growth in higher education would be manifest in three (3) ways: Rate of growth (e.g., the doubling of students in higher education within five-year periods in the 1960s and another doubling by the middle of the 1970s); the growth of the absolute size of systems of and individual higher education institutions; and *changes in the proportion of the relevant age group enrolled in higher education institutions* (Trow, 2005). In 2000, Trow made the following revision to the particular manner with which the universal stage was then being manifest:

> The elite-mass-universal access model I set forth in the early 1970s assumed that universal access to higher education would come through increased numbers of students in all countries enrolling and attending – much of it part-time or at night – in non-elite institutions that might eventually and for some provide further links through credit transfer to degree-granting institutions[6]. That has been happening, though still on a modest scale. Information technology now forces a revision of our conception of the conditions making for universal access: IT allows, and becomes the vehicle for, universal access to higher education of a different sort of magnitude, with courses of every kind and description available over the Internet in people's homes and workplaces… (Trow, 2000, p. 14).

[6] This is a connection to the quote from Burton R. Clark beginning this introduction and referenced later in this dissertation that a major role for community colleges was (or was becoming at the time and due to a variety of factors) to function as a "cooling-off" institution aiding in the universalizing of access to higher education: Rather than be confronted with the violation of stated policy goals to democratize and increase access to/consumption of higher education and the poor image and public backlash resulting from this violation by expelling students, for those not prepared to fully pursue a degree or a particular field, community college was used to reorient the student to a different degree or to better prepare the student for said degree or field pursuit.

Trow (2005) observed:

> The growth of numbers, in itself, begins to change the conception that students have of their attendance in college or university. When enrollment rates are 4 or 5% of the relevant age group, students naturally see themselves as part of a highly privileged minority…that they are part of a small privileged institution with a clear set of common interests embodied in common values, symbols and ceremonies, modes of speech, and lifestyle. All that affirmed the communal identity of the academic institution against the rest of society.
>
> The growth of higher education toward and beyond 15% of the relevant age group…inevitably changed that. Students have come to see their entry into a university as a right earned by fulfilling certain requirements. And for an increasing proportion, attendance is in part obligatory: larger numbers in all countries attend a university at least partly because people in their parents' social strata send their children to university "as a matter of course"…
>
> Logically, if the move toward mass higher education were the result of state policy and careful planning, the development of a broad system of "comprehensive" secondary schools – carrying larger and larger numbers from every social strata to the point of university entry – would precede the growth of mass higher education itself. In practice, however, the explosive expansion of higher education over the past two decades has almost everywhere preceded the move toward broad comprehensive secondary education aimed at preparing larger numbers for entry to higher education (Trow, 2005, pp. 33-34).

Through Trow, a full and complete picture of higher education consumption can be further refined to articulate that at one time increasing consumption of higher education by a greater percentage of the eligible population did imply the granting of more degrees. But, changes in technology altered that expectation sufficiently for Trow (2000) to observe that universalization would mean greater access and heterogeneity in coursework and would change the format of institutions providing universal access without the expectation of a degree. Additionally, general feelings/assumptions of necessary or "obligatory" purchase of higher education may be concentrated within certain "social strata" (Trow, 2005).

Further nuance corrects that undergraduate enrollment currently (with 2021 data) is not conforming with the linear increasing expectation articulated by the abovementioned Goldrick-Rab and Cook (2011) (i.e., that there would be 17.5 million undergraduates enrolled by 2018 as a function of constantly increasing enrollment): The National Center for Education Statistics (NCES) summarizes that "[b]etween fall 2010 and fall 2021, total undergraduate enrollment in degree-granting postsecondary institutions decreased by 15 percent (from 18.1 million to 15.4 million students). However, between fall 2021 and fall 2031, total undergraduate enrollment is projected to increase by 9 percent to 16.8 million students" (National Center for Education Statistics, 2023, para. 1).

Still, the above examples of nuance describe economic behavior generally. Noticed by Senator Bernie Sanders and Representative Pramila Jayapal, Paolini (2019), Goldrick-Rab and Cook (2011), and Trow (2000) and through "broad comprehensive secondary education aimed at preparing larger numbers for entry to higher education" (Trow, 2005, p. 34), it seems that individuals demand consumption of higher education even if such consumption does not lead to degree completion. In other words, generally, the demand for some level of higher education consumption is there. Demand may also be somewhat "inelastic[7]." The NCES statistic above laments a decrease in undergraduate enrollment between 2010 and 2021. But, the NCES ascribes this drop to an "external shock," namely the response to the anomalous COVID-19 pandemic[8] (NCES, 2023). So, combining the statistics used in Goldrick-Rab and Cook (2011) and from the NCES

[7] "Inelasticity" refers to the lack of influence the price of a good has on the demand for that good. Its usage here assumes that between 2000 and 2021, prices for higher education consumption did change, but, resultingly, demand for higher education did not change considerably. Rather, the major change between this period was the result of an unpredictable assumed one-time anomaly ("shock"). For a more detailed explanation of "inelasticity," see Appendix A.

[8] "Overall, undergraduate enrollment was 15 percent lower in fall 2021 than in fall 2010, with 42 percent of this decline occurring during the pandemic (NCES, 2023)."

citation, from 2000 to 2021, undergraduate enrollment consistently has hovered at around 15 million students[9].

But, noticing economic behavior occurring does not imply being able to conclude the driver of the behavior. If what is said above is logical and accurately observed – that demand for consumption of higher education is relatively stable ("inelastic" if assuming prices change over time[10]) and does not necessarily or in practice result in degree completion – then from where does the demand derive? What is it that individuals assume they are purchasing?

This dissertation assumes the answer to this question disproportionately centers on the labor market.

Increasing or maintaining consumption of higher education is sold primarily as benefitting oneself. It is good for you. It is an "investment" for you. It "pays" you. Though stated, we assume that all other societal benefits are subsumed to the financial benefit to the individual. Or, we know any talk of societal benefits from mass consumption of higher education are merely talking points to further bolster the primary point that an individual consumes higher education in order to earn more money. We know this because actions speak louder than words; implementation is policy; and budgets are reality. And the primary means by which higher education is consumed is through individual indebtedness through federal government promoted, administered, and originated (student) loan instruments.

[9] It may be relevant to note, too, that "[i]n fall 2021 [and disaggregating the 15.4 million total undergraduates], U.S. degree-granting postsecondary institutions enrolled 9.5 million full-time and 5.9 million part-time undergraduate students (NCES, 2023)."
[10] This is an assumption discussed below.

"Education pays," as Kentucky's slogan – introduced by Governor Paul Patton in 1998[11] – states. "Going to college is one of the best investments you can make[12]." "Despite rising costs, college is still a good investment[13]."

Additionally, the expectation to increase consumption of higher education or to maintain consistent demand is accompanied by the desire to increase or maintain consumption without lowering the purchase price. After all and referencing the Federal Reserve Bank of New York cited above, "…the cost of college has increased sharply in recent years due to the rising opportunity cost of attending school and the steady rise in tuition…[but] the average rate of return for a bachelor's degree…remains high[14]…, easily surpassing the threshold for a good investment" (Abel & Deitz, 2019, para. 1).

[11] See: Louisville Business First. (1998, July 20). *"Education Pays" right message for Kentucky*. The Business Journals. (The link is located in the References.)
[12] See: Kiersz, A. (2019, June 6). Going to college is one of the best investments you can make – even if it doesn't feel like it. *Business Insider.* (The link is located in the References.)
[13] See: Abel, J.R., & Deitz, R. (2019, June 5). *Despite rising costs, college still is a good investment.* Federal Reserve Bank of New York: Liberty Street Economics. (The link is located in the References.)
[14] Before saying that the return to a bachelor's degree remain high, the quote mentions the average rate of return has "edged down slightly in recent years due to rising costs." The Federal Reserve Bank of New York estimates that the average rate of return to a bachelor's degree is around 14% (Abel & Deitz, 2019, para. 1).

Returning to Goldrick-Rab and Cook (2011) and their discussion of (substituting their words for my own) changes to economic behavior in consuming higher education resulting from changes to the environment and incentives, they make the following observation while focusing on changes to degree completion:

> Despite a greater awareness of the need for postsecondary education in terms of wages, job security, and job satisfaction, according to some estimates the percentage of entering students who achieve their goal of earning a bachelor's degree is lower today than it was in the 1970s (Goldrick-Rab & Cook, 2011, p. 261).

The above quote from Goldrick-Rab and Cook (2011) help tie the motivation behind the research defining this dissertation, the connection between economic behavior observations and the assumed driver of that behavior, and the definition of higher education/postsecondary[15] education used for this dissertation and its research:

We may witness consistent or increasing demand (universalization) for higher education and this demand may not manifest in degree completion. But, this dissertation assumes the driver of demand for consumption of higher education in all of its forms is the labor market ("wages," "job security," "job satisfaction"). After all, while there are some that would consume higher education because of joy or economic utility resulting simply from that consumption[16], it is not safe to assume "mass" demand ("massification") toward eventual "universalization" is moved by the same intrinsic joy.

And, again, while there surely are many motivations working separately or in combination to move mass-to-universal demand, the means for higher education consumption relies on a particularly implemented financial instrument that requires an outcome for the consumer that allows both repayment of that instrument and payment of

[15] See Appendix A for additional clarification on this dissertation's specific usage of "postsecondary" and like references to "higher education" that address the "institutional" usage and bias of this word.
[16] This dissertation's writer is one of those individuals, obviously.

a profit to the originator of that instrument (i.e., an interest rate) in the future. One consumes higher education primarily with the understanding that access to labor markets will pay for that consumption and its interest. And it is assumed that access to labor markets requires a degree, i.e., an outcome. Thus, the consternation expressed in the Goldrick-Rab and Cook (2011) quote cited above: Wages, job security, job satisfaction, etc. are increased through the granting of a degree, particularly a bachelor's degree. Individuals are aware of this. So, it seems vexing that demand only for enrollment is consistently maintained and that only some unmarked level of higher education is consistently consumed while financial benefit and personal gains, wellness, and utility require the degree[17].

This dissertation's research addresses the labor market and degree requirements with the implication that the "degree-granting" definition of higher education (or postsecondary education) is of most relevance to the motivations of demand to consume any level of higher education.

The research question for this dissertation will ask whether occupations (as defined by the Bureau of Labor Statistics and its *Occupational Outlook Handbook*) have noticeably shifted over time toward increased education requirement expectation in order to justify the assumption that "the economy" necessitates the mass consumption of higher education in order to enter the labor market (to work).

[17] Some possible explanations for this disconnect (that there is significant consumption of higher education without resulting degrees) are cited in economics literature. Bhuller, Mogstad, and Salvanes (2014) cite Carneiro et al. (2003) and Cunha et al. (2005) to claim that "psychic costs" could help explain why more individuals do not "take additional schooling despite its high estimated financial return (Bhuller et al., 2014, p. 3)." Bhuller et al. (2014) additionally cite Carneiro and Heckman (2002) and Lochner and Monge-Naranjo (2011) to claim that "credit market constraints" prevent consumption of additional schooling presumably to a degree.

The Literature Review as Chapter 2, then, will address three (3) topics that apply to the logic behind the research question and the methodology toward answering it.

Firstly, the Literature Review will address the definition and origin of the idea of the "knowledge economy" and discuss criticisms of the concept.

Secondly, the Literature Review will address "signaling theory" in economics and "credentialism" in sociology. "Signaling theory" and "credentialism" both are considered to operate within the "knowledge economy" assumption or framework. These theories still assume as given that there is a "knowledge economy" by which individuals must adjust their labor preferences and consumption of higher education. Thus, "human capital theory" will be reviewed as a precedent for "signaling theory" and "credentialism."

"Credentialism" is valuable in potentially resetting the lens through which we view higher education consumption. Collins (1979) opens his pathbreaking book with a discussion about the "myth of technocracy." And, especially, Brown (1995) in constructively criticizing Collins (1979) devotes considerable knowledge to the effects of the "external environment" comprising labor market conditions that are used to sell to individuals the consumption of higher education.

"Credential inflation" or "degree inflation" will be discussed briefly within the discussion of "credentialism" more generally. Throughout the dissertation, the terms "credential inflation" and "degree inflation" will be used sparingly. Even though this dissertation's research is guided by a question regarding whether labor market occupations have increased education requirements or expectations over time, it would be inappropriate to use the terms "credential inflation" or "degree inflation" except in specific circumstances, i.e., where applicable. "Credential inflation" or "degree inflation" identifies effects resulting from "credentialism" that is a specific critical theory developed from sociology. This dissertation's method and its subsequent results cannot contribute directly to identifying this effect. This dissertation examines the entirety of occupations

identified by the United States Bureau of Labor Statistics (BLS) as expecting or requiring an Associate, Bachelor's or Master's Degree for entrance into the occupation. I will attempt to show *that* occupations either have or have not increased education requirements over time. I cannot show whether these increases are, indeed, "inflationary," i.e., (in its more liberal usage) superfluous or unnecessary or (in its strict usage) the result of individuals purchasing more credentials than the market needs thus devaluing the credential. Concluding whether increases are "inflationary" would require more detailed examination of individual or a subset of the occupations identified by the Bureau of Labor Statistics (BLS). This research simply seeks to establish a baseline for future research: It is common in public discourse and in the narratives shaping and caging our thinking about higher education policy to assume that increases in formal education expectations or requirements either is sought or is occurring already. So, are these increases indeed occurring?

Still, it is important to address "credential inflation" or "degree inflation" in order to discuss the ramifications of this dissertation's research and results. This dissertation will do so in the final chapter.

All tracts of literature used throughout this paper support the wisdom of asking the very basic question: Have requirements for entrance into occupations changed dramatically over time?

# CHAPTER 2: LITERATURE REVIEW

The question posed for this research and the subsequent dataset created as a result applies to a variety of research interests within higher education policy studies. Consequently, this literature review will discuss definitional and critical literature from three (3) areas where the research question and subsequent dataset seem most applicable or of most use: The assumption of a "knowledge economy," "signaling theory" in economics, and "credentialism" in sociology. The purpose of this literature review is to detail persistent criticism that drove and still is driving research in the below three (3) areas.

The research question articulated in Chapter 3, the results displayed in Chapter 4, and the discussion prompted by the results in Chapter 5 apply to the below literature reviews in the following manner:

That there exists a "knowledge economy" as distinct from an alternative named "economy" (e.g., a "blue-collar economy") and toward which occupations are being substituted is assumed the centralizing theme. The purchase of higher education as a benefit to oneself and to her or his financial future is premised on the assumption that there exists either an identifiable set of occupations requiring more formal "knowledge" distinct from an antithetical set requiring less formal "knowledge" (and toward which labor needs are being substituted) and/or a set of previously-identified occupations within which standards and tasks require greater skill or more formal knowledge. The research question (and subsequent results) addresses the "knowledge economy" implicitly: By comparing current occupations to their historical likenesses and identifying entry-level education requirements for both the present and past sets, there is the implication that a certain set of occupations is disappearing or being replaced vis-à-vis an alternative set, i.e., a particular interpretation of the "knowledge economy" discussed below. Further, identifying occupations that consistently have expected Bachelor's Degrees for entry or occupations

that have no historical entry-level academic degree antecedent illustrates this version of the “knowledge economy.” Additionally, this dissertation compares over time entry-level formal education requirements or expectations for a set of occupations that can be assumed to exist outside of the “knowledge economy,” i.e., those currently and generally requiring an Associate Degree for entry. Reviewing this set of occupations further adds to the discussion regarding whether there exists a “knowledge economy” to replace other “economies” or, rather, the current “economy” still reflects the “economy” of the past. Granted, this research cannot fully address the potential replacement of one “economy” for another. This research also cannot address with any significance the version of the “knowledge economy” best simplified as requiring increased formal “knowledge” within preexisting occupations, i.e., “upskilling.” Still, the relevance of including literature regarding definitions and criticisms of the “knowledge economy” is relevant to this research question and the results.

The assumption of the existence of a “knowledge economy” is linked to “signaling theory” as both inform the wisdom of purchasing additional higher education.

“Signaling theory” in economics is a major criticism to the mechanisms that produce positive “returns-to-education.” Neither the research question nor its results directly contribute to “signaling theory” literature. However, in order to present a unified and useful set of results for this dissertation, the logic behind “signaling theory” is used. This is described in detail in the methodology section (Chapter 3). It is relevant to review “signaling theory” both in order to justify using its logic for the results and because it is assumed here that “signaling theory” in economics and “credentialism” in sociology (to which the research question most closely adheres) are inextricably linked.

"Credentialism" is another line of criticism of the "returns-to-education" assumption underlying the continued purchase of higher education by the individual for the primarily financial benefit of the individual. ("Credentialism," technically, is a direct criticism of the "structural-functional" sociology paradigm. This, too, is addressed in this literature review.) The literature tends to speak to motives behind or the sociological consequences of "credentialing" and this research question and its results will not be able to make a direct statement to these motivations or consequences. Still, "credentialism" in sociology provides the most accommodating "round hole" into which this "square peg" of a research question and its results "fit." Prima facie, the results will provide a "baseline" from which to determine or further evidence whether "credential inflation" exists within individual or subsets of occupations. Additionally, one of the sources cited as illustrative of "credentialism" theory – (Brown, 1995) – provides justification for the data source used to answer the research question.

## REGARDING THE KNOWLEDGE ECONOMY

Driving increasing consumption of higher education (at an increasing rate) might most accurately be conceptualized (and neologized here) as Elite External Definitions of the Economy. Since the early 1960s, this “Elite External Definition of the Economy” has had a name: the “Knowledge Economy." (Discussed below, sociologist Randall Collins (1979) addressed this conception as the “myth of technocracy.”)

Hogan (2011) [18] distinguishes three (3) definitions of the term “knowledge economy.” Powell and Snellman (2004) evidence the assumption that there are three (3) definitions of the term “knowledge economy” by identifying three lines of research from which the following definitions derive:

The first definition primarily derives from Machlup (1962) where Fritz Machlup identified a section of the overall economy devoted to the production and distribution of knowledge. Research ends up focusing on the rise of and disproportionate influence on economic and social change of “science-based” industries. Bell (1973) conveys the idea relevant to this conception of the “knowledge economy” that theoretical knowledge is the source of innovation. Powell and Snellman (2004) cite that Machlup (1962), Porat (1977), Stanback (1979), and Noyelle (1990) prove through an historical line of research that this conception of the “knowledge economy” is valid as such research has as its driver the observation of considerable growth in employment within sectors of the economy whose purpose is to produce and distribute knowledge. Identifying the “knowledge economy” as a walled-off sector of the economy (i.e., a set of industries and businesses) whose product literally is “knowledge” is obviously a narrow definition and in today’s current usage, it is

[18] “Although the term ‘knowledge economy’ is widely used, there does not really seem to be a single agreed-upon definition of the term. Instead, at least three alternative concepts of the knowledge economy have been forwarded (Hogan, 2011, p. 4).”

likely not the primary definition that comes to mind. Hogan (2011) notes that Machlup's definition is better conceptualized using the term "knowledge-based economy."

The second definition of "knowledge economy" broadens the Machlup (1962) definition. It divides the overall economy into two (2) sectors: The "knowledge-intensive" sector, comprised of skilled and highly educated workforces, and the sector that is not "knowledge intensive," conversely comprised of less skilled and/or less educated workforces. This definition should sound familiar to higher education policymakers. Throughout the 1990s and early 2000s[19], such a proclaimed division in job types, without controversy, drove the assumption that higher education brings financial benefit to individuals that, over an individual's lifetime, exceeds the costs[20] of higher education consumption. The rise of the personal computer and the accompanying wishful thinking disguised as provable hypothesis is relevant to this definition. Powell and Snellman (2004) describe that debates within the economics field regarding whether particular industries were truly "knowledge-intensive" has affected this definition of the "knowledge economy." Gordon (2000) and Brynjolfsson and Hitt (2000), as examples, attempted to analyze the extent to which presumed "knowledge-intensive" sectors contributed to economic productivity growth. This is important because economic productivity growth is the primary mechanism by which returns to higher education are realized for the individual. Hogan (2011) summarizes the prevailing wisdom: "Human capital contributes to economic growth in several ways. Education and training improve labor productivity even with fixed technology" (p. 6). Powell and Snellman (2004) summarize that "[m]uch of the macroeconomic research on the knowledge economy has focused on the linkage between technology and labor productivity, defined as the amount of output given a unit of labor

[19] This is the time period within which this dissertation's writer came of age.
[20] "Costs" are in terms of opportunity cost (i.e., lost income while consuming higher education), in terms of the sticker price, in terms of cash-flow costs resulting from the usage of debt, and the additions to the sticker price resulting from interest rates from the usage of debt.

input" (p. 206). Hogan (2011) relates the concept of the "new economy" that became popular and was widely advertised throughout the 1990s. The "new economy" was characterized by rapid productivity growth resulting from rapid technological change. Technology and productivity would end inflation and end the business cycle. While the dot-com crash made Panglosses out of such views, "globalization" would step in to substitute to continue the bolster that increased knowledge meant increased productivity that meant increased salaries for those that consumed higher education. The current (elite) conception of the economy is "knowledge-based, globalized, entrepreneurial, IT-driven, and innovation-based (Atkinson & Andes, 2010)." These scholars and amidst others, however, find it difficult to distinguish the effects on economic productivity growth resulting from the establishment and identification of "knowledge-intensive" businesses and industries partially because there is a significant endogeneity problem. Relevant to the point of this writing, at the height of the narrative that individuals should consume and pay personally for the consumption of higher education because new sectors and jobs were opening en masse that required "knowledge" and thusly would pay said individuals handsomely, other atypical financial market and macroeconomic developments were occurring simultaneously that affected economic "productivity" (Powell & Snellman, 2004) and the subsequent rates-of-return to education.

Related, there is a significant (and seemingly forgotten or ignored) history of attempts by research to link technology or "knowledge" investments to economic productivity that found the connection significantly wanting. Dubbed the "productivity paradox," economic research conducted on the history of "knowledge" investments made throughout the 1970s and 1980s generally found a lack of evidence (statistical insignificance) of positive relationship between those "knowledge" or technology investments and economic productivity. Roach (1987) summarizes that the massive growth in computer investments in the late 1970s through the 1980s was met with

economic productivity losses. There had been steady upward productivity gains throughout the 1950s and 1960s, but beginning in the early 1970s, economic productivity had stalled even as technology investments during this period had surged. Roach (1987) focused on the "service" sector or the "white-collar" sector of the economy: The greatest increases in technology investment throughout the 1970s and 1980s occurred within the "white-collar" sector. But, the "white-collar" sector during this time period experienced dramatically severe economic productivity stalls or reductions. Specifically, from 1970-1985, the proportion of overall capital spending within "white-collar" industries that was devoted to computer spending increased from 6.4% to 15.5%. Meanwhile, "white-collar" workers were losing ground in terms of productivity to their "blue-collar" production and manufacturing worker counterparts. But, it is not as if technology and computer investment within the "blue-collar" or manufacturing and production sectors of the economy were having positive productivity effects. Berndt and Morrison (1995) and Morrison (1997) concluded that gross marginal product of technology investment within the manufacturing sector was less than the costs associated with said technology investments. Loveman (1994) found that between 1978 and 1984, returns on investment in technology and information technology within large manufacturing firms were negatively correlated with those firms' productivity. In order to dilute the common wisdom that the "knowledge economy" or the information age has presented society with an unprecedented reconsideration for the requirements of labor, Gordon (2000) argued and presented evidence that information technology and the internet generally have had less an effect on the economy when compared to effects from earlier disrupters like electricity. And, finally, connecting the dots and returning to the point that establishing an obvious, exogenous connection between the establishment of a "knowledge" sector of the economy, subsequent increases in technological investment, and increases in economic productivity-cum-returns to higher education consumption is difficult, it is primarily when

studying the late 1990s that statistically significant evidence of a positive correlation between technology or “knowledge” investment and productivity growth begins to show (e.g., Oliner & Sichel, 2000; Jorgenson et al., 2000). The “new economy” narrative began in the mid-1990s when productivity growth began to resurge, and public intellectuals noticed what seemed like newly increasing investments in technology and “knowledge.” But such mythmaking ignored the massive investments (both absolutely and as a proportion of overall capital investment) in computers, technology, information technology, and general “knowledge” that had occurred throughout the 1970s and 1980s without obvious effect on productivity and subsequent economic growth. So, it is prudent to assume that “other” macroeconomic and/or financial market and policy changes may be endogenous to the presumed and widely promoted narrative that “knowledge” drives productivity (that drives returns to higher education consumption for the individual) as evidenced by the gains made to the “knowledge sector” defining policy and narrative throughout the 1990s and 2000s.

The third definition of the “knowledge economy” assumes that the production, distribution, and usage of “knowledge” drives the economy as a whole and permeates any position within any industry comprising said economy as a whole. While there certainly are new jobs and new sectors formed that are considered “knowledge-intensive,” the “knowledge economy” under this third definition refers also to the assumption that even within established industries or “low-tech” industries, “knowledge-intensive” changes take hold. Consider an information technology (IT) department within a processing warehouse. Drucker (1993), Nonaka and Takeuchi (1995), and Prusak (1997) exemplify early research assuming this definition, according to Powell and Snellman (2004). Such research focused on the role of continuous innovation and learning within individual firms themselves. The ability to transfer “knowledge” formally or “explicitly,” i.e., the very character of “knowledge” becomes important. There are economic and sociological consequences to both the

individual and firm if the nature of knowledge either is (disproportionately) transferrable formally or “implicit” (i.e., non-transferrable or difficult to transfer to others, i.e., talent). From this definition, conception, or assumption of the “knowledge economy” derives the perception of “up-skilling”: Even within established industries or within time-insensitive job categories, “knowledge” is required and subsequent additional training or education is required in order to meet the needs either of the industry or to incorporate or integrate the skills necessary to operate or manage the injections of “technology” into these established industries or time-insensitive job categories.

## REGARDING “SIGNALING THEORY” AND “CREDENTIALISM”

The logic behind this research is that higher education consumption and subsequent financing policy driving that consumption (especially the policies marketing to de facto necessitating, originating through federal agency, and subsidizing student loans coupled with policies ensuring collections of said loans) is justified by the existence of the “knowledge economy” that is assumed here to be a somewhat mythical concept. The existence of the “knowledge economy” itself is to be researched because it drives the “returns-to-education” narrative that justifies the potentially dangerous indebtedness of generations.

Still, it is important to situate this research within the larger latticework comprising criticisms to the idea that higher education is to be consumed because its primary benefit is to the individual’s financial well-being over time (and because the individual’s financial well-being is dictated by a “knowledge economy”).

Generally, criticism to “returns-to-education” assumed here is dominated by economic scholarship under the “signaling theory” heading and by sociological scholarship under the “credentialism” heading.

Both “Signaling Theory” and “Credentialism” refers to a predominant criticism by Economics and by Sociology (and the sociology of education), respectively, to Economics’ “human capital theory” (and to Sociology’s “functionalist theory”).

"Human Capital Theory" is assumed here as the primary driver of higher education consumption and names the theory from which derives the concept of "returns-to-education." The seminal works in human capital theory (i.e., Schultz, 1961 and 1963; Becker, 1964; Mincer, 1974) identified a specific role for higher education consumption in its benefit to the individual (in its "private" benefits). An individual treats education consumption as an investment that yields "returns" for the consumer. Bowen (1964) discussing the economics of education and higher education finance in three (3) essays provides a clarifying synopsis of the then-early articulations of human capital theory as expressed through methods and that still remain as core assumptions currently. In assessing the economic effects from consuming education, "[f]our main approaches (each having a number of variants) can be distinguished: (1) the simple correlation approach; (2) the residual approach; (3) the returns-to-education approach; and (4) the forecasting-manpower needs approach" (Bowen, 1964, p. 4).

Under the "simple correlation approach," Bowen (1964) clarifies that economic effects of education consumption have been expressed "in the generic sense" of "correlating some overall index of educational activity with some index of the level of economic activity" (Bowen, 1964, p. 4). Variants of this approach include "inter-country correlations," where, say, education enrollment ratios and Gross National Product (GNP) or Gross Domestic Product (GDP) either as a whole or per-capita are compared across countries; "inter-temporal correlations," where consumption of education and GNP/GDP are correlated within one (1) country over time; and "inter-industry and inter-firm correlations," where, perhaps, a proportion of an industry's or a firm's work force is identified as consuming some level of education (e.g., "post-secondary") and that proportion is correlated with profitability of said industry or firm.

Under the “residual approach,” generally, the outcome is total increase in economic output, e.g., GNP or GDP, over time. After controlling for as much of the total increase over time by known variables (e.g., physical capital and labor) and their typical operationalizations, there is an unexplained residual that contributes to the growth of the economic output variable.

This unexplained residual “bucket” is considered primarily to be populated by education consumption and/or by technical advances. What Bowen (1964) calls the “residual approach” is a fundamental conception of “human capital” and drove the research of acknowledged founders Theodore W. Schultz and Gary Becker. Schultz would devote much of his research career to developing measures of “human capital stock.”

The “returns-to-education approach” articulated by Bowen (1964) is argued here as the concept of “human capital” that most guides current higher education policy and justifies its either direct or implied drive to increase its consumption (i.e., “massify” or “universalize” consumption). Relevant for clarification once the fourth “approach” is discussed below, this is the interpretation of “human capital theory” that most drives the individual to consume and, thus, either demand from policy or agree to terms by policymakers to facilitate the individual purchase of higher education. Comparing the lifetime earnings of individuals or groups having consumed more education with those that have consumed less education is supposed to indicate “returns” from the consumption of education. This is the “capital” in “human capital.” Consumption of education is an investment (i.e., costs are borne upfront) in what will be the development of capital (i.e., the individual consuming education becomes more productive) for increases in future production that will, thusly, increase the individual’s earnings over her or his lifetime. So,

as an example, yes, one might be out $13,212.00 a year[21] in tuition for four years (e.g., the University of Kentucky) and, yes, those four (4) years (or more) represents an "opportunity cost" in the form of an additional four (4) or more years of lost wages; but, that $52,848.00 out-of-pocket plus $124,800.00[22] in lost wages working full-time in an establishment paying $15.00 per hour yields returns over one's lifetime that far exceed the $184,800.00 spent consuming higher education and obtaining a baccalaureate[23]. And the reason why consuming education yields returns that far exceed the total purchase of higher education consumption is because increased education leads to increased productivity. And increased productivity leads to increased lifetime earnings.

The "returns-to-education approach" also manifests as an increase in national productivity, i.e., the overall stock of a nation's "human capital."

Finally, the "forecasting manpower needs approach" identifies what is assumed here a driver of higher education policy targeted to increasing consumption of higher education from the perspective of those in higher education administration and of policymakers considering the needs or expressed desires of groups and associations comprised of specific subsets of "the economy." When higher education institutions and states exclaim confidently that they need x number of, say, nurses or of those focusing on STEM[24] within the next y range of years, these institutions and states are reflecting the

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[21] The $13,212.00 is in-state undergraduate tuition for the University of Kentucky at the time of this writing. It does not include food and housing estimates (+ $15,242.00), books and supplies estimates (+ $1,200.00), travel estimates (+ $2,244.00), personal expenses estimates (+ $3,200.00), and loan origination fees (+ $84.00) for an estimated total yearly expense (i.e., fall and spring academic terms) of $35,182.00. This is a relevant caveat, because the loan being originated to pay for one academic year (fall and spring academic terms) will amount closer to or will exceed the $35,182.00 amount each year. So, attending the University of Kentucky (without opportunity cost) may require a total loan burden of $140,728.00 at 5.50%. For the "price tag" cost of attendance to the University of Kentucky, see: University of Kentucky. (n.d.). *Student financial aid and scholarships*. (The link is located in the References.) For the undergraduate loan interest rate, see: Federal Student Aid. (n.d.). *Interest rates and fees for federal student loans*. (The link is located in the References.)

[22] $15 an hour x 40 hours per week x 52 weeks per year x 4 years

[23] The above cited Avery and Turner (2012) calculate lifetime (life-cycle) earnings using this method and adding a 3% discount rate. Generally, the above calculation is a "back-of-the-envelope" method of illustrating "returns" as lifetime earnings and, thus, economics literature focusing on "life-cycle" earnings and/or on Internal Rates of Return (IRR) will articulate deeper and more subtle versions of this rough calculation.

[24] Science, Technology, Engineering, and Math

outcome of this “approach” to human capital. Productivity increases at the macro level and with the assumption that all variables are known for a given period of time allow this definition of “human capital.”

The “forecasting manpower needs approach” speaks to the proposed research questions guiding this writing. In 1964, i.e., still near the beginning of the formalization and popularization of “human capital theory,” Bowen (1964) commented on the limits of the “forecasting manpower approach” that still are relevant and are discussed today. Manpower projections tend to be considerably and frequently off the mark. Professional organizations/associations, individual employers, and other “professional investigators” (Bowen’s term) obviously cannot foresee changes in or implication of new technological or scientific developments. Projections likely do not take into account substitution between capital and labor and between “highly-trained manpower” and “less-highly-trained manpower.”

Further, “[t]hese projection difficulties are particularly pronounced in the case of persons whose training is general, and it is for this reason that many manpower studies have dealt only with groups such as engineers – and, of course, engineers can also upset supply and demand forecasts by taking managerial positions which are not ‘just’ engineering jobs. At the other end of the spectrum, projecting the demand for very specific occupations is also fraught with risks in that advancements in knowledge (or miscalculations of any kind) can lead to a very large proportionate error…that students making irrevocable career choices may have been misled” (Bowen, 1964, p. 36).

Bowen (1964) continues to comment that manpower projections are “not really directed at assessing the economic contribution of education…[E]stimates of the future number of people with a given kind of training who are ‘needed’ or ‘wanted’ are rather devoid of meaning unless one also has a good idea of the relation between the benefits

to be obtained by having this number of trained persons *and the costs involved in having them* [emphasis is Bowen's]" (Bowen, 1964, p. 36).

So, to make relevant connections: First, note that Bowen points out that when manpower projections are made, there are consequences for the individual. His comment that manpower projections "are not really directed at assessing the economic contribution of education" means that the "returns" or the "human capital" that is developed from manpower projections result from individuals purchasing (higher) education in the direction of the manpower projections. "Returns" to education are not intrinsic. Fields and associations and industries are messaging the population about where returns are guaranteed. Second, note the implication from Bowen's astute observation that manpower studies, presumably for practical reasons, do not analyze general manpower needs; rather, they focus on groups of manpower needs. Related, for those manpower projections that target specific occupations, if the projection is incorrect or flawed, the student who at the time purchased the education required for that manpower assessment bears fully the cost of the manpower projection folly. The implication is that there is very real risk – a significantly likely risk, even – that manpower projections (that always end up focusing on groups or targeting specific occupations) result in a glut in the labor marketplace in the groups or in specific occupations for which the projections were made. So, an individual that listens to the projections advertised by the media or by higher education institutions in time "t" could end up in a field or occupation where supply exceeds demand in time "t + 1" and, thus, her or his salaries and resultant "returns" to education are artificially lowered by the manpower projections. To a point of this writing, the individual does not have power over the "economy." Or perhaps more relevantly, the "economy" is not an exogenous preexisting entity, a Colorform playset mat onto which individuals are placed. External interests (e.g., academic fields, professional associations, industries) are constructing the "economy" into which an individual participates. The "economy" is constructed from above,

so to speak. Thirdly, note a seeming contradiction: Manpower projections, if wrong, can have serious economic and financial consequences for an individual and manpower projections end up being made by and toward groups or specific occupations. Yet, two prominent reasons why manpower projections may be incorrect are due to further or secondarily external forces outside of the control of the academic fields, professional associations, and industries constructing the “economy” by driving demand for (higher) education consumption artificially through their manpower projections and the subsequent advertisement of, de facto, guaranteed “returns” to education consumption. The secondarily external forces, as articulated by Bowen (1964) and that still are recognizable today are: the “substitution between capital and labor” and the “substitution between highly-trained manpower and less-highly-trained manpower.” The “substitution between capital and labor” should sound familiar to those who assume that the economy is becoming more “complicated” or more “technical,” and/or to those that assume “there are jobs that others don’t want to do” or that many jobs will be replaced by robots, artificial intelligence (AI), or, generally, machination and technological development. But, acknowledging this substitution implies that the Manpower Projectors are constructing an “economy” on the inside while there are other “forces that be” constructing the borders of the “economy.” The “substitution between highly-trained manpower and less-highly-trained manpower” implies a feedback loop that further defines or limits the tools used by the Manpower Projectors to construct the “economy”: By projecting the need for the individual to purchase more and more education, they create over time a glut of “highly-trained” workers. The “less-highly-trained” workers become unneeded or undesired in the machinations of the Manpower Projectors. If it can be analogized like a coloring book, “secondarily external forces” have drawn an outline of the “economy” (e.g., it’s capital-intensive and technologically driven) and if the “external forces” (to the individual) (e.g., academic fields, professional associations, industries, et al.) can be viewed as coloring

within the lines of the “economy,” then the “less-highly-trained” workforce can be viewed as crayons no longer used or used minimally or sparingly in the coloring of the overall “economy” picture.

In economic theory, “signaling” and, in sociology, “credentialism” will focus its criticisms of “human capital theory” on what Bowen (1964) identified as the “returns to education approach” and the “future manpower projections approach.”

But, note one other point relevant to the research question: The origin of “human capital theory” is statistical. To the point of Bowen’s (1964) first two “approaches,” economists noticed that after World War II and based on aggregate production functions, there were “unexplained” or “residual” effects partially explaining the explosive post-war national economic growth when using standard definitions of physical capital and labor. Using Viswanath, Reddy, and Pandit (2009), throughout the 1950s, economists attempted to identify what comprised this “residual.” Some assumed that the standard definition of physical capital needed to be adjusted to include improvements in the quality of that capital and/or to include variables acknowledging technological progress in capital. Others assumed the residual held within it newly mass-utilized organizational principles that squeezed additional productivity out of labor. Solow (1957) assumed that the “residual” could be explained by technology itself. And Schultz (1959, 1961) famously theorized that investment in human beings, investment in their training and in educational consumption explained the “residual.” (In fact, to the myopia of education consumption, most of Schultz’s assumptions regarded training and not formal education consumption.)

So, in order to begin discussing and to guide the discussion of “signaling theory” and “credentialism,” it is clarifying to note that “signaling theory” and “credentialism” both take as given the origin of human capital theory (“structural-functionalist theory” in

sociology[25]). They do not question the fundamental assumption of whether Schultz (1961) was indeed correct that unexplained growth in a booming post-World War II economy was due to investment in human capital. They do not attempt to address the corollary that investment in human beings, generally, can be disaggregated into "training" and into "formal education consumption" and that since the formation of human capital theory, the abundance of research and statistical endeavor has been focused on the "formal education consumption" component of "human capital" and not on the "training" component of its definition.

[25] "Structural-Functionalist Theory" is more accurately defined in a footnote accompanying the discussion of "credentialism" below.

Regarding "signaling theory," the following assumptions are necessary in the specific case where "signaling" is used for labor: All prices are relative, including the price of an individual's labor and the price that an employer is willing to pay for an individual's labor. The hiring of an individual is manifest through a contract where it is assumed both parties willingly agree to the price of labor accepted by the employee and paid by the employer. But, the market for labor – or for any good, generally – is imperfect and this imperfection is driven by "information asymmetry." A price for any good, including one's labor to be purchased by an employer, reflects the value of that good to the consumer[26] *assuming the consumer knows everything about the product*, i.e., has "perfect information."

"Signaling theory," then, has its true origin in the well-known and oft-cited work by George Akerlof published in 1970 called "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism": "The existence of goods of many grades poses interesting and important problems for the theory of markets…There are many markets in which buyers use some market statistic to judge the quality of prospective purchases" (Akerlof, 1970, p. 488). While Akerlof (1970) would not mention "signals[27]," the purpose of quoting directly is to illustrate what should be an immediate connection to the labor market: "The existence of goods of many grades (i.e., potential employees)" and the use of "market statistics" to judge the quality of those goods (e.g., some objectively observable measure like a college degree).

[26] This is especially true in an economic transaction between just two parties, e.g., the hiring of an employee by an employer, where a price is negotiated and is not the aggregation of multiple and variable "willingnesses to pay." ("Willingnesses to pay" is addressed in Appendix A.)

[27] Akerlof (1970) would use the buying and selling of used cars to illustrate that there is "information asymmetry" and to illustrate the tendency for "information asymmetry" to lead to an overabundance of bad used cars, or "lemons," in the used car market. But, by articulating "information asymmetry" and illustrating its tendency to lead to a market full of low-quality goods, Akerlof set the stage, so to speak, for articulating and theorizing the value and implementation of "signals."

In 1972, economist Edmund S. Phelps would directly address the labor market as a source for "information asymmetry" in his "The Statistical Theory of Racism and Sexism." Phelps (1972) would formalize a theory of discrimination about which had been previously discussed and identified by the likes of noted economists Gary Becker (1958) and Kenneth Arrow (1973). The relevant point of the piece was that a "theory of discrimination" can be articulated and formalized because the labor market operates imperfectly. The labor market operates imperfectly "because of the scarcity of information about the existence and characteristics of workers and jobs" (Phelps, 1972, p. 659). Specifically, in a situation where it can be assumed that employers have no problem ideologically in hiring and working with black or female workers, such employers will still discriminate against hiring black and female employees. There is "information asymmetry" in the market for labor and, "if the cost of gaining information about the individual applicants is excessive," then "[s]kin color or sex is taken as a proxy for relevant data not sampled." Phelps (1972) notes that discrimination occurs because of the "signal[28]" that skin color or sex used to send that, at the time of the writing, black and female workers have a higher probability of being "less qualified" than white, male workers. Phelps (1972) formalized this "theory of discrimination" and said nothing further about potential counteractions to the discrimination. But, from the assumption that "cost[s] of gaining information about the individual applicants" are "excessive," one can see from where the formal articulation of "signaling theory" as applied to the labor market derives. "Information asymmetry" in any market begets discrimination in labor markets begets the value of "signals" to the labor market.

[28] I am actually using this term incorrectly or loosely here. After Phelps (1972), Spence (1973) would use the word "signal" and distinguish it from "indices." A "signal" can be controlled by, in this case, the potential employee seeking a job. Meanwhile, an "index" is an immutable characteristic of the potential employee, e.g., race, sex, etc.

To the usage and definition of “signaling theory,” Michael Spence (1973, 1974) is given credit primarily. Generally, “signaling” occurs within markets where the potential “signalers” are numerous and where a potential “signaler” will not be able to “signal” frequently enough that she or he is able to develop a “reputation,” i.e., where “signaling” in a market typified by “information asymmetry” is performed enough times that now there is perfect or adequate information in the market. Thus, the job market is the most obvious application [29] of the aforementioned general assumptions. “To hire someone…is frequently to purchase a lottery…In most job markets the employer is not sure of the productive capabilities of an individual at the time he hires him” (Spence, 1973, p. 356). So, an employer will require information from a job applicant. Some of this information is immutable (e.g., race, sex, criminal records, service records); some of this information can be manipulated or controlled by the job applicant/potential employee. The information that can be controlled by the potential employee, in this case, is the “signal” in signaling theory. And a common “signal” is formal education consumption.

Of particular note is the “critical assumption” that a “signal” will not work (it will not distinguish one job applicant from another) unless the “costs of signaling are negatively correlated with productive capability” (Spence, 1973, p. 358). In other words, “signaling” is not a deceptive practice. While speaking of the assumption generally in Spence (1973), Spence (1974) devotes a chapter to the consumption of education as a signal. The assumption that education can be used as a “signal” in the labor market assumes that those purchasing additional education (beyond the required minimum) are more productive than those that do not. “…[T]he high-productivity types have lower educational costs than the others” (Spence, 1974, p. 15). Consuming education does not have an

[29] Spence (1973) notes that promotions in organizations, loans and consumer credit, and college admissions procedures also are applications of the assumptions of markets and “quasi-markets” where “signaling is likely to occur.

effect on an individual's productivity. And those that are naturally more productive choose to purchase additional education. As productivity increases, the costs of consuming additional education decreases. Consequently, education consumption "signals" those that are more productive than their competition in the labor market because for those that are less productive, the costs of consuming education increases leading to those individuals not purchasing as much education as those that are more productive.

Related is the assumption that "signaling" (as it applies to the labor market) really is about wage negotiation rather than entrance into the labor market. "Signaling theory" is not the same as "screening": For labor markets, "screening" solves for information asymmetry through the hiring professional. Before allowing the potential hire to enter the position for which she or he applied, the hiring professional, for example, will develop and/or implement an application review that requires the applicant to provide information that she or he may otherwise not provide and/or requires the applicant to respond to questions meant to elicit information about the applicant's productivity. The applicant interview with a hiring professional is an example of "screening." Requiring an aptitude test or an assessment is "screening." "Screening" is performed by the party seeking to hire, by the party demanding labor choosing amidst a supplied set of options. So, referencing "screening," the purpose is to identify individuals for entrance into a profession or occupation regardless the later contracting for wages. "Signaling," meanwhile and in the labor market case, is performed by the applicant (or future applicant) and it is not expected to be performed immediately before attempting to enter into the labor market, generally, or into an occupation or set of occupations or profession. An individual will take it upon her- or himself to identify and purchase "signals" that will convey information to a future job market and future hiring professionals that the "signaler" understands or perceives as benefitting her or his marketability as defined by positive wage differentials amidst substitute (labor) products within a defined job market. A "signaler" fully expects to

be able to enter the job market/occupation class/field. Rather, the “signaler” solves for information asymmetry within a chosen job market by presenting forthrightly information intended to better position her or him for the wage contract once hired.

As described in the methodology section below (Chapter 3), the “signaling theory” will be used to justify the way that results for this dissertation are summarized. In terms of purchasing formal higher education, it is safely assumed that this “signal” is most prevalent in attempting to obtain an entry-level occupation. (After having worked in a profession for a significant amount of time, other “signals” likely become more prominent vis-à-vis higher education attainment. Or, rather, “signals” are less needed because the aforementioned “information asymmetry” in the labor market is partially addressed through an individual having an accessible work history.)

As an example of using “signaling theory” to criticize increasing education consumption, a relatively recent book by Bryan Caplan (2018) – *The Case Against Education*: *Why the Education System is a Waste of Time and Money* – relies solely on the theory to make its purposefully polemic claim that consuming education, in terms of policy to be encouraged or enforced for all individuals, is wasteful and inefficient. First to note regarding this book is that it prefaces with an assumption this writing shares: Policymakers, the public, economists and all academic fields, et al. simply take for granted that education consumption yields individual (private) financial returns. It is a truism; it is axiomatic. In fact, that the assumption is a mere truism leads to a criticism of the book or, perhaps, leads to disappointment in the book’s content: The book, ultimately, is primarily an entertaining and well-written discussion of the economic “signaling theory” criticism of “human capital theory.”

In other words, this book has been written multiple times in the past and the thinking is not new. Still, the book is valuable precisely because of an assumption this dissertation also makes that we have allowed the “returns to education” narrative (and

pretext for justifying ever-increasing education consumption and for structuring all of policy toward or assuming that end) to be told like oral tradition such that the narrative becomes unquestioned.

Caplan (2018) also makes a relevant assumption from the outset that education consumption does not, generally, affect the consumer's productivity. Again, this is an important assertion in that "human capital theory" and the subsequent "returns" manifest from purchasing education (from investing in oneself) depend on education's ability to increase "productivity." And "signaling theory" requires the claim that productivity and skills are divorced from the value of consuming education. "…[D]espite the chasm between what students learn and what workers do, academic success is a strong *signal* of worker productivity. The labor market doesn't pay you for the useless subjects you master; it pays you for the preexisting traits you reveal by mastering them" (Caplan, 2018, p. 13).

Caplan (2018) analogizes education consumption as "magic." And Caplan's polemic derives from this metaphor: The bulk of Caplan (2018) argues an extreme position that education consumption has effectively nothing to do with the learning of skills and the subsequent productivity that derives from said skill-learning. Returns from education are "magic" not only because education is a "signal" generally unwholly correlated with productivity, but also because of one particular "signal" that higher education completion provides. The consumption of higher education to completion of a baccalaureate provides three (3) specific "signals." Two (2) of these signals are instantly recognizable and obligatory: A baccalaureate signals the intelligence necessary for our long-held and slavishly presumed "knowledge economy." A baccalaureate signals work ethic, discipline, the ability to produce quality work, and other examples of what Caplan (2018) identifies as "conscientiousness." But, the third "signal" propels the polemic and extremizes the assumption behind "signaling theory" that, generally, education consumption merely is not wholly linked with productivity and drives it toward assuming that, rather, education

consumption is entirely divorced from productivity. The completion of a baccalaureate signals obedience and conformity to social expectations and the willingness to devote effort to socially approved goals. Educational achievement is a social expectation in American society.

An individual purchases higher education toward completion of a baccalaureate in order to signal[30] that she or he is a "modern model worker."

> What are modern model workers like? They're team players. They're deferential to superiors, but not slavish. They're congenial toward coworkers but put business first. They dress and groom conservatively. They say nothing remotely racist or sexist, and they stay a mile away from anything construable as sexual harassment. Perhaps most importantly, they know and do what's expected, even when articulating social norms is difficult or embarrassing. Employers don't have to *tell* a modern model worker what's socially acceptable case by case (Caplan, 2018, pp. 17-18).

There also is a corollary to the third "signal" that the length of time (the "sheer duration") spent consuming education toward completion of the baccalaureate is important for the "signal" to work. This is a darker interpretation of the assumption behind "signaling theory" proper that the costs of purchasing the "signal" must be negatively correlated with productivity. For this interpretation (and presumably because "signals" are wholly divorced from productivity for Caplan), whether the costs of consuming the education signal are more or less burdensome between or amidst individuals becomes somewhat irrelevant. Because regardless the cost, an important part of the baccalaureate-completion "signal" is simply that an individual "stuck it out" no matter the cost. Education consumption is supposed to be a slog. "Since easy-to-fake traits like conscientiousness and conformity

[30] Relevant to the discussion of "credentialism," Caplan (2018) notes that there are other "signals" sent besides the main three (3) driving his narrative (i.e., intelligence, conscientiousness, and conformity). Completing a baccalaureate signals "a prosperous family, cosmopolitan attitudes, and fondness for foreign films" amidst a host of other potential signals that are of interest and importance sociologically. But, as an economist and assuming a "profit-maximizing employer," these more sociological signals are superfluous to his argument.

are valuable, education *has* to take years. Signaling is a war of attrition. Giving up is early surrender. The longer you endure, the stronger you look…" (Caplan, 2018, p. 23).

As a consequence of the rather extreme position that a purchased "signal" is wholly divorced from productivity and the skills-learning inherent in increased productivity, Caplan (2018) devotes his book disproportionately to arguing and exemplifying that education, generally (i.e., secondary included) and higher education provide very little development of skills relevant to competing in the labor market. There is a "ubiquity in useless education."

Admittedly, Caplan (2018) is a polemic and its application of "signaling theory" is not one with which this dissertation agrees: That consuming education and higher education does not provide skills relevant to the labor market and does not increase an individual's productivity is too literal and, thusly, too juvenile an assertion. Caplan (2018) exemplifies this adolescent thinking by devoting at least one chapter to rehashing and attempting to qualify the well-worn complaint made by every middle school and high school student in every country with a school system and in every time since the invention of schooling when she or he was frustrated at her or his progress in class: When am I ever going to use [insert subject or assignment here] again? Most subjects discussed in a science class likely will never be encountered again unless an individual literally goes into "x" science field. The subjects of most math classes, again, likely will never be seen again by the typical employee, i.e., how often has any individual conducted a system-of-equations or needed to find the area underneath a curve?

Of course, such a cliché criticism of education and higher education consumption prompts the typical counter that the value of education (consumption) derives from teaching individuals *how* to think. One may not ever specifically solve for x ever again in one's life, but there is value to thinking algebraically, mathematically, *logically*. There is value to learning how to think statistically and/or economically. There is value to

consuming music education through its teaching of memory, adroitness, and logic. There is value to reading literature through its fostering of “big-picture” thinking and effect on an individual’s analytical skills.

That consuming education and higher education directly links with specific skillsets and, related, that education and higher education policy should be focused on identifying the skills needed for the labor market and structuring its product for that skills consumption likely takes too literally what is meant by human capital “investment” as increasing one’s “productivity.”

There are two (2) points to assert to end this discussion of “signaling theory” and its appropriateness for this dissertation: One, I fully disagree with Caplan (2018) that education consumption is divorced completely from “productivity” and that education does teaches no (or very few) skills relevant to the workplace. At the time of this writing, I work as a full-time salaried employee and personal experience justifies that secondary and higher education has provided skills relevant to succeeding in my current occupation. In other words, arguing that education consumption is “useless” is an indefensible extreme that provides shock value and undercuts any serious argument about the role of education consumption and the labor market. That said, I do not disagree with the softer criticism of “human capital theory” offered by “signaling theory” that higher education consumption and productivity are endogenous: Education consumption does not increase productivity, per se. Rather, more “productive” individuals can or do consume more education (justifying its “signaling” function). That education consumption does not increase productivity seems more a problem with defining “productivity” in a world that idealizes the “knowledge economy” or “white-collar” occupations than with the composition of education. Stated differently to emphasize the connection with the research question, it is conceivable that consuming education could lead to increased productivity (and, thus, to “returns” from human capital investment) if we knew what needed to be taught in the

workplace. This is the fatuousness of arguments for “returns” to education consumption that use the professions (e.g., engineering) to illustrate said “returns”: Of course there are going to be returns to investment in education to become an engineer or a doctor or a dentist. It is very clear in practice what content comprises an engineering education because it is very clear what comprises the tasks of an engineer. Thus, an engineer with an education comprised of engineering curriculum is going to be able to produce more engineering than an engineer without an engineering education. The problem is that society and policy bleat ceaselessly the inevitable ubiquity of the “knowledge economy.” And what learnable tasks do “knowledge economy” jobs require for which a concrete education curriculum leading to increased productivity could be created? What is “productivity” in the “knowledge economy”? Do we focus education on “learning to code” coursework? Would we want to design coursework toward developing spreadsheets using the ever-present yet consistently wonky Microsoft Excel? Is productivity-cum-coursework the efficiency in implementing a supervisor’s frivolous idea borne from slavish adherence to faddish jargon and anxiety-fueled obsequiousness to his higher-ups? Is productivity defined as and, thus, would courses be designed to teach enduring seven hours of meetings in an eight-hour day while managing Sisyphus’s pile of feeder bar tasks? Is productivity defined as and thus can coursework be designed for maximizing the number of hours sitting and staring at a screen hoping to retire before age-related macular degeneration sets in? Is productivity and subsequent coursework designed to increase the efficiency of filing papers and printing-to-.pdf correspondence to be saved to share drives?

The above polemic set of rhetorical questions leads to the second point to assert at the end of this discussion on “signaling theory.” As mentioned above and that will be relevant to the below discussion of “credentialism,” “signaling theory” assumes the existence or prevalence of the “knowledge economy” as a given. Focusing again on

Caplan (2018), criticizing the content of education and assessing whether such content matters for the labor market misses the point. And if individuals are consuming higher education not for its content, but in order to provide “signals” to the labor market, this still does not say much about higher education and the contents (curricula) comprising it. This dissertation posits that it is the labor market itself or, rather, how the labor market is presented and advertised to education consumers by those outside education systems and economies (i.e., the “Elite External Definitions of the Economy”) that drives the distortions and illogic in consumption of higher education. Stated more bluntly, consuming higher education is promoted by policy through advertisement and culture and other external sources based upon assumptions about the composition of the labor market. And maybe twenty or so years ago, this was a relatively harmless ad campaign. But, with state support of higher education decreasing, tuitions increasing, and multiple generations of students indebted for, generally, 25 years of their working lives, it seems appropriate to reevaluate the primary assumption driving the mass-to-universal higher education consumption narrative: Does America really have or has it had a “knowledge economy”?

Beating a dead horse and flipping Caplan’s (2018) polemic on its head, to the extent that consuming education is “useless” or does nothing but provide “signals,” would not the cause of that be driven by society’s inability to concretely define what constitutes the “knowledge economy” and what skills are required to succeed in it?

In sociology, a prominent line of criticism of human capital theory and higher education consumption derives from "credentialism." And, in order to criticize human capital theory (or "structural-functionalist"[31] theory, technically), "credentialism" ends up requiring that human capital theory assume higher education consumption is concerned with the building of "skills." Generally assumed to be a seminal work prompting "credentialism" is Ivar Berg's *Education and Jobs: The Great Training Robbery* (Berg, 1971). Berg (1971) directly criticizes human capital theory primarily relying upon a set of arguments and subsequent analysis that questions the validity or the ability of employers to identify "requirements" for working in respective firms. Berg (1971) rightly distinguishes between requirements for a job and the "tastes" of employers and discusses how the two become conflated. An occupation does not necessarily *need* additional education; the employer or set of employers, for a myriad of reasons, prefer increased education consumption. Berg notes that prior research (at the time) muddles the ability to clearly identify a hierarchy of occupations where, clearly, increased education consumption leads to higher salaries. Excepting the obvious occupational categories (i.e., "professionals and

[31] "Structural-functionalist theory," or "functionalism," generally, refers to the existence of a social structure that shapes individual behavior through socialization. An institution or norm or role developed in a society serves a "function" beneficial to the preservation of that society. As it applies to education, "functionalism" asserts that schools are necessary for the imprint of social values into children. Education is social by its nature. Education institutions are the mechanisms by which culture and values are disseminated throughout society. Thus, education systems reflect and disseminate the current culture and values of a society (Durkheim, 1956). At least one of the authors I cite regarding "credentialism" (Brown, 1995) refers to "credentialism" vis-à-vis "human capital theory" and "structural-functionalist theory." It is my opinion or interpretation, then, either that "human capital theory" focuses on a specific "function" of social structures (the education structure) designed to shape individuals' behavior or that "structural-functional theory" would broaden the set of "skills" that "increase productivity" for which an individual would invest her or his "human capital" toward a "return." In the former interpretation, "human capital theory" describes the function of transferring via the education structure and perhaps through socialization labor market skills toward increasing productivity that will result later in economic/financial "returns" to the individual. In the latter interpretation, increased productivity toward individual financial "returns" includes both labor market skills as identified by economics and that cultural and values transference additionally are skills that increase productivity. Schultz (1961) seems to suggest that "structural-functionalist" theory and "human capital theory" are related as it is the "function" of education to develop human capital. Further, scholars have posited "human capital theory" also affects society (through the positive externality that one's increase in productivity affects others' abilities to increase productivity) and that, thusly, increases in countries' Gross Domestic or Gross National Products reflect aggregate human capital investments. Thus, Schultz (1961) links "human capital theory" with "functionalism" even more strongly in that "functionalism" applies to society as a whole (and does not affect only the individual). So, the transference or development of skills through the education structure affects the individual's ability to realize a "return" on human capital investment and also affects society as a whole.

ditchdiggers"), Berg (1971) cites Lawrence G. Thomas (1956), Robert L. Thorndike (1967), and Marvin D. Dunnette (1966) that differences amidst individual performance *within* occupational categories are as great or greater than variations *amongst* the occupational categories themselves. Occupations themselves do not necessarily confer upon the individual higher salaries (commensurate presumably with increased education consumption); more (subjectively) productive, more (subjectively) valued individuals *within* occupations command higher salaries. Berg (1971) tests the ability to assign "intellectual abilities" to occupations by reproducing and expanding upon previous research that assumed GED (General Educational Development) tests codified or incorporated what would be educational requirements (intellectual needs of occupations) into the tests and that, thusly, GED "levels" (from 1-7, with "1" signifying "low" and "7" signifying "high") could be translated into years of schooling and used as a scale of educational attainment as a function of intellectual abilities. GED levels were then matched with occupational requirements between two (2) decades. But, relevant for this discussion is that Berg's analysis (and the analysis of others cited) produced "nothing fixed about the relationship between GED and years of schooling.

“Depending on different assumptions about their correspondence, that is, about the matching of ‘requirements’ with ‘achievements,’ the ‘direct approach’ to the economic criteria for education afforded by this method can yield extraordinarily diverse findings” (Berg, 1971, p. 51).

Rather, and as a result of interview research with employers, education requirements end up being used as a “screening device” supposedly signifying the ability to get along with coworkers and the propensity to take advantage of opportunities. However, of more interest to this dissertation is the finding that, upon attempting to clarify specifically ways in which those employees with more formal education were better than those employees with less formal education, the owners and employers of business firms could not specify and did not collect data that would help them make such comparisons. Employers seemingly preferred more formal education for platitudinous reasons and rationalized the supposed “signals” formal education consumption provided.

Related to its role as a precursor to formal “credentialism” theory, Berg (1971) articulates insights with which this dissertation agrees and on which the research question relies. Berg (1971) questions the now timeless notion that the “economy” is changing dramatically such that occupations and jobs naturally require increasing education consumption. Berg (1971) questions the self-fulfilling prophesy that increases in incomes amongst college graduates is evidence of these increased incomes resulting from increased education consumption. Increased incomes may not indicate increased productivity as required by “human capital theory.” Incomes likely reflect ability over education consumption. Berg (1971) references studies supposedly illustrating that incomes are increased by education attainment only when “ability” is measured by IQ scores and with some measure of class status.

A summarizing point to be clarified is that, seemingly according to Berg (1971), consuming increased amounts of education is supposed to lead to the development of skills – both generally and directly relevant to an occupation – but the identification or even articulation of those skills are elusive to define and measure, especially for an employer.

Randall Collins' *The Credential Society* (1979) as a foundational text for "credentialism" provides an interesting connection to the point of the research guiding this writing.

Collins (1979) uses sociology's "functionalism" as his milieu by which to articulate the "credential society." This milieu is applicable to the research guiding this writing: Collins (1979) describes the "myth of the technocracy." Ultimately, Collins' book and this writing agree that how individuals view society or, in this case, the economy, is imposed upon them. It does not necessarily reflect reality.

To evidence this connection, it bears repeating the language Collins (1979) uses to identify the issue for which *The Credential Society* will refute:

> There is a naïve conception of social history that is extremely popular. People with different viewpoints give it different slants, but the basic story is much the same. The leading character is called Technology, or sometimes Science; very sophisticated storytellers have twin leads called Science and Technology. They are the active agents in the drama. In some versions, they are the heroes; in others, the villains. In all, they are endowed with overwhelming power.
>
> There are some other characters, too. One of them is called Modern Society, who is more or less the dutiful wife, following where Technology leads her. In some accounts she drags her feet; in others she eggs him on. But it does not make very much difference one way or the other because they are married, for better or for worse. There is one other character, a kind of stepchild called the Individual. His job is to fit into the family as best he can. This requires him to be diligent and skillful. Since the family is changing, getting more scientific, technological, and complex all the time, this can be a hard job… (Collins, 1979, p. 1).

The problem for Collins (1979) is that the depiction of society's composition indeed is a myth that Collins will attempt to dispel both historically and statistically. Toward its critique of sociological "functionalism", this myth prompts a pervasive set of values ("propositions") and messaging to be transferred through education as the "technological function theory":

> 1. The school requirements of jobs in industrial society constantly increase because of technological change. Two processes are involved:
>    a. The proportion of jobs requiring low skill decreases and the proportion requiring high skill increases.
>    b. The same jobs are upgraded in skill requirements.
> 2. Formal education provides the training, either in specific skills or in general capacities, necessary for the more highly-skilled jobs.
> 3. Therefore, education requirements for employment constantly rise and increasingly larger proportions of the populace are required to spend longer and longer periods in school (Collins, 1979, p. 12).

The "technological function theory" resembles the assumptions of the "knowledge economy."

Again, Collins may agree with this dissertation's assumption that society or the economy as conceptualized by the individual does not reflect individuals' observations of reality. Rather, it is imposed and taught.

Credentialism, however, seems to focus on explaining the effects of mischaracterizing the content of the package being sold through the education structure. Specifically for Collins (1979), credentialism is the effect of the mischaracterization of society that leads to or partially explains social inequalities. Due to an inaccurate depiction of society, the function of the education social structure transmits and rewards incorrect lessons and values. The "technological function theory" means that the values of competition and achievement are transferred through education and socialization. This social promotion of incorrect means toward inaccurate ends creates or incentivizes "the credential society."

Both as a function of navigating a falsely-imposed society and as a function of reality contradicting the imposed image (as evidenced through Collins' historical account of the development of education structures), individuals necessarily ended up defining and developing a means and metrics by which to compare and differentiate themselves both for entrance into and success within the labor market and for social standing. Competition requires standards and concrete measures of achievement. Thus, the importance and subsequent reliance on earned "credentials" becomes the outcome borne from the transference of incorrect values through the education structure. Additionally and similarly to economics,[32] credentials serve as a proxy or estimator for competency, ability, productivity, and all other values sought by society. Credentials also serve to provide access to networks, information, activities, and "restricted areas" of society. But, interestingly, credentials also are something about which "the elite" is not concerned.

[32] This is similar to economics and its usage of credentials to solve for "information asymmetry."

Credentials are for the middle-class. “The elite” are separated from the middle- and lower-classes and placed into a different set of secondary schools (e.g., private and boarding schools) and into prestigious institutes of higher education. This separate structure of education trains “the elite” to hold positions of power and, subsequently, “the elite” monopolizes those positions. “The elite” need only to compete and achieve amidst its class. Credentials are superfluous. The middle- and lower-classes, rather, progress through public secondary schools and higher education institutions. And the public schools transmit the values of competition and achievement that lead to the importance of credentials for competing in job markets outside of the monopolized centers of power.

There is another way to think about the relevance of the research question posed by this dissertation that links to David K. Brown and his 1995 *Degrees of Control: A Sociology of Educational Expansion and Occupational Credentialism*. Brown (1995) devotes his analysis as a response and detail-driven criticism to the abovementioned Randall Collins’ (1979) *The Credential Society*. Brown (1995) does not negate or criticize the conclusion that “credentialling” drives both higher education consumption and entrance into the labor market. Rather, and interestingly, Brown (1995) disagrees with the details Collins (1979) uses to support the “credentialing” conclusion. Generally, Brown (1995) disagrees with the description of the history of higher education institution development in the United States.

To Brown (1995), Collins (1979) makes the following mistakes in his "neo-Weberian" "historical-developmental" analysis of higher education:

- Collins (1979) identifies 1850 – 1860 as a time of enrollment crisis for higher education and, generally, between 1800 and 1870, institutional failures characterized the higher education institutional environment.
- Collins (1979) omits any consideration of credentialism being a function of the historical relationship between higher education and the recruitment processes of bureaucratic organizations.
- Collins (1979) seems to disproportionately focus on the development toward credentialing as it relates to "professional monopolies" (e.g., law, medicine, engineering).
- Collins (1979) assigns a central role for "multi-ethnic conflict" in the dramatic growth of education. "Class" conflict had (and still has) been subsumed by racial and ethnic conflict. Ethnic groups competed for occupational positions. In order to prevent ethnic groups from entering the labor market, the dominant Anglo-Protestant minority created education barriers (i.e., credentials). As newer ethnic groups (e.g., Catholics, Germans, Scandinavians, et al.) gained more access into occupations and, generally, gained more power, they too would erect educational barriers (e.g., their own school systems). The growth of education institutions and subsequent credentialing was partially a function of racial and ethnic groups finding a way around barriers erected by other dominant racial and ethnic groups through the establishment of parallel or competing school systems and higher education institutions.

Rather and generally, Brown (1995) assumes and details historically that higher education consumption generally has grown consistently over the course of American history. Collins' (1979) development of "credentialism" does not match with historical details. Thus, Collins (1979) cannot or does not answer why, uniquely when compared to the rest of the Western world, America's higher education system grew so rapidly. And this expansion occurred before it would be relevant that the point of consuming higher education was to earn credentials. For example, between 1870 and 1930, the proportion of college-aged individuals attending higher education institutions rose from 1.7% to 13.0%[33]. The Morrill Act of 1862 had been in effect less than a decade by the time the statistical increase in college consumption began its rise. State universities had not

[33] This statistic derives from the Forward to Brown (1995) written by David F. Labaree.

become widespread and community colleges had yet to proliferate[34]. By 1880, there were around 800 colleges.

Consequently, Brown (1995) brings in Margaret Archer's Sociology of Educational Expansion – that "avoids some of the pitfalls of the theories of educational expansion…(e.g., the absence of agency, monocausal mechanisms, and the tendency of some theorists to look at educational institutions apart from their external environments)" (Brown, 1995, p. 43) – and identifies a different theory leading to "credentialism" that focuses on consistent educational expansion: Educational expansion is a function of the "presence of sufficient wealth, distributed among a large proportion of the population, to make possible the rather 'wasteful' activity of formal cultural production (including education)"; "suitable collective belief systems ('traditions' or 'ideologies') that orient group actions and resources toward educational growth and credentialism at various points in the process of educational expansion…"; and "decentralized control of educational institutions required to allow groups with sufficient wealth and favorable ideological disposition actually to invest in higher education" (Brown, 1995, p. 48).

The purpose of mentioning the above is to isolate two (2) points: One, the folly of looking at "educational institutions apart from their external environments" and, two, the implication from combining "decentralized control of educational institutions" with the expectation that "collective belief systems" will "orient group actions and resources toward educational growth and credentialism." The growth in consumption of higher education does not result from formal education's self-evident value to the individual. Increased consumption of higher education is not solely or even primarily a function of its "returns" to an individual's investment in it.

[34] This insight also derives from the Forward to Brown (1995) by David F. Labaree.

Rather, Brown (1995) spends considerable time discussing the "external environment" comprised of labor market conditions favoring recruitment from higher education institutions. In the absence of "state control of higher education, a multivalent Protestant cultural tradition of college-educated clergy, and peculiar economic incentives to college founding" (Brown, 1995, p. 73), an "extensive persisting institutional base of colleges…flourished" (Brown, 1995, p. 73).

Brown (1995) concentrates specifically on land speculation and the particular "religio-ethnic competition" between Catholics, "anti-Catholics," and Protestantism as driving increased college founding (i.e., higher education consumption) throughout the nineteenth century. And while the late 1880s saw generally some decrease in higher education consumption (according to Brown due to the financial woes of individual institutions reflecting an oversupply of institutions coupled with individual perception that the labor market viewed higher education as frivolous), the machinations of education administrators, accreditation organizations targeting high schools, the professionalization of high school teaching and administration, the desires of philanthropic foundations, changes in perceptions of mating and coupling success (i.e., the imported Germanic tradition that a "university man" was "manly") and, perhaps most interestingly and eyebrow-raising, the advent of the "knowledge revolution" in the late nineteenth century that incorporated new "scientific subject matter" all partially ensured that higher education consumption increased over time.

All of the above is to say: To my interpretation, the work of Brown (1995) reinforces the theme guiding this dissertation that increased education consumption over all of time generally has been driven by "external interests" or, specific to this case, "Elite External Definitions of the Economy," e.g. the "knowledge economy" (and all of its iterations). Brown (1995) articulates examples of these "external interests" that exert influence independently from the individual.

"Credentialism" also has been influenced by the work of the sociologist cited in the introduction to this dissertation, Burton R. Clark. By his own admission, Clark devoted his scholarship to the "[analysis] of purposeful formal organizations" (Clark, 2008, p. 4). One of his more renowned analyses of "purposeful formal organizations" detailed an unadvertised role for certain majors in a baccalaureate-granting institution or for community (or "junior") colleges in America's higher education system: They have a "cooling-out" function. The "cooling-out" function of certain majors or of community or junior college results from America's assumed "open-door admissions" policy. Rather than fail and terminate a student's access to a baccalaureate-granting institution or directly dismiss a student from pursuing a certain major when a student is struggling either in a baccalaureate-granting institution generally or within said major, the baccalaureate-granting institution will recommend a "cooling-out" either within another "easy" major/field-of-study (where it is expected the student will arrive at her or his own decision to continue that "easy" major) or in a community or junior college (where the student can take remedial coursework until she or he is sufficiently "ready" for the rigors of a baccalaureate or where the student, again, will arrive at her or his own decision to terminate higher education at an two-year or Associate degree).

The below direct citation restates the above summary; but, it is included because of the effect of the diction in linking this to “credentialism” and to its relevance for this dissertation:

> The conflict between open-door admission and performance of high quality often means a wide discrepancy between the hopes of entering students and the means of their realization. Students who pursue ends for which a college education is required but who have little academic ability gain admission into colleges only to encounter standards of performance they cannot meet. As a result, while some students of low promise are successful, for large numbers failure is inevitable and *structured*. The denial is delayed, taking place within the college instead of at the edge of the system. It requires that many colleges handle the student who intends to complete college, and allows such student, whose destiny is to fail, to become involved…
>
> What is done with the student whose destiny will normally be early termination? One answer is unequivocal dismissal. This ‘hard’ response is found in the state university that bows to pressure for broad admission but then protects standards by heavy dropout. In the first year it weeds out many of the incompetent, who may number a third or more of the entering class. The response of the college is hard in that failure is clearly defined as such. Failure is public; the student often returns home. This abrupt change in status and in access to the means of achievement may occur simultaneously in a large college or university for hundreds, and sometimes thousands, of students after the first semester and at the end of the freshman year. The delayed denial is often viewed on the outside as heartless, a slaughter of the innocents. This excites public pressure and anxiety, and apparently the practice cannot be extended indefinitely as the demand for admission to college increases.
>
> A second answer is to sidetrack unpromising students rather than have them fail. This is the ‘soft’ response: never to dismiss a student but to provide him with an alternative. One form of it in some state universities is the detour to an extension division or a general college, which has the advantage of appearing not very different from the main road. Sometimes ‘easy’ fields of study, such as education, business administration, and social science, are used as alternatives to dismissal. The major form of the soft response is not found in the four-year college or university, however, but in the college that specializes in handling students who will soon be leaving – typically, the two-year public junior college (Clark, 1960, pp. 598-599).

The “cooling-out” function of higher education exists because purchasing higher education – especially the purchase of baccalaureate-granting institutions – is assumed nearly “necessary,” i.e., as “access to the means of achievement.” A baccalaureate-granting institution cannot just dismiss or fail students that are low-performing. The “[f]ailure is public.” It “excites public pressure and anxiety” as “heartless” and “a slaughter of the innocents.” Thus, it is implied, baccalaureate-granting institutions structure themselves in order to be able to divert and to “conceal” failure of masses of students every year. “Extension divisions,” certain “easy fields-of-study,” and the two-year community/“junior” college system partially exist to hide this “inevitable and structured” failure.

Stated differently and conforming to the language of this dissertation, Clark (1960) admits – over six decades ago – that the purchase of formal higher education for the individual is not the same type of consumption decision as, say, whether one desires steak or chicken for dinner or whether one desires to venture to a movie theater or stay at home and stream a movie. In other words, this is not a consumption decision where there is the option to *not* purchase one of a choice of goods (or, rather, to substitute one good for another). Higher education consumption is viewed here more like the purchase of gasoline: It is nearly necessary. There is no substitute if one wants to use a combustible engine. “Access the means of achievement” or “return home” having “failed.”

But, unlike gasoline that is nearly necessary to purchase because, effectively, there is no substitute for it if one wants to use technology on which we have become dependent, the purchase of higher education does have a substitute. Or, rather, *should* have a substitute: Simply enter the labor market through other means (e.g., via different occupations, training, internship, apprenticeship, entrepreneurialism, and “working one’s way up through the ranks”). That back in 1960 and still prevalent today it is implied that there is no substitute for entry into the labor market is not a naturally or organically

observed decision point. It is a reality imposed on individuals from “above” or sold to individuals “external” to their interests (and potentially benefitting other interests).

For “credentialism,” the “cooling-out” function of higher education implies one mechanism for the existence of “credentialing”: If “a third or more” of the higher education market should not be purchasing higher education and instead is de facto required to purchase it, then hierarchies and social orders are produced in response. That Clark (1960) articulated “easy” fields-of-study and “extension divisions” of universities implies a role for higher education consumption in establishing a certain social order. Higher education is not necessarily assumed to increase an individual’s capabilities or skills or productivity. Rather, an individual’s place within society is established and/or her or his ability to move within society is facilitated by “credentials.” If everyone is required or expected to purchase a handbag, then, sociologically, it matters which and what brand handbag an individual buys. Being able to purchase or having access to a Louis Vuitton, Gucci, or Prada handbag implies a status within society different than having access to or being able to purchase a Strathberry or Loewe. And being able to purchase a Strathberry or Loewe implies a status within society different than having access to a handbag distributed in Aldo or Zara or by Baggallini. Within a particular brand, being able to purchase the trendiest or most niche styles signifies a different societal standing than perhaps having a broadly useful or an all-purpose variety. Purchasing a brand from the designer signifies social difference vis-à-vis purchasing the same brand from an “off-market” retailer. And the intra-market (for handbags or for higher education) differentiation facilitates a feedback loop: Those that are able to purchase the most luxury most often already have access to the areas of society where power and “success” are most easily or obviously attained. This incentivizes those without immediate access to the trendiest, most niche, Louis Vuitton to desire that Louis Vuitton and, like walking paths that later become sidewalks, creates a well-worn pipeline to said power and “success.” Having a

Louis Vuitton handbag confers little or no extra skills, experience, talent, or productivity to be a Supreme Court justice; but, all Supreme Court justices have the most expensive, trendiest, and most niche Louis Vuitton handbag.

Related, Collins (1979) discusses "credential inflation": The value of a particular credential decreases as increasing numbers of individuals earn that credential. This, of course, mirrors what has become the presently ubiquitous economic observation that the value (or the "returns" to an individual) from, say, a baccalaureate does or should decrease as more individuals earn baccalaureates.

This economic observation's source can be traced to Labaree (2010)[35]:

> The rise in the education level of Americans in the last 150 years has been extraordinarily rapid, but this change has not succeeded in shuffling the social deck. People who had an educational edge on the competition were by and large able to maintain this edge by increasing their schooling at the same rate as those below them in the status order. The effect of this process over time was to increase the average education level of everyone in the labor queue, which artificially inflated educational requirements for jobs…They were forced to run to stay in place (Labaree, 2010, p. 241)

Araki and Kariya (2022) cite Brown (2001), Collins (2011), and Bills and Brown (2011) that credentialists' response to the worldwide and exponential expansion of higher education consumption is to note that "…the association between educational credentials and economic rewards generally weakens as a result of credential inflation" (Araki and Kariya, 2022, p. 904). Resultingly and justifying the above "handbag" analogy, Araki and Kariya (2022) cite Kariya (2011), Bills (2016), Ortiz and Rodriguez-Menés (2016), Di Stasio (2017), DiPrete et al. (2017), Posselt and Grodsky (2017), and Tholen (2017) to assert that credential inflation arguments and research "recently" has focused on "the heterogeneity among the highly educated": The fields of study undertaken by, the prestige

[35] The following quote and subsequent citation of Labaree (2010) can also be found in Fernandez & Umbricht (2016).

of the higher education institution attended by, and socioeconomic backgrounds of the "highly educated" influence the degree to which "returns" to higher education consumption are realized.

Related, according to Dore (1976), generally speaking, the "economy" has become more bureaucratized and it is this "bureaucratization of economic life" and "degree of bureaucratization of employment" that creates and sustains the need for the usage of diplomas. Dore (1980), in its comparison of countries outside the United States, adds that centralized national standardized exams lead also to a dependence on academic degrees for job placement. Much school is "reluctant schooling," i.e., formal education merely for the job attainment. The "bureaucratization of economic life" prompting this results from the theory or expectation that job qualifications tend to increase over time because there are too many individuals seeking a particular job and there is competition amidst professional bodies/associations and organizations to hire the top of the talent pool. This describes an application of "credential inflation." The insights of Dore (1976) and Dore (1980) also support the suspicion guiding this dissertation that demands for occupations by individuals are a function of certain occupations being "sold" or "advertised" "from above" or external to what would otherwise be an individual's occupational interests, i.e., the continued, now generational assertion that a "knowledge economy" exists and that it will or already has replaced other "economies" typifying the labor market. If "bureaucratization" of occupations results from the characteristics defining "credential inflation," i.e., too much demand for one or a set of occupations that drives down wages and leads to reliance on credentials in hiring amidst an abundant pool, then one has to wonder from where did the abundance of demand for an occupation or set of occupations derive?

Peter van der Meer (2001) cites an application of credentialism and expectations of credential inflation relevant to the results from this dissertation's research: Citing Hirsch (1976) and Collins (1979), van der Meer (2001) differentiates between private-sector and

public-sector occupations. Hirsch (1976) interpreted credentials and education generally as being a positional good. Collins (1979) is cited to note that these credentials, then and generally, are prerequisites for entrance into a labor market. So, between occupations comprising the private-sector and occupations comprising the public-sector, this credential prerequisite will be most noticeable or obvious in the latter (public-sector). The public sector is most overt in hiring based upon one's credential regardless whether the credential confers any real gains in productivity or skills. The public organization (and its method of assigning pay) benefits from the establishment of standardized requirements for formal education. It matters secondarily whether the credential increases/is responsible for any one individual's productivity. The "returns" for purchasing additional higher education (toward a credential) are more pronounced for the public sector.

Of interest to the implications resulting from this dissertation's research is that it may be that the existence of "credential inflation" (or "degree inflation") is assumed as ubiquitous and universally characteristic of the "economy." As examples of this assumption, see Burning Glass Technologies (2014) and Fuller, Raman, et al. (2017). Burning Glass Technologies (2014) asserts that "[i]ncreasingly, employers are seeking baccalaureate talent for what have been sub-baccalaureate jobs" (p. 1). Burning Glass Technologies (2014) finds that, generally, employers require a Bachelor's degree for many jobs and that, specifically, there has been a shift in the expectation or requirement for Bachelor's degrees amidst occupations that traditionally have not required one in the past. This finding is posited as evidence of "credential inflation." Similarly, Fuller, Raman, et al. (2017) premise their analysis that the economy is characterized by "degree inflation": "Degree inflation – the rising demand for a four-year college degree for jobs that previously did not require one – is a substantive and widespread phenomenon that is making the U.S. labor market more inefficient…" (p. 2). The "degree inflation" is driven partially by insights similar to Berg (1971): As one of their top three motives for doing so, employers

cite that they locate to the United States in order to have “better access to skilled labor.” But, to illustrate that employers may not be able to articulate or define what it is exactly they want in a worker, the same employers also stated that they also choose *not* to locate to the United States because of its “better access to skilled labor.”

Regardless, a point of this research is not to verify claims of typical or ubiquitous credential or degree inflation. At this stage, it is important to lay the foundation for future research that may affect and verify credential inflation or degree inflation assumptions: Just as it is suspicious to assert that there is some “knowledge economy” flooding the countryside and displacing other sectors of the “economy,” it is not sufficient simply to assert that, generally, the United States economy is experiencing an overabundance of credentials and that, resultingly, employers are seeking these credentials when they otherwise should not be thus devaluing the credentials. Which occupations, exactly, have experienced increases in expectations/requirements for a formal academic degree in order to enter the occupation? In future research, can these occupations later be grouped and classified into an “economy” with definable characteristics? Are there additional factors influencing an increase in formal education expectations in one or more individual occupations that would justify said increase (i.e., “upskilling”)? Do individuals really adhere to the marketed characterization of the “economy,” i.e., do those occupations determined to expect increased formal degrees really possess the quantity of labor and wage differential justifying that increased expectation?

# CHAPTER 3: METHODS

## THE RESEARCH QUESTION

The previous two chapters are intended to lead to and to justify the research question: At this point in higher education policy history, it seems society is nearing an inflection point. While it may be true that society and its leaders consistently have sought increasing consumption of higher education, it has only been recently that such consumption has been so fervently advocated as being necessary for the well-being of an individual. Despite its ubiquity, this is a rather extreme position. The position is so extreme that the current political debate regarding the student loan (i.e., the continuance of the primary mechanism realizing the desire for increased higher education consumption) is characterized by polar, all-or-nothing positions: The political Right desires to expand indefinitely student loan usage and seeks never to forgive any amount of student loan debt. The political Left desires to rid the usage of student loans and seeks to forgive all student loan debt. Both positions assume that higher education consumption no longer is a typical consumption choice. Its consumption is deemed nearly necessary. Thus, the Right bemoans the usage of public money currently or in the future (through debt service) to alleviate the responsibility of individuals to realize what is deemed a guaranteed material well-being and the Left bemoans the interpreted callous need for an individual to finance what is deemed as a necessity.

It is assumed here, then, that now is the time to return to question a fundamental assumption behind the drive to increase consumption of higher education by an expanded consumer base. Is consumption of higher education necessary or, stated with dilution, is it really wise to assume and to argue that consumption of higher education should always be considered a good and worthwhile investment? Such a question is a derivative of a perennial question animating higher education policy: Is the primary role of higher education to ensure career readiness, material well-being, and "gainful employment"? It is a question relevant to illustrating whether there is an economy either comprised of a new set of occupations requiring increased formal "knowledge" and/or of existing occupations requiring increased "knowledge" within and as a function of quotidian tasks. It is a question relevant to the application of "signaling theory" in economics and that is intended to be interest to "credentialism theory."

To that broad philosophical question, this paper posits the following research question and hypothesis:

> **<u>Question #1</u>: Have occupations with similar or like tasks, expectations, and experience requirements or expectations increased their education requirements over time?**
>
> *$H_0$: Occupations with similar or like tasks, expectations, and experience requirements or expectations have increased their education requirements over time.*
>
> *$H_1$: Occupations with similar or like tasks, expectations, and experience requirements or expectations have not increased their education requirements over time.*

## DATA SOURCES

Thus, it seems appropriate to address the potential that the characterization of the economy toward promoting increasing consumption of higher education is developed by "external interests" through using the federal government's consistent attempt to define the "economy" for public consumption.

The sources to address the research questions will be the United States Department of Labor's United States Bureau of Labor Statistics *Occupational Outlook Handbook* (OOH) and its reliance upon the Standard Occupational Classification (SOC) system and the Department of Labor's (DOL's) (through its Employment and Training Administration) Dictionary of Occupational Titles (DOT).

Data Source #1: The Occupational Outlook Handbook

The Bureau of Labor Statistics *Occupational Outlook Handbook* has been published bi-yearly since 1940. By its own admission:

> The *Occupational Outlook Handbook* (OOH) is a career resource offering information on the hundreds of occupations that provide the overwhelming majority of jobs in the United States. Each occupational profile describes the duties required by the occupation, the work environment of that occupation, the typical education and training needed to enter the occupation, the median pay for workers in the occupation, and the job outlook into the next 10 years for that occupation. Each profile is in a standard format that makes it easy to compare occupations (U.S. BLS, 2014-2015, p. xi).

The OOH covers about 80% of the occupations comprising the United States economy.

In 1940, the OOH was known as the *Occupational Outlook Service*. The handbook was initially developed to help World War II veterans make career choices upon returning home. In 1949, the *Occupational Outlook Service* was changed to the *Occupational Outlook Handbook*. In that formative year, 288 occupations were divided into three (3) broad categories: “Trade and Industrial Trial Occupation”; “Clerical, Sales, and Service Occupations”; and “Professional, Semi-Professional, and Administrative Occupations.” By 1957, the format of the OOH took the form that still is, with minor changes, used to this day. By 1960, the habit of publishing numerical projections of anticipated occupational needs for the economy for a ten-year period was introduced (Taylor, 2019).

The point is, in order to view the nature of the occupational economy with any form of standardization, the *Occupational Outlook Handbook* is a time-tested and reliable source.

Currently, the OOH is accessible primarily online. From its online source, it is possible to sort the 80% of occupations comprising the United States economy by a

number of variables, one of which includes by education requirement and another of which includes degree of on-the-job training generally required.

That occupation lists could be sorted by education requirement is a relatively new addition to the OOH. Occupation lists sorted by education requirement have only been available for some years: It has only been since the publication of the 2012-2013 OOH that the Bureau of Labor Statistics has provided readers of the OOH with an "Entry-Level Education" variable that, without nuance, simply states a minimum, categorical, formal education requirement standard for entry, e.g., "Bachelor's Degree" or "Master's Degree." Starting with the 2012-2013 OOH, the standardized format of the content for each occupation detailed changed from the format used for decades previously:

Before the publication of the 2012-2013 OOH, each occupation detailed contained a section entitled "Training, Other Qualifications, and Advancement." And, while over time and preceding the publication of the 2012-2013 OOH the wording under this "Training…" section became less nuanced,[36] the "Training, Other Qualifications, and Advancement" section of an occupation detailed generally began with a statement about entry-level education requirements that might most accurately be described as equivocating. An occupation might state something like "[m]ost institutions require x degree." But, such a statement would be followed by paragraphs of caveats. Most likely, "Training, Other Qualifications, and Advancement" narratives emphasized the heterogeneity of the market for any occupation. "Employers' needs vary" is the theme of many of the occupations detailed in OOH publications prior to 2012-2013.

[36] Specifically, a subsection labeled "Education and Training" eventually was added under the "Training, Other Qualifications, and Advancement" section of each occupation detailed. An unambiguous statement like "x occupation typically or generally needs y degree" lead into the subsection on "Education and Training."

The *Occupational Outlook Handbook* website displays only the most recent sorting of occupations by education requirement. The list of occupations with which the analysis will compare is current as of January 2024 (and current to 2022).

Data Source #2: Standard Occupational Classification (SOC) System

The occupations comprising the *Occupational Outlook Handbook* (OOH) are classified and subsequently coded. Until 2000, a consumer of the *Occupational Outlook Handbook* would note each occupation classified and coded most prominently according to the Dictionary of Occupational Titles (DOT). However, since 1977, occupations have also been classified and coded according to the Standard Occupational Classification (SOC) system.

The United States first attempted to classify occupations using the 1850 Census of Population that listed around 320 occupations (Emmel & Cosca, 2010). The attempt by the federal government to classify occupations continued throughout the 20th century. Of course, into the 20th century, the number of occupations only ever increased, complicating classification, and necessitating a standardized, comparable system of classifying occupations (Emmel & Cosca, 2010).

Nineteen seventy-seven (1977) saw the first publication of the Standard Occupational Classification (SOC) system. SOC attempted to unify multiple agencies' independent identification and collection of occupational data (Emmel & Cosca, 2010). The SOC system was not adopted by the agencies whose data it intended to standardize. SOC went through a revision soon after its first publication – 1980. Still, it was not adopted by federal government agencies. Agencies continued identifying and collecting occupational data using their respective methods.

The Bureau of Labor Statistics (BLS) hosted an international conference in 1993 with the purpose of developing a revised Standard Occupational Classification (SOC) system that would have buy-in and, thusly, be used by other federal agencies. A SOC Committee soon after was established and promoted by the Office of Management and Budget (OMB) and by portions of the Executive Office of the President. Presumably, the Executive Office of the President used its constitutional power over executive branch

agencies (i.e., Federal agencies) to influence all Federal agencies with a divergent occupational classification system to work with the SOC Committee and, thus, adopt SOC revisions. The SOC Committee included representatives from the Bureau of Labor Statistics (BLS), the Department of Labor's Employment and Training Administration (DOL ETA), the Census Bureau, and other agencies (Emmel & Cosca, 2010[37]).

Out of the SOC Committee that resulted from the 1993 international conference, the 1998 SOC was developed. It was a set of revisions and considered improvements to original (1977) SOC system. The SOC Committee published the revisions as the 2000 SOC.

The Standard Occupational Classification (SOC) system used today to categorize occupations identified in the *Occupational Outlook Handbook* (OOH) retains the same basic structure as 1998/2000 SOC. Identified occupations are assigned a six-digit code where the first and second digits represent an occupation's "Major Group," the third digit represents an occupation's "Minor Group," the fourth and fifth digit identifies the "Broad Occupation," and the sixth digit identifies the "Detailed Occupation."

[37] The entire paragraph ultimately is a restatement from Emmel and Cosca (2010).

To illustrate SOC coding, I will use one particularly broad set of occupations – "Management" occupations – and will embolden and color in the list the digits leading to the classification. The matching of the coloration of the digits and its link to the "Major Group," "Minor Group," "Broad Occupation," and "Detailed Occupation" identification are in footnotes[38]. As a base for reference,

the code **00-0000** refers to "All Occupations" :

- **11**-0000 = Management Occupations
  - 11-**1**000 = Top Executives
    - 11-1**01**0 = Chief Executives
      - 11-101**1**[39] = Chief Executives
- **11**-**9**000 = Other Management Occupations
  - 11-9**03**0 = Education and Childcare Administrators
    - 11-903**1** = Education and Childcare Administrators, Preschool and Daycare
    - 11-903**2** = Education and Childcare Administrators, Kindergarten through Secondary
    - 11-903**3** = Education Administrators, Postsecondary
    - 11-903**9**[40] = Education Administrators, All Other

[38] Red = "Major Group"
Green = "Minor Group"
Blue = "Broad Occupation"
Purple = "Detailed Occupation"

[39] Note that the use of the "1" as the last digit (as the "Detailed Occupation" coding) and that it does not further specify the occupational category means that there is no further specification beyond the "Broad Occupation" identifier, e.g., there are no sub-categories of "Chief Executive." Alternatively stated, there is no further "detailed occupation" beyond the "broad occupation" of "Chief Executive. But, the coding cannot stop with the last digit being "0." The system must be complete. Just because there is no further delineation beyond the "Broad Occupation" does not mean that the coding should stop at the fifth digit.

[40] The use of "9" as the sixth digit in the coding (i.e., the "Detail Occupation") serves a "bucket" function. In the example above, under "Education and Childcare Administrators," there are only three (3) sub-categories (three more "detailed occupations"): Preschool and Daycare Educators and Administrators, Kindergarten through Secondary Educators and Administrators, and Postsecondary Educators and Administrators. There are no fourth, fifth, sixth,…,eighth sub-categories. The "9" serves as a "catchall" designation.

One point to take away from the above elaboration of the SOC system relevant to the research question and methodology is that in order to compare occupations and their entry-level education requirements over time, one must first be able to identify like occupations across time. That the Bureau of Labor Statistics (BLS) (with Department of Labor, the Census Bureau, et al.) ultimately developed a standard classification for occupations alleviates this first step. Since 1977, a standardized classification system has coded and categorized over 80% of all occupations in America.

An obstacle is presented with the knowledge that this standardized classification system has been revised four (4) times (i.e., 1977/1980, 1998/2000, 2010, and 2018). These revisions require a means to convert from one set of revisions to another. The Bureau of Labor Statistics offers to the public[41] these conversions between systems. The issue for this research is that the coding conversions apply only chronologically and only apply from 2000 to the present system. One can convert from 2000 code and occupation classification to 2010 and from 2010 to 2018 classifications, but one neither can convert from 2018 to 2010, from 2010 to 2000, nor – and most relevantly – from 2000 to any time before 2000.

[41] The system conversions are termed “crosswalks.” The current set can be found at the link in the References. Cited as O*NET (2022).

Another obstacle presented derives from the following statement provided by the Bureau of Labor Statistics in summarizing briefly the Standard Occupational Classification (SOC) system. The whole quote is provided for context; the relevant part of the quote is emboldened:

> The 2018 Standard Occupational Classification (SOC) system is a federal statistical standard used by federal agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. All workers are classified into one of 867 detailed occupations according to their occupational definition. To facilitate classification, detailed occupations are combined to form 459 broad occupation, 98 minor groups, and 23 major groups. **Detailed occupations in the SOC with similar job duties, and in some cases skills, education, and/or training, are grouped together** (BLS, n.d.).

The appositive “in some cases” implies that skills, education, and/or training requirements were a secondary or tertiary consideration in classifying occupations. So, while for the past decade the *Occupational Outlook Handbook* (that uses the SOC system) has categorized entry-level education requirements for each occupation profiled, in comparing the current list of occupations and their quantitative entry-level education statements with occupations from the 1980s or 1990s, there is the issue of comparing said quantitative statements on education and training requirements with the more context-dependent statements on education requirements from the past. SOC, through its own qualifier, did not primarily categorize occupations according to the variable needed to answer this research question. So, I cannot claim that the means of categorization informs education requirement variables: I cannot claim that, even though there is nuance in the entry-level education requirement narrative, I still am able to assert a standard entry-level education requirement deduced from the categorization system itself.

I would need to develop a means by which to standardize entry-level education requirements of occupations classified according to SOC over time. And this leads to the final data source relevant to the research question and its methodology.

## Data Source #3: Dictionary of Occupational Titles (DOT), Fourth Edition, Revised 1991

The *Dictionary of Occupational Titles, Fourth Edition, Revised 1991* refers to the final revision of the final edition of the *Dictionary of Occupational Titles*.

The final edition of the *Dictionary of Occupational Titles* (DOT) is the fourth ($4^{th}$) edition. It was first published in 1977. (This is also the first year of the Standard Occupational Classification – SOC – system development.) The final revision to the fourth edition of the DOT occurred and was published in 1991 as a two-volume set. The DOT continued to be released in two-year intervals (i.e., 1994-1995) until 1999 when it was replaced by the Occupational Information Network (O*NET). But, there were no additions or revisions to DOT after 1991.

The *Dictionary of Occupational Titles* (DOT) was first published in 1939. “The first edition contained approximately 17,500 concise definitions presented alphabetically, by title, with a coding arrangement for occupational classification. Blocks of jobs were assigned 5- or 6-digit codes which placed them in one of 550 occupational groups and indicated whether the jobs were skilled, semi-skilled, or unskilled” (DOT, 1991, p. xv).

The DOT was developed through the United States Employment Service after the mid-1930s passage of the Wagner-Peyser Act that “established a Federal-State employment service system, and initiated an occupational research program, utilizing analysts located in numerous field offices throughout the country, to collect the information required [to respond to the demand of an expanding public employment service for standardized occupational information to support job placement activities]” (DOT, 1991, p. xv).

> The second edition DOT, issued in March 1949, combined material in the first edition with several supplements issued throughout the World War II period. The second edition and its supplements reflected the impact of the war on jobs in the U.S. economy including occupations in the plastics, paper and pulp, and radio manufacturing industries.
>
> The third edition DOT, issued in 1965, eliminated the previous designation of a portion of the occupations as “skilled, semi-skilled, or unskilled” and substituted a classification system based on the nature of the work performed and the demands of such work activities upon the workers. These new indicators of work requirements included eight separate classification components: training time, aptitudes, interests, temperaments, physical demands, working conditions, work performed, and industry.
>
> The fourth edition of the DOT, published in 1977, contained over 2,100 new occupational definitions and several thousand other definitions were substantially modified or combined with related definitions. In order to document these changes, approximately 75,000 on-site job analysis studies were conducted from 1965 to the mid-1970s. These studies, supplemented by information obtained through extensive contacts with professional and trade associations, reflected the restructuring of the economy at that time.
>
> Two supplements to the DOT have been released since the publication of the 1977 fourth edition DOT, one in 1982 and one in 1986. The 1982 supplement contained titles, codes, and definitions derived from Occupational Code Requests submitted by DOT users to local Job Services offices. The 1986 supplement continued this effort to publish new definitions as well as modify existing definitions consistent with new data collected. The 1986 supplement contained 840 occupational definitions; of these 761 were not defined in the fourth edition (DOT, 1991, p. xv).

You read the above direct quotation from the “Introduction” to Volume 1 of the *Dictionary of Occupational Titles, Fourth Edition, Revised 1991* in order to make the following points relevant to the research methodology:

The first point concerns the timeline of the DOT’s development. The final (fourth) edition and its “supplements” (i.e., revisions) were last revised in 1991 and were published continuously in two-year intervals throughout the 1990s. Note the correspondence to the timeline for development of the Standard Occupational Classification (SOC) system. The first truly meaningful revision to SOC that reflected full federal government-wide buy-in occurred after a 1993 international conference and was finalized and adopted in 1998 for use in 2000. So, until 2000, the fourth edition of the DOT, last revised in 1991, was considered the default source for occupational classification and job placement.

Secondly and additionally, the fourth edition of the DOT published until it was replaced by O*NET in 1999 and last revised in 1991, de facto acts as a historical omnibus. That the fourth edition contains results from 1977, 1982, 1986, and 1991 and is considered current through 2000 (after which the SOC[42] replaces the DOT) implies that it can be used as a singular source for comparing current occupational definitions and education requirements to those from late 1970s through 2000.

Most relevantly, unlike the Standard Occupational Classification (SOC) system, from its inception occupations in the DOT were categorized overtly (and partially) by an entry-level education variable. In the first and second editions, this variable was a de facto education one, i.e., “skilled,” “semi-skilled,” and “unskilled” imply a need (or lack of need) for formal education. Beginning with the third edition (in 1965), occupations were classified partially according to a “training time” variable. As will be shown below, this “training time” variable is a quantitative entry-level education variable.



[42] The Dictionary of Occupational Titles actually was replaced by O*NET. However, O*NET effectively is the Standard Occupational Classification (SOC) system after O*NET went completely online beginning in 1999. The relationship is as follows: O*NET refers to a database of occupational classifications. In 1999, it included skills, abilities, knowledge, preparation, associated tasks, and other information on 1,122 occupations. It is meant “as a medium for exchanging information. Workers benefit by exploring career options and learning which skills employers seek for specific types of work. Employers identify necessary skills to increase the efficiency of recruitment and training. Educational planners need O*NET to design instructional programs that teach the skills demanded in the workplace” (Mariani, 1999, p. 3). O*NET was born in contrast to the DOT. Before its final set of revisions in 1991, DOT was considered too “blue collar”: “The need for occupational information that is more relevant to the modern workplace spurred the creation of O*NET. During the mid-1990s, a team of public and private sector organizations, led by the U.S. Department of Labor’s Employment and Training Administration, created O*NET. The Employment and Training Administration released a preliminary version of O*NET on a limited basis in December 1997. It made a refined O*NET 98 available to the general public in December 1998” (Mariani, 1999, p. 3). Note that the Department of Labor’s ETA was involved and integral in developing and revising the SOC system. Mariani (1999) speaks to a third revision to O*NET to be implemented in 2001, i.e., at the same time that the 1998 SOC is finalized and published as 2000 SOC. Prior to 2001, O*NET adapted occupation information from “pre-existing sources” that included the DOT. In 1999, data collection toward a third revision of O*NET began. “In 2001, these new data are scheduled to appear in the comprehensive O*NET database, and the *occupations will be realigned according to the revised Standard Occupational Classification system* [emphasis mine]” (Mariani, 1999, pp. 3-4). To summarize, 2000-2001 represented a convergence: DOT was replaced by O*NET which aligned with 2000 SOC. The *Occupational Outlook Handbooks* from 2000 on relied on SOC rather than on DOT.

## RESEARCH METHODOLOGY

The newness of the ability to sort occupation profiles by education requirement is a justification for the following proposed research method:

In order to address the research question (Question #1), it would be beneficial to compare occupation profiles and their education requirements over time. Currently, the *Occupational Outlook Handbook* (OOH) identifies 832 occupation profiles. Consequently, this paper proposes to analyze occupation profiles from the OOH in reverse. Education requirements are sortable using the following categories:

- "Doctoral or Professional Degree,"
- "Master's Degree,"
- "Bachelor's Degree,"
- "Associate Degree,"
- "Postsecondary Non-Degree Award,"
- "Some College, No Degree,"
- "High School Diploma or Equivalent," and
- "No Formal Educational Credential"

I will sort the most current OOH's occupation profiles by education requirements. The methodology will ignore occupations listed as needing "No Formal Educational Credential," "High School Diploma or Equivalent," "Some College, No Degree," and "Postsecondary Non-Degree Award."

Ignoring occupations listed as needing "No Formal Educational Credential" and "High School Diploma or Equivalent" is obvious. This paper does not expect that educational credentials will downgrade over time. An occupation that currently requires "No Formal Educational Credential" or requires only a "High School Diploma or Equivalent" very likely did not require the purchase of higher education in the past.

As a brief digression that affects the research methodology, it seems common when discussing the necessity of purchasing higher education that messaging about returns deceptively strays to the observation that for some professions a credential is required. Doctors need M.D.s; lawyers need J.D.s; engineers need P.E.s. The natures of certain work positions indeed require the purchase of higher education. To overly generalize, certain jobs in society are conducted with a high degree of information asymmetry from the perspective of the consumer. This asymmetry can be, quite literally, deadly. Doctors can kill; lawyers can strip an individual of all societal rights and protections; an engineered structure can fail, massacring and maiming all within the vicinity of the failure. Admitting that there are positions that require a credential in order to enter and, thus, require the purchase of higher education is not an argument that all positions within even a labor market that seems to be differentiated by the term "knowledge economy" requires purchase of higher education.

Consequently, I will ignore "Doctoral or Professional Degree" occupations. By definition, such occupations requiring a "professional degree" or a "doctorate" have always and likely necessarily have required specific (professional) training and certification. Unless this paper intends to compare a surgeon today to a barber during the Middle Ages, it is uninformative to trace the education requirements for a profession over time. To rehash the referenced previous point, in my experience, a significant number of arguments have used the red herring of a professional certification or doctorate to support the presumed need to consume higher education. Consuming higher education to pursue a juris doctorate (J.D.) is not controversial. Seemingly congratulating the consumption of higher education to work at Enterprise Rent-A-Car (and to represent one's college sports team) is controversial.

Similar logic also applies to the aforementioned exclusion of occupations requiring "Some College, No Degree" and "Postsecondary Non-Degree Award[s]." Most occupations under these categories consider certification as an educational requirement. And, like being a surgeon or lawyer or engineer, it is intuitive the need for certification to be eligible to earn money performing the occupations listed under these educational requirement categories. Ignoring occupations designated as requiring "Some College, No Degree" and "Postsecondary Non-Degree Award" also is a function of the scarcity, idiosyncratic, and entrepreneurial nature of the occupations listed under these categories. Still, for reference and illustration, an appendix (Appendix E) will list the occupations designated as requiring the "Some College, No Degree" and "Postsecondary Non-Degree Award" educational purchase.

Consequently, this research will focus on the occupation profiles that require a "Bachelor's Degree" a "Master's Degree," and an "Associate Degree," i.e., credentials[43] for which the purchase of higher education is de facto "required."

Prima facie, the analysis I will use is straightforward: Perform three (3) sorts for occupations requiring a "Bachelor's Degree," a "Master's Degree," and an "Associate Degree" from the current online *Occupational Outlook Handbook* (OOH). Identify the historic complements to the resulting lists of current occupations/occupation categories. These complements should be identifiable through past editions of the *Occupational Outlook Handbook* (OOH). Determine whether current academic degree requirements have been consistent over time.

[43] As a blunt statistic potentially illustrative of the message throughout this writing, out of 832 occupations for 2022, only 179 require a "Bachelor's Degree," 39 require a "Master's Degree," and 49 require an "Associate Degree."

The complications to the "straightforward" analysis are twofold: One (and the fundamental purpose of this analysis) is that prior to 2010[44] a systematic or standardized citation of entry-level education requirements had not been fully utilized by the Bureau of Labor Statistics (BLS) (through the OOH). Regarding measures of education and training, the Bureau of Labor Statistics (BLS) references at least three (3) different "systems" of entry-level education identification and classification of training expectations: Pre-1995, 1995-2008, and 2010 to the present. Regarding 1995-2008 and 2010 to the present, the Bureau of Labor Statistics (BLS) clarifies that the two systems for entry-level education requirements are not comparable[45]. Two, occupational categories obviously have changed significantly over time. So, how does one compare the proverbial apples to oranges?

Addressing the second complication leads to addressing the first: From its inception, the Bureau of Labor Statistics has codified its occupations using, first, the Employment and Training Administration's (under the U.S. Department of Labor) Dictionary of Occupational Titles (DOT) and, later, the Standard Occupational Classification (SOC) system. From 1977 to 1991, both the DOT and the SOC existed simultaneously. But, do to issues with SOC described above, the DOT would continue to be the default occupation profile system through 1999. The DOT later would be replaced by the Occupational Information Network (O*NET) and, currently, SOC and O*NET use similar classifications for occupations[46]. The only difference between O*NET and SOC is that O*NET accounts for a broader set of disaggregates of occupations than SOC. O*NET

[44] U.S. Bureau of Labor Statistics (2022)
[45] U.S. Bureau of Labor Statistics (2022)
[46] In fact, the current SOC is referred to as O*NET-SOC 2019. To be specific, O*NET adds to 2018 SOC an additional coded qualifier that effectively increases the number of occupations covered. So, 2018 SOC and its six-digit code divides occupations into 23 "Major Groups," 98 "Minor Groups," 459 "Broad Occupations," and 867 "Detailed Occupations." O*NET-SOC 2019 adds an additional two (2) digits further sub-divides the "Detailed Occupations." Through sub-divisions, effectively O*NET-SOC 2019 adds 149 occupations "Detailed Occupations." The O*NET-SOC taxonomy includes 1,016 occupational titles where 2018 SOC includes 867 "Detailed Occupations."

utilizes the same structure and definitions as the SOC but in some cases provides additional detailed occupations (further disaggregates) beyond the six-digit SOC level coding. O*NET also provides occupation-specific information – such as tasks, tools and technology, knowledge, skills, and abilities – that is not found in the SOC (SOC Information Desk/Bureau of Labor Statistics, personal communication, October 5, 2022).

That DOT became O*NET and that O*NET ultimately uses the Standard Occupational Classification (SOC) system for occupations is important to explaining the research methodology because of the following previously referenced complication: The SOC has been revised multiple times. As examples, 2000, 2010, and 2018 saw significant revisions to SOC. These revisions generally were not compatible amongst each other. Or, more accurately, compatibility could be achieved between the current SOC and its immediate predecessor. But, the current SOC and a predecessor two or three generations old were not compatible.

However, SOC and DOT have consistently been compatible. And SOC and O*NET, i.e., DOT's successor, are compatible.

The Bureau of Labor Statistics provides a "crosswalk" to compare SOC and DOT[47] codes.

Consequently, this analysis will rely upon two (2) unique properties of the *Dictionary of Occupational Titles Fourth Edition, Revised 1991* (i.e., DOT) to compare current *Occupational Outlook Handbook* (OOH) (that use 2018 SOC) occupation profiles and their entry-level education requirement with entry-level education requirements of occupations in the past.

[47] The O*NET SOC 2019-to-DOT crosswalk (and other crosswalks) can be found via the link in the References for the O*NET (2022) citation.

The first property has already been discussed above: That the 1991 revised fourth edition DOT was first published in 1977 and included supplements from 1982 and 1986 *and* that this 1991 revised fourth edition of the DOT was used (and considered current) throughout the entirety of the 1990s means that comparing current occupation education requirements today to those within the 1991 revised fourth edition of the DOT is comparing occupation education requirement expectations as expressed by the federal government from 1977 through 1999.

The second property unique to the DOT, generally, and specifically to the 1991 revised fourth edition of the DOT is that, like the current SOC and OOH, the DOT effectively quantified education requirement expectations for entry into the occupations it identified.

Going into detail, a DOT occupation profile is written systematically: Each occupation identified is headed with an Occupational Code Number, followed by an Occupational Title, an Industry Designation, and Alternate Titles. The introduction to Volume 1 of the *Dictionary of Occupational Titles, Fourth Edition, Revised 1991* provides the following example:

> **652.382-010[48] CLOTH PRINTER[49] (any industry)[50] alternate title: printer; printing-machine operator[51]**

[48] This is the Occupational Code Number. The DOT details the meaning of every digit or set of digits.
[49] This is the Occupational Title. It is also referred to by the DOT as the "base title." It is always capitalized.
[50] This is the Industry Designation. It is always within parentheses.
[51] This is the set of Alternate Titles. Some occupation profiles do not have alternate titles.

The body of an occupational definition (i.e., profile) is structured as follows: The first sentence (following the industry designation and alternate titles) is the *Lead Statement*. The *Lead Statement* summarizes the entire occupation and offers essential information regarding worker actions; the objective or purpose of worker actions; machines, tools, equipment, or work aids used by the worker; materials used, products made, subject matter dealt with, or services rendered; and instructions followed or judgments made. The *Lead Statement* is always followed by a colon (:). The bulk of the occupational definition consists of the *Task Element Statements*. These refer to specific tasks the worker performs in order to accomplish the occupation purpose identified in the *Lead Statement*. Following the *Task Element Statements* are what the DOT refers to as *"May" Items*: "Many definitions contain one or more sentences beginning with the 'may.' They describe duties required of workers in this occupation in some establishments but not in others…" (DOT, 1991, p. xxi). After the inclusion of so-called *"May" Items*, an occupation definition includes *Undefined Related Titles*: "Undefined related titles, when applicable, appear at the end of the occupational definition, with initial capital letters, preceded by a phrase, such as 'May be designated according to…'…This type of title indicates a variation or specialization of the base occupation. It resembles the base enough to accompany it but differs from it enough to require an explanatory phrase and its own unique title. An undefined related title has the same code as its base title…" (DOT, 1991, p. xxii).

Finally, every occupation definition/profile in the DOT is accompanied by a *Definition Trailer*. It is the *Definition Trailer* with which this analysis will be comparing current occupations' entry-level education requirements with those of the past 45 years. I will quote the DOT directly:

> Selected characteristics and auxiliary profile data are contained in a 'trailer' appended to each definition. The trailer contains the following selected occupational analysis characteristics: GOE Code; Strength rating; R, M, and L of GED; and SVP.
>
> The Date of Last Update (DLU), the last item in the trailer, is the date of the most recent material gathered in support of that occupation. The date "1977" indicates that the job has not been studied since the publication of the Fourth Edition DOT in 1997. This entry allows the reader to identify the currency[52] of each definition. It will also provide easy identification of definitions "new" to the DOT or alert the reader to previously published and recently updated definitions (DOT, 1991, pp. xxii-xxiii).

Specifically, I will compare current citations of entry-level education requirement expectations from the *Occupational Outlook Handbook* (OOH) with the aforementioned "R, M, and L of GED" statement located in the *Definition Trailer* of every occupation profile within the *Dictionary of Occupational Titles, Fourth Edition, Revised 1991* identified as analogous to current occupations according to the aforementioned "crosswalk" provided by the Bureau of Labor Statistics (i.e., through the conversion of the SOC code identifying a current OOH occupation to the DOT and its Occupational Code Number).

[52] If this analysis ever expands to include changes in wage values over time, noting that the definition was last updated in 1977 or 1982 or 1986 will allow for proper inflation adjustment comparing past wages with current ones, i.e., real wage change.

To that end, it is relevant to detail the “R, M, and L of GED” variable that is used in the *Definition Trailer*. I will quote directly from the second volume of the *Dictionary of Occupational Titles, Fourth Edition, Revised 1991*:

> General Educational Development embraces those aspects of education (formal and informal) which are required of the worker for satisfactory job performance. This is education of a general nature which does not have a recognized, fairly specific occupational objective. Ordinarily, such education is obtained in elementary school, high school, or college. However, it may be obtained from experience and self-study.
>
> The GED Scale is composed of three divisions: Reasoning Development, Mathematical Development, and Language Development. The description of the various levels of language and mathematical development are based on the curricula taught in schools throughout the United States. An analysis of mathematics courses in school curricula reveals distinct levels of progression in the primary and secondary grades and in college. These levels of progression facilitated the selection and assignment of six levels of GED for the mathematical development scale.
>
> However, though language courses follow a similar pattern of progression in primary and secondary school, particularly in learning and applying the principles of grammar, this pattern changes at the college level. The diversity of language courses offered at the college level precludes the establishment of distinct levels of language progression for these four years. Consequently, language development is limited to five defined levels of GED inasmuch as levels 5 and 6 share a common definition, even though they are distinct levels (DOT, 1991, pp. 1009; 1012).

The purpose of quoting the above lengthy passage from the *Dictionary of Occupational Titles, Fourth Edition, Revised 1991* completely is to provide the context for what will be an appendix to this dissertation. (See Appendix C.) The *Definition Trailer* to which I will be comparing current occupational education requirements only refers to a numerical designation (Levels) for *Reasoning Development* (R), *Mathematical Development* (M), and *Language Development* (L). Levels apply in reverse chronological order: Level 6 is the highest R, M, or L "Level" and Level 1 is the lowest R, M, or L "Level." The aforementioned appendix (i.e., Appendix C) will detail what each "Level" means according to the DOT.

Of note, however, is how the "Levels" correspond to the education requirement categories used by the *Occupational Outlook Handbook* (OOH): Which "Level" is equivalent to a "Bachelor's Degree"? Which "Level" is equivalent to a "Master's Degree"? Which "Level" is equivalent to an "Associate Degree"?

To answer this question, I reference the National Occupational Information Coordinating Committee (NOICC) and its 1982 document, "Vocational Preparation and Occupations – Third Edition" (VPO) (NOICC, 1982) that, by its own admission, takes directly from the United States Department of Labor's "Relating General Educational Development to Career Planning" document published in 1971 (DOL, 1971). This document is directly connected to the *Dictionary of Occupational Titles*: The DOT (as cited directly above) admits that its "description of the various levels of language and mathematical development are based on the curricula taught in schools throughout the United States" and that "language courses follow a similar pattern of progression in primary and secondary school…" (DOT, 1991, p. 1012). NOICC (1982) directly references the *Dictionary of Occupational Titles*:

> Each occupation in the DOT has been assigned a series of subcodes which provide supplementary information about occupation. One of these subcodes is for General Education Development (GED). The GED code is a three-digit number which indicates the reasoning (R), mathematical (M), and language (L) development levels that a worker should possess upon entering a given job.
>
> GED levels range from one (1), the lowest level of complexity, to six (6), the highest level of complexity. The GED levels are cumulative; that is, each ascending level indicates a set of abilities and knowledges which are required in addition to all the abilities described at the lower levels. For example, a GED level of (R) 3, (M) 3, and (L) 3 means that a person must possess all the abilities listed in GED levels 1, 2, and 3 for reasoning, mathematics, and language (NOICC, 1982, p. i).

NOICC (1982) assigns United States formal education grade levels to the GED levels:

- GED Level 1 refers to Grades 1-3
- GED Level 2 refers to Grades 4-6
- GED Level 3 refers to Grades 7-8
- GED Level 4 refers to Grades 9-12
- GED Level 5 refers to College 1-2
- GED Level 6 refers to College 3-4 (NOICC, 1982, pp. 1-13)

As with the description of GED levels from the *Dictionary of Occupational Titles, Fourth Edition, Revised 1991* (DOT), I will append NOICC (1982) to this writing. (See Appendix D.)

NOICC (1982) is a core source document that informs how the federal government viewed formal education requirements for entry into occupation profiles. Of immediate note is that the highest formal education qualification for any occupation in the 1991 fourth edition of the DOT is a Bachelor's Degree. So, any occupation comparable to the 1991 fourth edition of the DOT from the current *Occupational Outlook Handbook* (OOH) requiring a Master's Degree already shows signs of credential inflation.

Having addressed the appropriateness and fit of the data sources, the research methodology can be summarized as follows: Sort and then isolate current *Occupational Outlook Handbook* (OOH) occupations by the entry-level requirement of a Bachelor's Degree, Master's Degree, or Associate Degree[53]; apply the Standard Occupational Classification-to-Dictionary of Occupational Titles (SOC-to-DOT) crosswalk to convert current OOH occupations to occupations identified in the *Dictionary of Occupational Titles, Fourth Edition, Revised 1991* (DOT) that were considered current from 1977 to 1999[54]; record the GED levels of the DOT occupation analogous to the current OOH occupation; compare 1977-1999 education requirements to 2022 education requirements (still current to January 2024).



[53] In order to reproduce this step at the time of this writing (2023), the following order is followed:

- Go to the web-based *Occupational Outlook Handbook*.
- "Select Occupations By" all dropdown variables presented (i.e., Median Pay, Entry-Level Education, On-the-Job Training, Number of New Jobs, and Growth Rate). This lists all occupations covered by the *OOH.*
- Sort the resulting list by "Entry-Level Education." The webpage containing the list of all occupations is the "Occupation Finder".

[54] In order to reproduce this step at the time of this writing (2023), first the 2018 SOC (i.e., the O*NET-SOC 2019) coding will need to be added to the list of occupations sorted by "Entry-Level Education":

- From the "Occupation Finder" click on each occupation listed. This directs to a "Summary" page for that occupation.
- From the "Summary" page, scroll to the bottom and click on the "More Information, Including Links to O*NET" link. This will direct to a "Contacts for More Information" page.
- From the "Contacts for More Information" page, a link to one or more "O*NET" occupation designations will result. Clicking on each of these links provides the O*NET-SOC 2019 code that is then compared to the *Dictionary of Occupational Titles* via the "DOT to SOC 2019" crosswalk.

## Method for Identifying Meaningful Results

Comparing 1977 to 1999 entry-level education requirements for analogous occupations in 2022 requires being able to present the data in a meaningful format.

The merging of the *Dictionary of Occupational Titles* (DOT) occupations to the O*NET system using the *Standard Occupational Classification* (SOC) system to be reported further summarized in the *Occupational Outlook Handbook* (OOH) (thus allowing backward compatibility between the SOC and DOT via a "crosswalk") required condensing nearly 2,500 (2,481) occupations from the DOT into hundreds (588) of occupations classified using the SOC system into the 237 occupations comprising the OOH (i.e., 149 occupations requiring Bachelor's Degrees, 39 occupations requiring Master's Degrees, and 49 occupations requiring Associate Degrees). For this dissertation, working backward (comparing current entry-level education requirements with requirements from the past) required disaggregating these 237 current OOH occupations (requiring either a Bachelor's, Master's, or Associate degrees) into the original master list of SOC and DOT occupations.

Presenting the master list of entry-level education requirements for nearly 2,500 different occupations that fall under 237 current occupations does not explain or illustrate much.

Additionally and as described above, the DOT occupations listed entry-level education requirements via three (3) separate variables for each occupation – *Reasoning Development* (R), *Mathematical Development* (M), and *Language Development* (L) – for which there are six (6) "Levels" for each variable with each "Level" representing a formal education equivalent.

So, to derive what will be presented as results and that is intended for use in future research, the following method was followed upon disaggregating 237 OOH occupations into their SOC system counterparts and then into their DOT equivalents and upon citing the R, M, and L entry-level education requirement equivalents for each DOT occupation:

First, within each 2022 OOH occupation and their SOC System-coded counterparts, any duplicative DOT counterpart was deleted.

Next, the three (3) variables comprising the entry-level education requirement equivalent for each DOT occupation – R, M, and L – were condensed into one (1) variable: The highest of the three (3) “GED” “levels” (R, M, L) was taken as the entry-level education requirement equivalent for each DOT occupation. In other words, this dissertation uses the assumption about individual behavior animating “signaling theory” in economics: An individual will purchase the maximum amount of education required to be able to produce a “signal” to as wide an array of employers as possible and to lower the risk of being able to enter an occupation’s market.

For each non-duplicative DOT occupation, the highest “GED” “level” value amidst the R, L, and M values was recorded as that occupation’s entry-level education requirement. Some non-duplicative DOT occupations did not have “GED” “level” values for R, L, and M assigned to them primarily because some DOT occupation codings ultimately were excluded from the DOT.

The final (i.e., highest) education requirement (“GED” “level”) values for each DOT occupation within each 2022 OOH occupation were tallied and recorded amidst the possible education categories, i.e., primarily High School Diploma, Associate Degree, and Bachelor’s Degree. DOT occupations that did not have education requirements were excluded from the tally and overall count (i.e., they are not included in the denominator when tallies of the highest “levels” of multiple DOT occupations were divided by the total number of DOT occupations comprising a 2022 OOH occupation). The final 1977-1999 education requirement assigned to each 2022 OOH occupation was the highest value for the “GED” “level” for each non-duplicative DOT occupation comprising the 2022 OOH occupation recorded the most times.

If tallies of the highest value of the three “GED” “levels” for each non-duplicative DOT occupation comprising its 2022 OOH occupation counterpart produced a plurality, then the range of historic education requirements was recorded. Specifically, within each 2022 OOH occupation, if the tally of the highest value for the “GED” “level” for the DOT occupations comprising the 2022 OOH occupation produced two totals that were within 33% or 34% of each other (i.e., the first and second place historic education requirement assignment was a 67%/33% or 66%/34% split), then both historic education requirement equivalents were recorded.

Finally, for the results presented formally in Chapter 4, for those 2022 OOH occupations resultingly assigned a range of historic education requirements, the highest education requirement defining the range ultimately was used.

Again, this paper asserts the need to return to fundamental assumptions. The research proposed for this writing does not require a high level of analysis. It proposes straightforward categorization. Higher education policy and politics more generally currently claims and has been proclaiming characteristics about the economy that potentially seem little more than wishful thinking, myopia, and confirmation bias. They may also be true. The federal government has kept records and guided the perception of occupation designation and profile since World War II. However, it is only very recently that the need to systematize education requirements has become manifest. Perhaps or it is intended that a rough systemization of the educational requirements of occupation profiles in the past as compared to today will illuminate the extent to which the “economy” has changed over time or the existence of the “knowledge economy.” Which occupations have consistently over time required a higher education completion credential and which occupations only recently have required such credentialing? Have there been wellsprings of new occupations created over time that have been designated as requiring the consumption of higher education? Categorical analysis of occupation profiles over time and checks on projections may provide perspective on the reality of America’s economy and the education it requires.

# CHAPTER 4: RESULTS

Below are tabulated the results of the methodology described in Chapter 3.

The results are presented in three (3) sub-sections: Bureau of Labor Statistics 2022 *Occupational Outlook Handbook* (OOH) occupations listed as requiring a Bachelor's Degree for entry-level employment, occupations listed as requiring a Master's Degree for entry-level employment, and occupations listed as requiring an Associate Degree for entry-level employment where shown is an increase in education requirements over time; 2022 OOH occupations listed as requiring a Bachelor's, Master's, and Associate Degrees where shown is no change in education requirements over time; and 2022 OOH occupations where either there was no historic complement for the occupation or there was no data for education requirements for this historic complement to the 2022 OOH occupation. For the last in the above list, the results will show a "Not Applicable (N/A)" designation and assume that entry-level education requirements would have been the same between 1977 and 1999 as they are listed for 2022.

Regarding those 2022 OOH occupations showing an increase in entry-level education requirements over time, these results are further tabulated according to which lower education requirement applies. For example, for those 2022 OOH occupations requiring a Bachelor's Degree, the results are presented in a table showing which of these 2022 OOH occupations required an Associate Degree between 1977 and 1999, which required a High School Diploma between 1977 and 1999, and which required the equivalent of an Eighth Grade education between 1977 and 1999.

Regarding those 2022 OOH occupations where it is assumed that the current entry-level education requirements are the same as entry-level requirements for the years 1977-1999 because there were no historic complements or education requirement data was not available or discernible for historic complements, these occupations are assumed here to be the evidence of a “knowledge economy” according to the second and third definitions described in the Literature Review in Chapter 2.

Thus, the results are categorized into two (2) themes: Results that evidence heightened expectation for formal education requirements upon entering Bureau of Labor Statistics identifications of occupations and results that, secondarily, evidence a “knowledge economy.”

Even though there are two themes or categories to the results, they both operate to answer the one (1) research question articulated in Chapter 3. Asking whether formal education requirements for entrance into occupations have increased over time is a question that implies the existence of a “knowledge economy” and that there are “new” or newly-elevated occupations should be expected in asking whether entry-level education requirements have increased over time.

Finally, primarily due to its size, a fuller set of summary tables showing how the Chapter 3 methodology was used is presented as an appendix. (See Appendix B.)

## ENTRY-LEVEL EDUCATION REQUIREMENTS INCREASED: The Bachelor's Degree

Out of 179 current (2022) occupations listed by the Bureau of Labor Statistics (BLS) for its *Occupational Outlook Handbook* (OOH) that require a Bachelor's Degree for entry into the occupation, 134 are determined through this dissertation's methodology to have needed less formal education than a Bachelor's Degree between the years 1977 and 1999.

Stated differently, nearly three-quarters (3/4) or 75% (74.86%) of current occupations recommended by the Bureau of Labor Statistics (BLS) as needing a Bachelor's Degree for entry in 2022 was not determined to need one around 25 years ago[55].

Of these 134 occupations that are determined to have not needed a Bachelor's degree 25 years ago, 122 still would have required an Associate Degree, i.e., a credential earned through purchase of higher education. Only 11 of the 134 would have sought a High School Diploma only.

The one (1) occupation deemed to require an "Eighth-Grade" only education ("Statistical Assistant") needs context that is relevant to the discussion conducted in Chapter 5. It will be addressed there.

Generally, then, note that 122 out of 179 occupations saw an increase in degree requirements and in the subsequent purchase of higher education by two years, i.e., the standard difference between receiving an Associate Degree and a Bachelor's Degree.

[55] i.e., from 1999 to 2024: As a reminder, that the entry-level education requirement comparison includes date ranges between 1977 and 1999, it is assumed for this dissertation that all historic education requirements are current to 1999. The historic education requirements result from the *Dictionary of Occupational Titles* (DOT) that was continuously updated to 1991 and used until 1999 until it was fully substituted. So, an occupation with a degree requirement in 1978 still applied in 1999 simply because the degree requirement was not updated between 1978 and 1991 and the DOT was still a primary document in use until 1999.

Table 1. Occupations Where Education Requirement Increased from Associate Degree to Bachelor's Degree

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 1 | Accountants and Auditors | Bachelor's | *Associate* |
| 2 | Actuaries | Bachelor's | *Associate* |
| 3 | Administrative Services Manager | Bachelor's | *Associate* |
| 4 | Agents and Business Managers of Artists, Performers, and Athletes | Bachelor's | *Associate* |
| 5 | Agricultural Engineers | Bachelor's | *Associate* |
| 6 | Airline Pilots, Copilots, and Flight Engineers | Bachelor's | *Associate* |
| 7 | Arbitrators, Mediators, and Conciliators | Bachelor's | *Associate* |
| 8 | Art Directors | Bachelor's | *Associate* |
| 9 | Atmospheric and Space Scientists | Bachelor's | *Associate* |
| 10 | Broadcast Announcers and Radio Disc Jockeys | Bachelor's | *Associate* |
| 11 | Budget Analysts | Bachelor's | *Associate* |
| 12 | Business Operations Specialists, All Other | Bachelor's | *Associate* |
| 13 | Buyers and Purchasing Agents | Bachelor's | *Associate* |
| 14 | Camera Operators, Television, Video, and Film | Bachelor's | *Associate* |
| 15 | Career/Technical Education Teachers, Middle School | Bachelor's | *Associate* |
| 16 | Career/Technical Education Teachers, Postsecondary | Bachelor's | *Associate* |
| 17 | Career/Technical Education Teachers, Secondary School | Bachelor's | *Associate* |
| 18 | Chief Executives | Bachelor's | *Associate* |
| 19 | Child, Family, and School Social Workers | Bachelor's | *Associate* |
| 20 | Civil Engineers | Bachelor's | *Associate* |
| 21 | Clinical Laboratory Technologists and Technicians | Bachelor's | *Associate* |
| 22 | Coaches and Scouts | Bachelor's | *Associate* |
| 23 | Commercial and Industrial Designers | Bachelor's | *Associate* |
| 24 | Compensation and Benefits Managers | Bachelor's | *Associate* |
| 25 | Compensation, Benefits, and Job Analysis Specialists | Bachelor's | *Associate* |
| 26 | Compliance Officers | Bachelor's | *Associate* |
| 27 | Computer and Information Systems Managers | Bachelor's | *Associate* |
| 28 | Computer Hardware Engineers | Bachelor's | *Associate* |
| 29 | Computer Network Architects | Bachelor's | *Associate* |
| 30 | Computer Occupations, All Other | Bachelor's | *Associate* |
| 31 | Computer Systems Analysts | Bachelor's | *Associate* |
| 32 | Construction Managers | Bachelor's | *Associate* |
| 33 | Credit Analysts | Bachelor's | *Associate* |

Table 1. Occupations Where Education Requirement
Increased from Associate Degree to Bachelor's Degree (Continued)

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 34 | Data Scientists | Bachelor's | *Associate* |
| 35 | Database Administrators | Bachelor's | *Associate* |
| 36 | Database Architects | Bachelor's | *Associate* |
| 37 | Dietitians and Nutritionists | Bachelor's | *Associate* |
| 38 | Directors, Religious Activities and Education | Bachelor's | *Associate* |
| 39 | Education Administrators, All Other | Bachelor's | *Associate* |
| 40 | Education and Childcare Administrators, Preschool and Daycare | Bachelor's | *Associate* |
| 41 | Educational Instruction and Library Workers, All Other | Bachelor's | *Associate* |
| 42 | Electrical Engineers | Bachelor's | *Associate* |
| 43 | Electronics Engineers, except Computer | Bachelor's | *Associate* |
| 44 | Elementary School Teachers, except Special Education | Bachelor's | *Associate* |
| 45 | Emergency Management Directors | Bachelor's | *Associate* |
| 46 | Entertainment and Recreation Managers, except Gambling | Bachelor's | *Associate* |
| 47 | Facilities Manager | Bachelor's | *Associate* |
| 48 | Fashion Designers | Bachelor's | *Associate* |
| 49 | Film and Video Editors | Bachelor's | *Associate* |
| 50 | Financial and Investment Analysts | Bachelor's | *Associate* |
| 51 | Financial Examiners | Bachelor's | *Associate* |
| 52 | Financial Managers | Bachelor's | *Associate* |
| 53 | Financial Risk Specialists | Bachelor's | *Associate* |
| 54 | Fine Artists, including Painters, Sculptors, and Illustrators | Bachelor's | *Associate* |
| 55 | Forensic Science Technicians | Bachelor's | *Associate* |
| 56 | Fundraising Managers | Bachelor's | *Associate* |
| 57 | General and Operations Managers | Bachelor's | *Associate* |
| 58 | Graphic Designers | Bachelor's | *Associate* |
| 59 | Health Education Specialists | Bachelor's | *Associate* |
| 60 | Human Resources Managers | Bachelor's | *Associate* |
| 61 | Human Resources Specialists | Bachelor's | *Associate* |
| 62 | Industrial Engineers | Bachelor's | *Associate* |
| 63 | Industrial Production Managers | Bachelor's | *Associate* |
| 64 | Information Security Analysts | Bachelor's | *Associate* |
| 65 | Insurance Underwriters | Bachelor's | *Associate* |
| 66 | Interior Designers | Bachelor's | *Associate* |
| 67 | Kindergarten Teachers, except Special Education | Bachelor's | *Associate* |
| 68 | Labor Relations Specialists | Bachelor's | *Associate* |

Table 1. Occupations Where Education Requirement
Increased from Associate Degree to Bachelor's Degree (Continued)

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 69 | Landscape Architects | Bachelor's | *Associate* |
| 70 | Loan Officers | Bachelor's | *Associate* |
| 71 | Logisticians | Bachelor's | *Associate* |
| 72 | Management Analysts | Bachelor's | *Associate* |
| 73 | Managers, All Other | Bachelor's | *Associate* |
| 74 | Marine Engineers and Naval Architects | Bachelor's | *Associate* |
| 75 | Market Research Analysts and Marketing Specialists | Bachelor's | *Associate* |
| 76 | Marketing Managers | Bachelor's | *Associate* |
| 77 | Materials Engineers | Bachelor's | *Associate* |
| 78 | Mathematical Science Occupations, All Other | Bachelor's | *Associate* |
| 79 | Mechanical Engineers | Bachelor's | *Associate* |
| 80 | Medical and Health Services Managers | Bachelor's | *Associate* |
| 81 | Meeting, Convention, and Event Planners | Bachelor's | *Associate* |
| 82 | Middle School Teachers, except Special and Career/Technical Education | Bachelor's | *Associate* |
| 83 | Mining and Geological Engineers, including Mining Safety Engineers | Bachelor's | *Associate* |
| 84 | Museum Technicians and Conservators | Bachelor's | *Associate* |
| 85 | News Analysts, Reporters, and Journalists | Bachelor's | *Associate* |
| 86 | Occupational Health and Safety Specialists | Bachelor's | *Associate* |
| 87 | Personal Financial Advisors | Bachelor's | *Associate* |
| 88 | Petroleum Engineers | Bachelor's | *Associate* |
| 89 | Probation Officers and Correctional Treatment Specialists | Bachelor's | *Associate* |
| 90 | Producers and Directors | Bachelor's | *Associate* |
| 91 | Project Management Specialists | Bachelor's | *Associate* |
| 92 | Property Appraisers and Assessors | Bachelor's | *Associate* |
| 93 | Public Relations Managers | Bachelor's | *Associate* |
| 94 | Public Relations Specialists | Bachelor's | *Associate* |
| 95 | Purchasing Managers | Bachelor's | *Associate* |
| 96 | Recreational Therapists | Bachelor's | *Associate* |
| 97 | Registered Nurses | Bachelor's | *Associate* |
| 98 | Religious Workers, All Other | Bachelor's | *Associate* |
| 99 | Sales Engineers | Bachelor's | *Associate* |
| 100 | Sales Managers | Bachelor's | *Associate* |
| 101 | Secondary School Teachers, except Special and Career/Technical Education | Bachelor's | *Associate* |
| 102 | Securities, Commodities, and Financial Services Sales Agents | Bachelor's | *Associate* |

Table 1. Occupations Where Education Requirement
Increased from Associate Degree to Bachelor's Degree (Continued)

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 103 | Set and Exhibit Designers | Bachelor's | *Associate* |
| 104 | Social and Community Service Managers | Bachelor's | *Associate* |
| 105 | Social Workers, All Other | Bachelor's | *Associate* |
| 106 | Software Developers | Bachelor's | *Associate* |
| 107 | Software Quality Assurance Analysts and Testers | Bachelor's | *Associate* |
| 108 | Special Education Teachers, All Other | Bachelor's | *Associate* |
| 109 | Special Education Teachers, Kindergarten and Elementary School | Bachelor's | *Associate* |
| 110 | Special Education Teachers, Middle School | Bachelor's | *Associate* |
| 111 | Special Education Teachers, Preschool | Bachelor's | *Associate* |
| 112 | Special Education Teachers, Secondary School | Bachelor's | *Associate* |
| 113 | Special Effects Artists and Animators | Bachelor's | *Associate* |
| 114 | Substance Abuse, Behavioral Disorder, and Mental Health Counselors | Bachelor's | *Associate* |
| 115 | Substitute Teachers, Short-Term | Bachelor's | *Associate* |
| 116 | Surveyors | Bachelor's | *Associate* |
| 117 | Tax Examiners and Collectors, and Revenue Agents | Bachelor's | *Associate* |
| 118 | Teachers and Instructors, All Other | Bachelor's | *Associate* |
| 119 | Training and Development Managers | Bachelor's | *Associate* |
| 120 | Training and Development Specialists | Bachelor's | *Associate* |
| 121 | Web and Digital Interface Designers | Bachelor's | *Associate* |
| 122 | Web Developers | Bachelor's | *Associate* |

Table 2. Occupations Where Education Requirement Increased from High School Diploma to Bachelor's Degree

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 1 | Adult Basic Education, Adult Secondary Education, and English as a Second Language Instructors | Bachelor's | *High School Diploma* |
| 2 | Advertising and Promotions Managers | Bachelor's | *High School Diploma* |
| 3 | Agricultural Inspectors | Bachelor's | *High School Diploma* |
| 4 | Biological Technicians | Bachelor's | *High School Diploma* |
| 5 | Cartographers and Photogrammetrists | Bachelor's | *High School Diploma* |
| 6 | Cost Estimators | Bachelor's | *High School Diploma* |
| 7 | Fish and Game Wardens | Bachelor's | *High School Diploma* |
| 8 | Medical Dosimetrists | Bachelor's | *High School Diploma* |
| 9 | Proofreaders and Copy Markers | Bachelor's | *High School Diploma* |
| 10 | Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products | Bachelor's | *High School Diploma* |
| 11 | Therapists, All Other | Bachelor's | *High School Diploma* |

Table 3. Occupation Where Education Requirement Increased from Eighth Grade to Bachelor's Degree

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 1 | Statistical Assistants | Bachelor's | *Eighth Grade* |

## ENTRY-LEVEL EDUCATION REQUIREMENTS INCREASED: The Master's Degree

Out of 39 current (2022) occupations listed by the Bureau of Labor Statistics (BLS) for its *Occupational Outlook Handbook* (OOH) that require a Master's Degree for entry into the occupation, 36 are determined through this dissertation's methodology to have needed less formal education than a Master's Degree between the years 1977 and 1999.

Stated differently, 92% (92.31%) of current occupations recommended by the Bureau of Labor Statistics (BLS) as needing a Master's Degree for entry in 2022 was not determined to need one around 25 years ago[56]. This statistic needs context that will be discussed in greater detail in Chapter 5: Technically, none (0) of the OOH occupations requiring a Master's Degree in 2022 would have needed one roughly 25 years ago. The other three (3) unaccounted for in the description of the results either did not have historical occupational counterparts or their counterparts had no quantified degree (or education standard) requirements listed.

Of these 36 occupations that are determined to have not needed a Master's degree 25 years ago, only 11 would have required a Bachelor's Degree and, of interest, 25 would have required an Associate Degree.

All 36 occupations required a credential earned through purchase of higher education.

[56] i.e., from 1999 to 2024: As a reminder, that the entry-level education requirement comparison includes date ranges between 1977 and 1999, it is assumed for this dissertation that all historic education requirements are current to 1999. The historic education requirements result from the *Dictionary of Occupational Titles* (DOT) that was continuously updated to 1991 and used until 1999 until it was fully substituted. So, an occupation with a degree requirement in 1978 still applied in 1999 simply because the degree requirement was not updated between 1978 and 1991 and the DOT was still a primary document in use until 1999.

Generally, then, note that all 36 (or, de facto, 39) occupations saw an increase in degree requirements and in the subsequent purchase of higher education by two years or four years, i.e., the standard difference between receiving an Bachelor's Degree and a Master's Degree or an Associate Degree and a Master's Degree, respectively. That 25 of the 36 effectively required an Associate Degree in the past and now require a Master's Degree in 2022 will be a topic of discussion in Chapter 5.

Table 4. Occupations Where Education Requirement Increased from Bachelor's Degree to Master's Degree

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 1 | Acupuncturists | Master's | *Bachelor's* |
| 2 | Anthropologists and Archaeologists | Master's | *Bachelor's* |
| 3 | Epidemiologists | Master's | *Bachelor's* |
| 4 | Industrial-Organizational Psychologists | Master's | *Bachelor's* |
| 5 | Instructional Coordinators | Master's | *Bachelor's* |
| 6 | Mathematicians | Master's | *Bachelor's* |
| 7 | Political Scientists | Master's | *Bachelor's* |
| 8 | Psychologists, All Other | Master's | *Bachelor's* |
| 9 | School Psychologists | Master's | *Bachelor's* |
| 10 | Sociologists | Master's | *Bachelor's* |
| 11 | Statisticians | Master's | *Bachelor's* |

Table 5. Occupations Where Education Requirement Increased from Associate Degree to Master's Degree

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 1 | Archivists | Master's | *Associate* |
| 2 | Art, Drama, and Music Teachers, Postsecondary | Master's | *Associate* |
| 3 | Athletic Trainers | Master's | *Associate* |
| 4 | Computer and Information Research Scientists | Master's | *Associate* |
| 5 | Curators | Master's | *Associate* |
| 6 | Economists | Master's | *Associate* |
| 7 | Education Administrators, Kindergarten through Secondary | Master's | *Associate* |
| 8 | Education Administrators, Postsecondary | Master's | *Associate* |
| 9 | Educational, Guidance, and Career Counselors and Advisors | Master's | *Associate* |
| 10 | Farm and Home Management Educators | Master's | *Associate* |
| 11 | Healthcare Diagnosing or Treating Practitioners, All Other | Master's | *Associate* |
| 12 | Healthcare Social Workers | Master's | *Associate* |
| 13 | Historians | Master's | *Associate* |
| 14 | Librarians and Media Collections Specialists | Master's | *Associate* |
| 15 | Marriage and Family Therapists | Master's | *Associate* |
| 16 | Mental Health and Substance Abuse Social Workers | Master's | *Associate* |
| 17 | Nurse Anesthetists | Master's | *Associate* |
| 18 | Nurse Midwives | Master's | *Associate* |
| 19 | Nurse Practitioners | Master's | *Associate* |
| 20 | Occupational Therapists | Master's | *Associate* |
| 21 | Orthotists and Prosthetists | Master's | *Associate* |
| 22 | Physician Assistants | Master's | *Associate* |
| 23 | Rehabilitation Counselors | Master's | *Associate* |
| 24 | Speech-Language Pathologists | Master's | *Associate* |
| 25 | Urban and Regional Planners | Master's | *Associate* |

## ENTRY-LEVEL EDUCATION REQUIREMENTS INCREASED: The Associate Degree

Out of 49 current (2022) occupations listed by the Bureau of Labor Statistics (BLS) for its *Occupational Outlook Handbook* (OOH) that require an Associate Degree for entry into the occupation, 25 are determined through this dissertation's methodology to have needed less formal education than an Associate Degree between the years 1977 and 1999.

Stated differently, a little more than one-half (1/2) or 51% (51.02%) of current occupations recommended by the Bureau of Labor Statistics (BLS) as needing an Associate Degree for entry in 2022 was not determined to need one around 25 years ago[57].

Of these 25 occupations that are determined to have not needed an Associate Degree 25 years ago, all would have sought a High School Diploma. In other words, the purchase of higher education was not necessary. This implies a role for continuing education through training and apprenticeship that is interesting to consider and, thus, will be addressed in Chapter 5.

Generally, then, note that 25 out of 49 occupations saw an increase in degree requirements and in the subsequent purchase of higher education by two years, i.e., the standard difference between receiving a High School Diploma and an Associate Degree.

[57] i.e., from 1999 to 2024: As a reminder, that the entry-level education requirement comparison includes date ranges between 1977 and 1999, it is assumed for this dissertation that all historic education requirements are current to 1999. The historic education requirements result from the *Dictionary of Occupational Titles* (DOT) that was continuously updated to 1991 and used until 1999 until it was fully substituted. So, an occupation with a degree requirement in 1978 still applied in 1999 simply because the degree requirement was not updated between 1978 and 1991 and the DOT was still a primary document in use until 1999.

Table 6. Occupations Where Education Requirement Increased from High School Diploma to Associate Degree

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 1 | Aerospace Engineering and Operations Technologists and Technicians | Associate Degree | *High School Diploma* |
| 2 | Agricultural Technicians | Associate Degree | *High School Diploma* |
| 3 | Avionics Technicians | Associate Degree | *High School Diploma* |
| 4 | Broadcast Technicians | Associate Degree | *High School Diploma* |
| 5 | Cardiovascular Technologists and Technicians | Associate Degree | *High School Diploma* |
| 6 | Computer Network Support Specialists | Associate Degree | *High School Diploma* |
| 7 | Dental Hygienists | Associate Degree | *High School Diploma* |
| 8 | Desktop Publishers | Associate Degree | *High School Diploma* |
| 9 | Diagnostic Medical Sonographers | Associate Degree | *High School Diploma* |
| 10 | Electro-Mechanical and Mechatronic Technologists and Technicians | Associate Degree | *High School Diploma* |
| 11 | Embalmers | Associate Degree | *High School Diploma* |
| 12 | Food Science Technicians | Associate Degree | *High School Diploma* |
| 13 | Funeral Home Managers | Associate Degree | *High School Diploma* |
| 14 | Geological Technicians, except Hydrologic Technicians | Associate Degree | *High School Diploma* |
| 15 | Human Resources Assistants, except Payroll and Timekeeping | Associate Degree | *High School Diploma* |
| 16 | Legal Support Workers, All Other | Associate Degree | *High School Diploma* |
| 17 | Medical Equipment Repairers | Associate Degree | *High School Diploma* |
| 18 | Morticians, Undertakers, and Funeral Arrangers | Associate Degree | *High School Diploma* |
| 19 | Nuclear Technicians | Associate Degree | *High School Diploma* |
| 20 | Occupational Therapy Assistants | Associate Degree | *High School Diploma* |
| 21 | Physical Therapists Assistants | Associate Degree | *High School Diploma* |
| 22 | Preschool Teachers, except Special Education | Associate Degree | *High School Diploma* |
| 23 | Radio, Cellular, and Tower Equipment Installers and Repairers | Associate Degree | *High School Diploma* |
| 24 | Respiratory Therapists | Associate Degree | *High School Diploma* |
| 25 | Veterinary Technologists and Technicians | Associate Degree | *High School Diploma* |

## ENTRY-LEVEL EDUCATION REQUIREMENTS DID NOT CHANGE: The Bachelor's Degree

Out of 179 current (2022) occupations listed by the Bureau of Labor Statistics (BLS) for its *Occupational Outlook Handbook* (OOH) that require a Bachelor's Degree for entry into the occupation, 37 are determined through this dissertation's methodology to also have needed the Bachelor's Degree between the years 1977 and 1999.

Stated differently, a little more than one-fifth (1/5) or 21% (20.67%) of current occupations recommended by the Bureau of Labor Statistics (BLS) as needing a Bachelor's Degree for entry in 2022 was determined also to need one around 25 years ago[58].

[58] i.e., from 1999 to 2024: As a reminder, that the entry-level education requirement comparison includes date ranges between 1977 and 1999, it is assumed for this dissertation that all historic education requirements are current to 1999. The historic education requirements result from the *Dictionary of Occupational Titles* (DOT) that was continuously updated to 1991 and used until 1999 until it was fully substituted. So, an occupation with a degree requirement in 1978 still applied in 1999 simply because the degree requirement was not updated between 1978 and 1991 and the DOT was still a primary document in use until 1999.

Table 7. Occupations Where Education Requirement
Did Not Change from Bachelor's Degree

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 1 | Aerospace Engineers | Bachelor's | *Bachelor's* |
| 2 | Animal Scientists | Bachelor's | *Bachelor's* |
| 3 | Architects, except Landscape and Naval | Bachelor's | *Bachelor's* |
| 4 | Architectural and Engineering Managers | Bachelor's | *Bachelor's* |
| 5 | Bioengineers and Biomedical Engineers | Bachelor's | *Bachelor's* |
| 6 | Biological Scientists, All Other | Bachelor's | *Bachelor's* |
| 7 | Chemical Engineers | Bachelor's | *Bachelor's* |
| 8 | Chemists | Bachelor's | *Bachelor's* |
| 9 | Clergy | Bachelor's | *Bachelor's* |
| 10 | Computer Programmers | Bachelor's | *Bachelor's* |
| 11 | Conservation Scientists | Bachelor's | *Bachelor's* |
| 12 | Editors | Bachelor's | *Bachelor's* |
| 13 | Engineers, All Other | Bachelor's | *Bachelor's* |
| 14 | Environmental Engineers | Bachelor's | *Bachelor's* |
| 15 | Environmental Scientists and Specialists, including Health | Bachelor's | *Bachelor's* |
| 16 | Financial Specialists, All Other | Bachelor's | *Bachelor's* |
| 17 | Food Scientists and Technologists | Bachelor's | *Bachelor's* |
| 18 | Foresters | Bachelor's | *Bachelor's* |
| 19 | Geographers | Bachelor's | *Bachelor's* |
| 20 | Geoscientists, except Hydrologists and Geographers | Bachelor's | *Bachelor's* |
| 21 | Health and Safety Engineers, except Mining Safety Engineers and Inspectors | Bachelor's | *Bachelor's* |
| 22 | Hydrologists | Bachelor's | *Bachelor's* |
| 23 | Interpreters and Translators | Bachelor's | *Bachelor's* |
| 24 | Life Scientists, All Other | Bachelor's | *Bachelor's* |
| 25 | Materials Scientists | Bachelor's | *Bachelor's* |
| 26 | Microbiologists | Bachelor's | *Bachelor's* |
| 27 | Music Directors and Composers | Bachelor's | *Bachelor's* |
| 28 | Natural Sciences Manager | Bachelor's | *Bachelor's* |
| 29 | Nuclear Engineers | Bachelor's | *Bachelor's* |

Table 7. Occupations Where Education Requirement
Did Not Change from Bachelor's Degree (Continued)

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 30 | Operations Research Analysts | Bachelor's | *Bachelor's* |
| 31 | Physical Scientists, All Other | Bachelor's | *Bachelor's* |
| 32 | Social Scientists and Related Workers, All Other | Bachelor's | *Bachelor's* |
| 33 | Soil and Plant Scientists | Bachelor's | *Bachelor's* |
| 34 | Teaching Assistants, Postsecondary | Bachelor's | *Bachelor's* |
| 35 | Technical Writers | Bachelor's | *Bachelor's* |
| 36 | Writers and Authors | Bachelor's | *Bachelor's* |
| 37 | Zoologists and Wildlife Biologists | Bachelor's | *Bachelor's* |

## ENTRY-LEVEL EDUCATION REQUIREMENTS DID NOT CHANGE: The Master's Degree

According to this dissertation's methodology, all 2022 OOH occupations assumed to require a Master's Degree for entry did not require or suggest one 25 years ago.

This result primarily is a function of the data sources used for this research: The *Dictionary of Occupational Titles* and its usage of a "GED Scale" (appended to this document as Appendix C and Appendix D) did not account for educational attainment above what would be considered a Bachelor's Degree. This fact has implications that will be discussed in Chapter 5.

## ENTRY-LEVEL EDUCATION REQUIREMENTS DID NOT CHANGE: The Associate Degree

Out of 49 current (2022) occupations listed by the Bureau of Labor Statistics (BLS) for its *Occupational Outlook Handbook* (OOH) that require an Associate Degree for entry into the occupation, 24 are determined through this dissertation's methodology to also have needed the Associate Degree between the years 1977 and 1999.

Stated differently, a little less than one-half (1/2) or 49% (48.98%) of current occupations recommended by the Bureau of Labor Statistics (BLS) as needing an Associate Degree for entry in 2022 was determined also to need one around 25 years ago[59].

The one anomaly to note is the occupation labeled "Paralegals and Legal Assistants." Adhering to the dissertation methodology strictly, this one profession would have required or suggested more formal education 25 years ago than it does today. Consequently, I interpreted the result downward in defiance of the methodology. The logic behind this will be explained in Chapter 5.

[59] i.e., from 1999 to 2024: As a reminder, that the entry-level education requirement comparison includes date ranges between 1977 and 1999, it is assumed for this dissertation that all historic education requirements are current to 1999. The historic education requirements result from the *Dictionary of Occupational Titles* (DOT) that was continuously updated to 1991 and used until 1999 until it was fully substituted. So, an occupation with a degree requirement in 1978 still applied in 1999 simply because the degree requirement was not updated between 1978 and 1991 and the DOT was still a primary document in use until 1999.

Table 8. Occupations Where Education Requirement
Did Not Change from Associate Degree

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 1 | Air Traffic Controllers | Associate Degree | *Associate Degree* |
| 2 | Architectural and Civil Drafters | Associate Degree | *Associate Degree* |
| 3 | Calibration Technologists and Technicians | Associate Degree | *Associate Degree* |
| 4 | Chemical Technicians | Associate Degree | *Associate Degree* |
| 5 | Civil Engineering Technologists and Technicians | Associate Degree | *Associate Degree* |
| 6 | Dietetic Technicians | Associate Degree | *Associate Degree* |
| 7 | Drafters, All Other | Associate Degree | *Associate Degree* |
| 8 | Electrical and Electronic Engineering Technologists and Technicians | Associate Degree | *Associate Degree* |
| 9 | Electrical and Electronic Drafters | Associate Degree | *Associate Degree* |
| 10 | Engineering Technologists and Technicians, except Drafters, All Other | Associate Degree | *Associate Degree* |
| 11 | Environmental Engineering Technologists and Technicians | Associate Degree | *Associate Degree* |
| 12 | Environmental Science and Protection Technicians, including Health | Associate Degree | *Associate Degree* |
| 13 | Forest and Conservation Technicians | Associate Degree | *Associate Degree* |
| 14 | Health Information Technologists and Medical Registrars | Associate Degree | *Associate Degree* |
| 15 | Hydrologic Technicians | Associate Degree | *Associate Degree* |
| 16 | Industrial Engineering Technologists and Technicians | Associate Degree | *Associate Degree* |
| 17 | Life, Physical, and Social Science Technicians, All Other | Associate Degree | *Associate Degree* |
| 18 | Magnetic Resonance Imaging Technologists | Associate Degree | *Associate Degree* |
| 19 | Mechanical Drafters | Associate Degree | *Associate Degree* |
| 20 | Mechanical Engineering Technologists and Technicians | Associate Degree | *Associate Degree* |
| 21 | Nuclear Medicine Technologists | Associate Degree | *Associate Degree* |
| 22 | Paralegals and Legal Assistants | Associate Degree | *Associate Degree* |
| 23 | Radiation Therapists | Associate Degree | *Associate Degree* |
| 24 | Radiologic Technologists and Technicians | Associate Degree | *Associate Degree* |

## EVIDENCE OF THE “KNOWLEDGE ECONOMY”

The following occupations from the Bureau of Labor Statistics *Occupational Outlook Handbook* that for 2022 required either a Bachelor’s Degree or a Master’s Degree for entry into the occupation did not have a historic complement. To be specific, the following occupations had a Standard Occupational Classification (SOC) code, but this code (at this time) did not have a *Dictionary of Occupational Titles* (DOT) conversion.

That to currently, the United States government that has maintained an occupational classification for 85 years (since 1939) has yet to formally apply a conversion from the DOT to the SOC may (perhaps weakly) point to evidence of the “knowledge economy” (toward which the consumption of formal higher education for the purpose of individual financial betterment is justified).

It is assumed in reporting these results that the following occupations either, one, did not exist within the 1977-1999 framework defining the usage of the DOT or, two, did not exist in the same way (i.e., with the same understanding of its quotidian tasks and skill requirements) as its nominal past complement did. The former interpretation adheres to the “second definition” of the “knowledge economy” described above from Hogan (2011) and Powell and Snellman (2004) that assumes that there are, broadly, two (2) sectors to the “economy,” one of which is a “knowledge intensive” or “new” sector comprised of skilled and highly educated workforces or that Atkinson and Andes (2010) would describe as being considered “knowledge-based, globalized, entrepreneurial, IT-driven, and innovation-based.” The latter interpretation adheres to the “third definition” of the “knowledge economy” described from Hogan (2011) and Powell and Snellman (2004) that assumes that the production, distribution, and usage of “knowledge” drives the economy as a whole and permeates any position within any industry comprising said economy as a whole. Within established occupations, “knowledge-intensive” changes have been

incorporated that, in this case, would make it difficult for the Bureau of Labor Statistics to identify a past complement with a current (2022) occupation even if nominally they are the same or similar. “Upskilling” may have occurred.

Table 9. Occupations Requiring a Bachelor's Degree in 2022 for Which There Were No Historic Complements

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 1 | Community and Social Service Specialists, All Other | Bachelor's | *N/A (Bachelor's)* |
| 2 | Credit Counselors | Bachelor's | *N/A (Bachelor's)* |
| 3 | Designers, All Other | Bachelor's | *N/A (Bachelor's)* |
| 4 | Exercise Physiologists | Bachelor's | *N/A (Bachelor's)* |
| 5 | Fundraisers | Bachelor's | *N/A (Bachelor's)* |
| 6 | Legislators | Bachelor's | *N/A (Bachelor's)* |
| 7 | Network and Computer Systems Administrators | Bachelor's | *N/A (Bachelor's)* |
| 8 | Social Science Research Assistants | Bachelor's | *N/A (Bachelor's)* |

Table 10. Occupations Requiring a Master's Degrees in 2022 for Which There Were No Historic Complements

| Count | OOH Occupation | Entry-Level Education, 2022 | Entry-Level Education, 1977-1999 |
|---|---|---|---|
| 1 | Counselors, All Other | Master's | *N/A (Master's)* |
| 2 | Genetic Counselors | Master's | *N/A (Master's)* |
| 3 | Survey Researchers | Master's | *N/A (Master's)* |

# CHAPTER 5: DISCUSSION AND ANALYSIS

Chapter 4 and its display of results from the methodology described in Chapter 3 lead to identifying seven (7) areas of discussion, interpretation, and implication: Where education requirements increased between 1999 and 2024 [60] from 1) less formal education to a Bachelor's Degree, 2) less formal education to a Master's Degree, and 3) less formal education to an Associate Degree; where education requirements did not increase between 1999 and 2024 for occupations currently requiring a 4) Bachelor's Degree, 5) Master's Degree, and 6) an Associate Degree; 7) where there was no historic complement to a current occupation thus potentially evidencing specific additions to the "knowledge economy."

This Chapter 5 is going to discuss each of the above in order. Afterward, this chapter will discuss "big picture" issues regarding "credentialism" and "credential inflation" and relate it to the dissertation's methodology. The chapter will then use the implications of the research agenda toward the "returns-to-education" assumption. Finally, the chapter will discuss general limitations to the data and research.

[60] The Occupational Outlook Handbook data is 2022 data but is considered current as of February 2024.

## ENTRY-LEVEL EDUCATION REQUIREMENTS INCREASED: The Bachelor's Degree

The first interesting implication from identifying the historic complements and their education requirements or expectations and comparing them to occupations currently considered by the Bureau of Labor Statistics (BLS) and its *Occupational Outlook Handbook* (OOH) as requiring a Bachelor's Degree is the proportion of historic occupation complements that did not require a Bachelor's Degree. To put this in perspective, the Bureau of Labor Statistics (BLS) identifies 832 occupations comprising the American economy. Of these 832 occupations, only 179 are considered to require a Bachelor's Degree for entrance into their respective labor markets. So, only 22% (21.51%) of the occupational choices that would be presented to young adults as targets for entry into the labor market writ large requires a Bachelor's Degree in 2022 (and current to February 2024) for said entry. According to this dissertation's methodology, as recently as 25 years ago, a young adult would only be offered one-quarter (25.14%) of today's 22% set of occupations as necessitating a Bachelor's Degree.

If the above interpretation sounds reasonable, then an interesting set of research questions deriving from this dissertation's results would center around asking and analyzing the role of training, apprenticeship, and internship practices between 1977 and 1999 (i.e., during the time period of widespread usage of the *Dictionary of Occupational Titles*). In the past roughly 25 to 50 years, has there been a dramatic substitution in the burden of training from the businesses and firms comprising each occupation to the shoulders of baccalaureate-granting higher education institutions? If so, why has this occurred?: Is this trend from training to the purchase of higher education driven by policy? Is it driven by culture? Is it driven by the consequence and direction of external funding to baccalaureate-granting higher education institutions? Is it driven by consequences of foreign policy, e.g., that America and most "developed" countries have made it a point to

compete with each other and to score that competition using easily-identifiable and countable outcome metrics?

But, at least regarding those occupations discerned to need an Associate Degree in the past, there may be an alternative interpretation when one considers more closely this dissertation's methodology: That a "Project Management Specialist" or "Loan Officer" or "Recreational Therapist" once only required an Associate Degree and now requires a Bachelor's Degree needs to bear in mind that an "Associate Degree" may be defined somewhat differently in the past than what would be considered an Associate Degree today. After all, to conduct this methodology required adhering to a scale that "relat[ed] General Education Development to career planning" (NOICC, 1982, p. D/i). What is considered an "Associate Degree" for the historic occupation complement of a current Bureau of Labor Statistics (BLS) *Occupational Outlook Handbook* (OOH) occupation is discretely defined as a "GED Level" that articulates and provides examples of criteria. So, saying one had an Associate Degree level of education (i.e., one to two years of college) meant that one was considered able to do fundamental statistics calculations, perform calculus, read literature and plays, display inductive and deductive reasoning and identify argument fallacies, be persuasive in speaking and in rhetoric, develop a free and independent skill in writing, etc. Would the typical Associate Degree today be able comfortably to do what was considered "Associate Degree" development 25 to 50 years ago? Those are fairly high standards for capability in the workplace. By implication, the assumption guiding signaling theory in economics may be supported: There is endogeneity and selection bias in who chose to consume college 25 to 50 years ago. The individual choosing to consume any amount of college 25 to 50 years ago was different than the average individual. College was consumed because the "costs" associated with college were lower for this atypical individual. And it can be assumed that an atypical

person for whom college is “easy” and of “lower cost” is going to complete a four-year degree in order to “signal” to the widest marketplace.

Regarding those occupations needing only an Associate Degree in the past, perhaps the individual pursuing those occupations would have completed a four-year degree. As access to higher education improved and was widened and as massification was implemented, the individual consuming higher education looked more like the average (regressed to the mean). Perhaps current occupations only are codifying the behavior of those more atypical individuals consuming higher education in the past. In other words, maybe the occupations listed as necessitating only an Associate Degree in the past always expected those pursuing those occupations to have a Bachelor’s Degree given the nature of the type of person choosing to consume higher education 25 to 50 years ago.

To the current occupations requiring a Bachelor’s Degree that once necessitated the equivalent of a high school diploma, these occupations appear generally to be ones where the individual would be acting as an assistant or an apprentice with the subsequent expectation that she or he would move up either through experience or formal education or where the occupation would be assumed to provide training to the individual pursuing the field within which the occupation resides.

Finally, to the one (1) current occupation requiring a Bachelor's Degree that once necessitated the equivalent of an "eighth grade" education, for context it is relevant to note which set of historic occupation complements from the *Dictionary of Occupational Titles* comprised the "Statistical Assistant" occupation: A "Statistical Assistant" today is complemented by a "Compiler," a "Chart Calculator," a "Statistical Clerk" and a "Statistical Clerk in Advertising," a "Planimeter Operator," a "Chart Clerk," and a "Chart Changer" in the past. Individually, the occupations comprising "Statistical Assistant" indeed do not require much "development" beyond seven (7) or eight (8) years of schooling. But, a "Statistical Assistant" is going to be expected to perform all of the aforementioned past complements. And any field in need of a "Statistical Assistant" likely is not going to hire one with significantly less formal education than the individuals that she or he is assisting.

## ENTRY-LEVEL EDUCATION REQUIREMENTS INCREASED: The Master's Degree

As a general observation, of particular interest is the sheer dearth of occupations in 2022 advertised by the Bureau of Labor Statistics as requiring a Master's Degree for entrance into respective labor markets. We have all heard someone we know say that "the Master's Degree is becoming the new Bachelor's Degree." This exact statement is cited in multiple publications regarding credentialism. These publications all cite Pappano (2011) that is an article in the *New York Times* entitled "The Master's as the New Bachelor's." But, as mentioned above, the Bureau of Labor Statistics records 832 occupations. Only 39 total occupations today require a Master's Degree. Stated differently, only 5% (4.69%) of all federally-recognized occupations are advertised to require a Master's Degree. If the Master's Degree is becoming the new Bachelor's Degree, then the individuals comprising the overall labor market or "economy" writ large must be disproportionately concentrated within these 39 occupations. This is something that can be examined in future research. But, looking at the blunt statistic that less than 5% of the occupations comprising the "economy" as recognized by the federal government, the Master's Degree in 2022 (and relevant in February 2024) seems devoted to very specific occupations.

That said, the list of current occupations requiring a Master's Degree that once necessitated a Bachelor's Degree is interesting indeed due to these very specific occupations comprising this list: With perhaps "Acupuncturist" and "Instructional Coordinator" as exceptions, the occupations comprising this list should today be on a list of occupations requiring a Ph.D.: They appear as if they are academic professions (e.g., "Anthropologists and Archaeologists," "Sociologists," "Political Scientists," "Statisticians," etc.). Using the inclusion of "Industrial-Organizational Psychologists" and "School Psychologists" as clues, it appears these occupations may all exist in the public sector.

These are public “Anthropologists and Archaeologists,” “Sociologists,” “Political Scientists,” and “Statisticians.” If this is an accurate assumption, then this would provide support for the application of credentialism that Peter van der Meer (2001) highlighted: The public sector is going to overtly rely on credentials regardless whether credentials confer upon individuals additions of skills or productivity. The organization itself benefits from credentials. The “returns” from a credential are more obvious and pronounced to an individual employed in a public organization.

Regarding the list of current occupations requiring a Master’s Degree that once necessitated the equivalent of an Associate Degree, these, again, appear to be public sector occupations (e.g., “Urban and Regional Planners”) and academician equivalents in the public sector (e.g., “Economists” and “Historians”). Of interest for future research are those occupations in this list that appear to evidence professionalization. Historical analyses on these occupations would be valuable lines of research both intrinsically and as context for why tertiary education consumption has changed in the manner currently observed today. Examples might include the origin(s) of the “Athletic Trainer” or “Urban and Regional Planners” professions, the professionalization of “Nurse Midwives,” and/or the specific foci of social workers (e.g., “Healthcare Social Workers” and “Mental Health and Substance Abuse Social Workers”).

## ENTRY-LEVEL EDUCATION REQUIREMENTS INCREASED: The Associate Degree

Regarding the suspicion that individual labor markets and the firms that comprise them may have shifted the burden of training and apprenticeship to higher education institutions seems most obviously justified while perusing the list of current occupations advertised as requiring an Associate Degree that 25 years ago and according to this dissertation's methodology required only a high school diploma (i.e., did not require the purchase of higher education). The occupations comprising this list primarily are assistants to and technicians in support of fields where more advanced credentials are expected or required. So, rather than the expectation that an assistant to a veterinarian or a "Legal Support Worker" or an "Aerospace Engineering and Operations Technologist and Technician" is an apprentice to or undergoing within a firm or field training toward becoming a veterinarian or lawyer or "aerospace engineer," higher education institutions are producing these would-be apprentices and/or are conducting introductory training in these fields as a substitute for the fields themselves conducting this training.

There is, of course, a more positive spin to the above statement: That this assumption exists that 25 to 50 years ago certain support and technician positions did not require or did not expect formal higher education consumption and now do implies that these current Associate Degree occupations are now newly terminal occupations. They indeed are not “steps” into the field or roles for an apprentice. In assuming within firm training or apprenticeship, these fields in need of support disincentivize that support. Not everyone desiring to do legal work or work with the healthcare of animals wants indeed to be a lawyer or veterinarian. If support for lawyers and veterinarians implies training or apprenticeship, then the field has artificially limited its labor pool. So, the increase in credential and the de facto requirement to consume some higher education where maybe that was not an expectation in the past expands the labor pool within fields that may need that labor and where, in the past, that pool was artificially restricted.

## ENTRY-LEVEL EDUCATION REQUIREMENTS DID NOT CHANGE: The Bachelor's Degree

The only meaningful statement to be made regarding the list of 2022 occupations that are interpreted through this dissertation's methodology to have always required a Bachelor's Degree is to reiterate the unexpected lack of these occupations. Assuming that one of the 37 occupations comprising this list have always required a Bachelor's Degree seems uncontroversial. But, that there are only 37 out of 832 total occupations identified by the federal government as comprising America's "economy" that have consistently required a Bachelor's Degree has future research implications and interesting policy implications.

## ENTRY-LEVEL EDUCATION REQUIREMENTS DID NOT CHANGE: The Master's Degree

Using this dissertation's methodology, there, of course, was no list comprised of 2022 occupations that always required a Master's Degree. Rather, what is interesting is the implication of the data source itself: The United States federal government through its Bureau of Labor Statistics (BLS) painstakingly and exhaustively catalogued the occupations comprising the American "economy" and published and disseminated this catalog through the *Dictionary of Occupational Titles* from 1939 until 1999. At least from 1977 to 1999, the U.S. federal government identified education requirements for entrance into its catalog of occupations comprising the American "economy." And in its methodology for assigning education requirements, the federal government did not even consider schooling beyond four years of college education.

So, what is the history of Master's Degree programs? How were they used before 1977 and during 1977 to 1999? There are a number of questions that could arise and would be interesting to place into context Master's program participation by both higher education institutions and by higher education consumers.

## ENTRY-LEVEL EDUCATION REQUIREMENTS DID NOT CHANGE: The Associate Degree

Admittedly, there does not seem the need for lengthy discussion regarding the list of 2022 occupations that are interpreted by this dissertation's methodology to have consistently necessitated an Associate Degree. None of the occupations comprising this list are controversial.

Rather, and again, it is worth reiterating the dearth of the overall "economy" (as defined through the identification of occupations by an authoritative federal agency) that requires and has consistently required an Associate Degree. Out of 832 total occupations, only 24 have required an Associate Degree between 25 and 50 years ago? Only 49 total require an Associate Degree in 2022?

There is a minor caveat to discuss that is relevant for replicating this methodology in the future: One occupation comprising the list of 2022 occupations consistently necessitating an Associate Degree is an outlier using the dissertation's methodology: Highlighted in blue font is the designation of the "Paralegal and Legal Assistants" occupation as de facto requiring an Associate Degree between 1977 and 1999. This highlight is there to remind that this dissertation's methodology was not followed strictly in designating the historic degree requirement for this occupation. If the dissertation's methodology was strictly followed for this one occupation, then it would be deemed that in the past the "Paralegal and Legal Assistants" occupation required a Bachelor's Degree and now only requires an Associate Degree. But, this would be a frivolous inflation and the occupation's credential deflation would only be a function of the summarization process to present results. Specifically, the "Paralegal and Legal Assistants" occupation is defined historically through three (3) occupations within the *Dictionary of Occupational Titles* (DOT): The "Patent Agent," the "Legal Investigator (Legal Assistant)," and the "Paralegal." Two of the three (3) DOT occupation conversions require the equivalent of an

Associate Degree. One of the DOT occupation conversions requires the equivalent of a Bachelor's Degree. But, there are three (3) occupations in total, so the distribution of historic education requirements is 67% and 33%. According to this dissertation's methodology, I recorded the historic education requirement, then, as a range between an Associate Degree and a Bachelor's Degree. Subsequently choosing the maximum education requirement within this range to report in the Chapter 4 results means assigning an occupation in 2022 requiring an Associate Degree a Bachelor's Degree in the past. Consequently, I consider this one occupation an outlier and recognize the limitation of this dissertation's methodology. Clearly, the 2022 "Paralegals and Legal Assistants" occupation and its historic equivalents consistently have required an Associate Degree only.

## EVIDENCE OF THE “KNOWLEDGE ECONOMY”

Though it was mentioned in passing in Chapter 4, it is important to emphasize it here that it constitutes a leap to conclusions to assume that 11 current occupations not determined to have an historic complement by the United States Bureau of Labor Statistics implies that the Bureau of Labor Statistics (BLS) and federal government consider these occupations “new” additions to the overall “economy” or occupations whose internal composition has been “upskilled.”

Still, it would be relevant and a worthwhile contribution (that is potentially fundable through a federal grant) to research why these 11 occupations do not have historic complements. Not recorded in this dissertation’s results are that there are significantly more than 11 occupations that do not have historic complements. Implied through the discussion of the methodology is that many of the *Dictionary of Occupational Titles* (DOT) occupations comprising the composition of current *Occupational Outlook Handbook* (OOH) occupations either did not have current complements or did not have education requirements attached to them. The 11 occupations recorded in Chapter 4 as evidencing the “knowledge economy” simply were the standalone 2022 occupations that had no historic complement. But, a joint venture with the Bureau of Labor Statistics to solve for either past and current occupation complement omissions or to solve for omitted education requirements would be beneficial work for the future.

## POTENTIAL IMPLICATIONS FOR "CREDENTIALISM" AND "CREDENTIAL INFLATION"

It must be stressed that the results from this research cannot be used directly to support or evidence "credentialism" and/or "credential/degree inflation."

Regarding "credentialism" and reminding of its definition, the results say nothing directly about the socializing role of formal higher education structures and/or institutions or about hiring decisions being premised on earned credentials.

Regarding "credential inflation" and reminding of its definition, the results cannot be used to claim that the occupations shown to have increased education requirements or expectations over time did so because of a general increase in postsecondary degree attainment (primarily centered on baccalaureate degree attainment) that devalues the high school diploma or the Associate Degree or other training/postsecondary certificates. Alternatively and also regarding "credential inflation," the results cannot be used to claim that the occupations shown to have increased education requirements over time did so because within specific occupations or fields or classes of occupations there is an overabundance of credentials vis-à-vis the supply of positions.

The primary limitation to the ability of this research to make a direct statement either on "credentialism" or on "credential inflation" is the scope of the analysis: I did not distinguish or define "sectors" of the economy or, generally, attempt to classify through sub-groupings of occupations any portion of the "economy." Rather, I distinguished amidst credential type, i.e., academic diplomas rather than, say, certifications or licenses: According to the United States Bureau of Labor Statistics (BLS), which occupations comprising most of the "economy" are expected to require an Associate Degree, a Bachelor's Degree, and a Master's Degree and have these occupations always been expected to require such specifically academic diplomas? Whether or not the occupations once effectively not requiring yet now requiring an academic diploma exist within a

typically highly credentialed sector of the economy (e.g., the medical profession and its secondary and support occupations or the public sector) or within the “blue collar” versus “white collar” economy was not identified for this research.

That said, this dissertation’s results can be used moving forward to develop future analyses evidencing or adding insight to “credentialism” and “credential inflation” hypotheses. This was the point of focusing a portion of the literature review justifying the research question on the concept of the “knowledge economy” and including scholars such as Berg (1971). It is the concept and decadeslong advertisement that the “knowledge economy” will substitute for or disproportionately usurp the primacy of other “sectors” of the economy (generally the “blue-collar” economy) that births the presumed eventual reliance on “credentials.” It is those occupations where productivity cannot be easily measured, where there may not be countable outputs comprising “success,” and/or where the measurable output partially requires some ill-definable set of personality traits masked as “skills” (e.g., time management, leadership, networking/interpersonal, strategic thinking, etc.) that creates the need for hiring professionals to “screen” from and for those looking to be hired to “signal” to the labor market. This “screening” or “signaling” mechanism is the “credential” as defined by an academic diploma. And, at least regarding the concern for Collins (1979), it is the seeking of these “credentials” that both create inequalities in social positioning and define and solidify those in the “elite” class (as the “elite” need not seek credentials for their secured position in society).

Related to the verification or primacy of the “knowledge economy” and “returns-to-education,” assuming that the proportional representation of America’s labor force within and amidst occupational categories likely have changed significantly over time, future scholarship using the dataset produced from this dissertation may support that such changes in the proportion of the American labor force within, generally, “white collar” versus “blue collar” occupations are not the result of natural economic forces (i.e., the

result of free will by individuals to pursue their interests that have marketable value). In other words, if history can be revised to clarify or emphasize that increases in individual demand for higher educational attainment have been driven by the externally-defined and evasive concept known as the "knowledge economy," then evidencing that x categories of occupations show increased labor supply over time while y categories of occupations have shown declining labor participation says little more than that ["State," subsequent policy, and external (interest) group] messaging about where one's financial future is most secure is indeed highly effective. Individuals may have flocked to occupations advertised or promoted as guaranteeing secure or high "returns" that leads to justification for establishing and maintaining "credentials" for that occupation that lead to an overabundance – an inflation – of earnings of that "credential." "Returns" to higher education consumption, then, result artificially and circularly. There is nothing intrinsic to the occupation or to the purchase of higher education to earn the credential itself. Individuals were "sold" guaranteed or safe or high "returns" if they pursued a particular occupation or set of occupations; these occupations require or are expected to need a "credential" for entry; individuals pay to earn that credential; employers hire based on the credential; there is an abundance of individuals earning that credential; the credential and the purchase of higher education itself is determined to offer "returns."

Thus, being able to define the "knowledge economy" would allow questions resulting from the details of the occupations comprising this analysis: Within defined "sectors" of the economy, who is participating in each occupation or set of occupations, i.e., what are the population and socioeconomic characteristics of the typical entrant into occupations, a set of occupations, or even a "sector" of the defined "knowledge economy"? Have said occupations experienced a change in academic degree requirements over time? What does this say about inequality?

Regarding “credential inflation” specifically, evidence of it occurring would include comparing wage differentiations amidst credentials or, traditionally and to include how “returns-to-education” typically are determined, between college degrees and high school diplomas. Have wages/salaries decreased over time vis-à-vis one credential and another credential requiring more formal education? Have wages/salaries decreased over time vis-à-vis a high school diploma? Additionally, it would be informative to quantify individual occupation participation over time: Does an occupation that once expected/required less formal education in the past contain some percentage greater participation than in the past? How has this occupation or, perhaps more relevantly, the advertisement of this occupation’s importance and potential financial benefit to the individual changed that resulted in the increased participation? Has increased participation led to a downward stress on wages/salaries?

To conclude by restating, the implications for “credentialism” and “credential inflation” resulting directly from this research reside in the potential to use this dissertation’s results for future scholarship.

## IMPLICATIONS OF FUTURE RESEARCH FOR "RETURNS-TO-EDUCATION": Paying to Work

Generally speaking, "returns to education" refers to the monetized benefit an individual receives by consuming, in this case, higher education in excess of the costs of consuming that higher education. While any discussion of "returns to (higher) education" always is accompanied by a parallel discussion that there are *social* returns to consuming higher education in addition to individual returns to consuming higher education[61], such discussions seem provided as secondary justifications for the primary argument that consumption of higher education is personally lucrative. Social returns to higher education usually are expressed as (positive) externalities. Externalities are the "neighborhood effects" or the "external effects" which, by definition, "are…not part of the contracts of purchase and sale in which most economic transactions are effected – if they were negotiated, they would not be external to the parties" (Stigler, 1987, p. 327). If the individual (private) consumption of higher education consists of a contract between the student and the higher education institution for the sale and subsequent delivery of education services to the student for an agreed-upon price to be paid to the institution, then any benefit (or cost) to other third parties that resulted from this contract would be considered an externality. And, while the consumption of any good can yield negative externalities, it is generally assumed that consumption of higher education produces only

[61] Relevant to emphasize and act as a caveat is to clarify that it is my stance that policy and policymakers intend "returns" to be realized in no other way except as individual financial benefit expressed as increased lifetime salary and wage-earning (vis-à-vis "high school completion or higher" or an "associate or higher degree" classifications). I argue that "returns-to-education" signifies only individual lifetime financial benefit by acknowledging the primacy of student loan-financing for consumption of higher education: Regardless aspirations or rhetoric that "returns-to-education" can manifest as various pro-social and pro-community outcomes, the method by which policy is financed is the method by which policy is implemented. Finance and budgeting is reality. And the reality is higher education is consumed by the individual and the individual is expected to pay for the consumption via debt financing. Debt is made deceptively easy to access and is monumentally difficult to dispel. That debt financing of higher education consumption by individuals is the nucleus around which all other forms of higher education finance circle implies that the consumption of higher education is meant for individual financial well-being primarily or disproportionately.

positive externalities. Examples of positive externalities resulting from the individual, private consumption of higher education include: the ability of an individual's consumption of higher education to increase another individual's productivity (Barr, 1993); the result that an individual's consumption of higher education yields higher earnings for that individual which yields increased tax payments for federal, state, and local governments (Barr, 1993); and the benefit that an individual's consumption of higher education may create cultural benefits and add to overall social cohesion (Barr, 2000). Regarding this last example of an externality, the promotion of "democratic forms, openness, transparency, popular sovereignty, and grassroots agency" (Marginson, 2012, p. 11); universal knowledge and information (Stiglitz, 1999); the cultivation of "capacities" (Sen, 1992); the preservation of cultural heritage, the cultivation of citizenship, the formation of individual character and critical thinking skills ("critical habits of the mind"), and economic development (Gumport, 2001) all are examples (provided by representative economists and scholars) of the potential social benefit to consumption of higher education by individuals that creates cultural benefits and provides social cohesion.

That this discussion claims that social benefits to consumption of higher education seem "secondary[62]" results from the assumption that the primary mechanism to finance higher education is the student loan.

[62] Arguably, that consuming higher education primarily benefits the individual financially is the "secondary" or ex post rationalization in economic theory. Ex post rationalization generally results from the "sunk cost fallacy" (Eyster, Li, & Ridout, 2021). And before the individual was willing to pay significantly for higher education, public policy and subsequent public financing made the first move: It subsidized higher education consumption – via multiple mechanisms, one of which was the creation of a market for student loans – presumably for its own ends before, after the fact, rationalizing that the incentives were "good" for the individual by noting the "returns" individuals received from purchasing the higher education good. This connects to the work of D. Bruce Johnstone who is most responsible for the word "cost-sharing" as it applies to higher education: Over time, the public has paid for less and less of higher education costs to be substituted by individuals sharing more and more of those costs.

As D. Bruce Johnstone has pointed out since at least 1986[63] and as an assumption that is foundational to – and, thus, interwoven throughout – the examination of higher education financing "schemes" that is the outcome of Johnstone and Marcucci (2010), as demand for higher education consumption has increased, "cost-sharing" (Johnstone's term) has become more prevalent. "Cost-sharing" for Johnstone is defined unidirectionally: The shift in the share of higher education costs has, over time, moved toward burdening individual families and students (i.e., the consumers) over the public (i.e., the supposed beneficiaries if social benefits to higher education consumption either were not subsumed to or were equal to the benefits accrued to the individual for consuming higher education). So, yes, state budgets still fund public colleges and universities and, yes, federal programs and subsequent grants and external sources fund colleges and universities directly and fund most of their research. But, as the percentage of public funds financing higher education decreases generally and as demand for consumption of higher education increases, the subsequent costs resulting from said decreasing share of public funds and increased costs to accommodate increased demand are passed along to the student and to her or his family. In other words, regardless of rhetoric or of normative desire, reality is defined through how policies are implemented and are illustrated by where the money to implement policy is allocated.

[63] See Johnstone (1986).

So, the reality is students and families are expected to pay for the increased demand to consume higher education through Johnstone's "cost-sharing" that take one (1) of seven (7) main forms (worldwide)[64]:

- The beginning of tuition fees (where higher education was formerly free)…
- The addition of a special tuition-paying track while maintaining free or very low-cost higher education for an increasingly limited number of regularly-admitted, state-supported students…
- A very sharp rise in tuition fees…
- The imposition of user charges, or fees, to recover the expenses of institutionally provided and formerly free or greatly subsidized residence and dining halls…
- A diminution of the value of student grants or other stipends…
- An increase in the effective cost recovery on student loans…
- A limitation on capacity in the low-tuition or tuition-free public sector, together with official encouragement (and frequently public subsidization) of a tuition-dependent, private higher educational sector (Johnstone & Marcucci, 2010, pp. 64-65).

The supposed organic demand for higher education today is supposed to stem from the presumed obvious analysis that the economy itself demands increasing quantities of education. The assumption that the labor market is defined by the "knowledge economy" drives the "returns-to-education" from which organic demand for higher education stems. When higher education policy and the rhetoric sustaining the policy frequently returns to the sagacity that higher education should be consumed through indebtedness, such policy assumes for higher education consumers that "returns" over their lifetimes exceed the amount borrowed (and its capitalized interest over the maximum time to repay) in order to consume higher education. Significant quantities of literature assume that individuals and individuals within certain targeted groups do not borrow in sufficient quantities or are too risk-averse to borrow sufficiently given what policy assumes

[64] Some of the abovementioned forms of "cost-sharing" identified by Johnstone and Marcucci (2010) do not apply to United States higher education, of course. Johnstone and Marcucci (2010) discusses financing "schemes" across the world. Regardless, each of the cost-sharing forms assume that the increased demand for higher education is justified based upon higher education's benefits primarily to the individual.

about the nature of "returns-to-education." And, indeed, what policy assumes (and what seems consistently evidenced and modeled) is that over time (and contrary to returns from other investments), returns to (higher) education have only ever increased. As examples: Goldin and Katz (2008) showed that returns to higher education (as defined against those with only a high school degree) had doubled in the three decades prior to the publishing of their book. Wei and Horn (2013) used the National Center of Education Statistics' 2003/2004 Beginning Postsecondary Students Longitudinal Study Second Follow-Up to show that employment rates of the 2003/2004 cohort of postsecondary students who completed ("completers") either their public or private four-year, their public two-year, or their for-profit institutional curriculum were always higher than the employment rates of those who had not completed ("non-completers") a postsecondary curriculum to earn a degree. Further, regardless the institutional type from which the credential was earned, "completers" had higher median annual incomes than "non-completers." Related, Avery and Turner (2012) used 2011 Bureau of Labor Statistics data to show that even amidst a recession (i.e., the Great Recession of 2008), the unemployment rate for college graduates (including those with advanced degrees) was not only far less than the unemployment rate for high school graduates-only (4.4% versus 8.5%) and for "non-completers" (4.4% versus 7.6%), but also was below the national average at the time. Avery and Turner (2012) also used the 2009 Current Population Survey to show that from 1965 to 2008, (present discounted values[65]) earnings differences (in constant dollars) (for both men and women) have only ever increased between those having earned a college degree and those having only earned a high school diploma. From 1965 to 2008 (over 42 years of work), college graduates accumulated $1.2 million in earnings (net of college tuition). High school graduates had only accumulated $780,000 over that same 42 years.

[65] At 3% annual discount rate. Further, Avery and Turner (2012) control for years of work, the growth rate of earnings over one's life, and labor force participation (among other unnamed variables).

At no point during the 42 years did year-to-year earnings (for either men or women or both) of college graduates ever even asymptotically converge on the significantly lower year-to-year earnings of high school graduates. Net earnings differentials always were two sets of parallel lines with college graduates always earning more between the years 1965 and 2008[66].

Analyses such as the samples provided above require the "knowledge economy" assumption regarding the nature of the labor market. To be clearer, such analyses that conclude or advocate for prima facie the safest investment one can make (i.e., an investment where returns are always positive and always well exceed the principal investment) assume that there is an economy defined by differentiated labor markets. There are labor markets where entrance requires a toll or tax to enter. That tax, of course, is the purchase and subsequent attainment of higher education. And this assumption is not controversial: Of course labor markets are differentiated. No individual wants to see (i.e., trusts) a doctor without a credential. No individual trusts her or his accounting to a competitive pool of labor that cannot prove through external accreditation that she or he has a command of the labyrinth of laws and controls that affect an organization's finances.

Research citing the returns to higher education (vis-à-vis a high school diploma especially) assumes that there are at least two (2) economies – perhaps the "blue-collar" and the "knowledge economy" – and entrance into one of those economies (the latter) requires higher education while the other does not (the former). And this observation could be true. But, this is a highly general way to think of something as dynamic as an economy that is, after all, populated by individuals serving the needs of other individuals in exchange for compensation that has a value that is, by nature, relative to myriad factors.

[66] Interestingly enough, Avery and Turner (2012) do caveat that the present discounted values of earnings differentials between college graduates and high school graduates do converge (with high school graduates' overtaking college graduates') if we assume that 75% of the difference in observed earnings is due primarily to self-selection into college.

Berg (1971), as an influential example of complicating assumptions about and, thus, the messaging regarding the "economy," generally criticizes as oversimplified the idea that educational requirements can systematically be attributed to job types thus justifying that more education yields more money for the individual. Berg (1971) devotes each of his chapters to illustrating through literature citation and basic data analysis that education achievements have highly variable effects on worker performance, job-related attitudes, on its usefulness to the public sector, and on the supply of labor for "blue-collar jobs." To make the point of his book, the highly variable effects are reported as more negative than positive: There is a "perverse relationship" between more education and worker performance; higher education tends to create more miserable employees; educational achievement in the public sector can be superfluous to the needs of the government organization.[67]

[67] For clarity regarding his perspective, Berg (1971) focuses on the military as indicative of public service. As an example of the view of education in the public sector, Berg (1971) cites an Air Force researcher, L.G. Humphrey, that comments for Berg on the nature of numerous studies regarding years of education and success in military service. "Years of education are: (a) only moderately related to objective measures of aptitude; (b) a poor predictor of success in training; (c) almost unrelated to objective measures of proficiency on the job…(Berg, 1971, 152)."

On the subject of increasing quantities of education and the "blue-collar worker," Berg (1971) ties some of his critical conclusions about the effects of education on work to the "special case" of the "blue-collar worker":

> Contrary to popular belief, education does not always group people according to their abilities, especially the abilities to do specific jobs…[T]here may be some truth in the adage that "you can't keep a good man down" in a society in which there are discrepancies between educators' and employers' definition of a "good man"…
>
> Beyond the question of ability…lies the more subtle one of motivation…
>
> We have already implied that Americans are influenced by the vulgarization of the argument that they have foregone incomes to complete their education. The popular culture plus experiences within the educational apparatus itself, with its implicitly or explicitly vocational aims, its placement personnel, guidance counselors, career-day programs, and employer interviews – all add independent weight to the widespread expectations among Americans that they deserve jobs that are interesting, that they will be promoted on the basis of abilities to which their diplomas and degrees give testimony, and they will make money. "To get a better job, get a better education," reads the subway placard; "things are changing," says the disc jockey, "and so," he quickly adds, "finish your education to get a bigger piece of the action and a better job" (Berg, 1971, pp. 121-122).

The message and cultural move toward increasing consumption of education in order to make more money and have a better life has two effects relevant to the "blue-collar" environment. One, education becomes aspirational: One's work and thus one's life is going to be fulfilling. One is important. One has purpose. Work is life. Thus, when reality sets in for most people that their preconceptions about the nature of work were manufactured and advertised and that most work resembles "blue-collar" work in that one is a replaceable part of a larger organization and without much power, is without a pathway to the expected and fantastical meteoric rise advertised, and is relegated to repeated and low-level tasks, this reality has a far more profound psychological effect than it should. Two, those in the "blue-collar" sectors materially suffer because the limited avenues for advancement that used to be available for a high school-educated worker become shut off as those with more education necessarily move into the "blue-collar" market and take those advancement positions. (This would be an example of "credential inflation.")

From the perspective of Berg (1971), the point is that the economy is not easily generalized. Material wealth and job satisfaction for the individual, i.e., returns, are a function of multiple variables, many of which do not have anything to do with education. Coworker and supervisor relationships, longevity, loyalty, and vertical interactions within an organization are as powerful a determinant of success for an individual as increasing consumption of education in order to be horizontally marketable (i.e., across organizations).

Wolff (2006) complicates the notion that the "knowledge economy" is and has been a uniformly and exponentially expanding force requiring an ever-increasing supply of "knowledge" or "information" workers. After defining "knowledge worker" and "data worker," Wolff (2006) points that between 1950 and 2000, "[a]bout two-fifths of the growth in the share of knowledge workers in total employment and two-thirds of the increase in the share of data workers…is attributable to differential rates of productivity movements among the industries of the economy…" and that "[o]n the production side of the economy, the substitution component explains almost three-fifths of the growth in the share of knowledge workers during the five decades and about a third of the growth in the share of data workers…" (p. 154). Wolff here is referencing the "unbalanced growth" theory of development. The "unbalanced growth" theory is a criticism of the "balanced growth" theory of development that claims (in reference to the 1803 Say's Law of Markets and to J.S. Mill in 1848) that economic development occurs as a broad range of different industries receive synchronous influxes of capital simultaneously (hence the term "balanced growth"). Industries that produce goods with higher income elasticities[68] of demand (i.e., goods whose demand is highly dependent on an individual's income) grow rapidly and attract lots of capital while, simultaneously, industries that produce goods with

[68] See Appendix A for a discussion of "elasticities."

low income elasticities of demand (i.e., goods that are demanded at the same level by individuals regardless their incomes) attract less. The “balanced growth” model is how the “knowledge economy” presumably has been popularized. Popular culture and public rhetoric note the synonymous meteoric rise of “technology” both as an industry sector itself and as a variable operating within existing industries. Wolff (2006) points out that, despite presumption, data about demand for and distribution of “knowledge workers” and “data workers” illustrate an “unbalanced growth effect.” “Unbalanced growth” reflects that investment resources are limited. Balanced growth occurs only during the “long run” as incremental investment decisions are made and investment projects are undertaken whose values do not exceed the amount of resources available. Two-fifths (40%) of the growth in the share of “knowledge worker” and two-thirds of the increase in the share of “data worker” as a function of total employment between 1950 and 2000 occurred incrementally over the fifty-year time period cited. There was not a sudden demand for a massive supply of “knowledge worker” and “data worker.” Wolff (2006) also references that the “substitution component explains almost three-fifths (60%) of the growth in the share of knowledge workers” and one-third of the growth in “data workers” between 1950 and 2000 (p. 154). This, again, is the “unbalanced growth” theory: The fifty-year growth in “knowledge worker” and “data worker” was a function of choosing (substituting) when and if to invest in a particular project. There was not coordinated investment and there may or may not have been significant planning as to the sequence of investments. Additionally, “Social Overhead Capital” (SOC) (e.g., government expenditure on public goods like roads) is very important to the ability and capability to expand an industry or develop a sector.

The point is, judging by how the demand for “knowledge worker” and “data worker” is illustrated in statistics, there has not been some dramatic shift in the factors that comprise the definition of the “economy.” Yes, there has been an increase in the share of total employment by the “knowledge worker” and the “data worker.” But, this increase has occurred incrementally and has been interspersed within the day-to-day activities comprising what may be inaccurately referenced as the “traditional” economy. There is no “new economy.” Rather, there is the “old economy” with some new additions emerging gradually.

Economist and a leading critic of free-trade economic policy, Ha-Joon Chang, makes the following observation in one of his books written for the public. It is worth quoting directly (Chang, 2010):

> There is remarkably little evidence showing that more education leads to greater national prosperity. Much of the knowledge gained in education is actually not relevant for productivity enhancement, even though it enables people to lead a more fulfilling and independent life. Also, the view that the rise of the knowledge economy has critically increased the importance of education is misleading. To begin with, the idea of the knowledge economy itself is problematic, as knowledge has always been the main source of wealth. Moreover, with increasing de-industrialization and mechanization, the knowledge requirements may even have fallen for most jobs in the rich countries. Even when it comes to higher education, which is supposed to matter more in the knowledge economy, there is no simple relationship between it and economic growth. What really matters in the determination of national prosperity is not the educational levels of individuals but the nation’s ability to organize individuals into enterprises with high productivity (Chang, 2010, pp. 178-179).

Finally, there seems something oddly contradictory about the assumptions that undergird the message that the additions to incomes for individuals resulting from returns to investing in higher education will only ever be positive when compared to the incomes for those obtaining only a high school diploma and that such returns are possible because the “economy” is defined by and, thus, requires an abundance of “knowledge.” Comparing incomes for those with college degrees vis-à-vis those with high school diplomas is only

informative if it can be assumed that in the two-economy image (used thus far in this discussion) both economies – the "knowledge economy" and the "blue-collar economy" – are of generally equal size. Controlling for all other variables influencing the dependent variable characterizing a lifetime increase in income (or the maximum likelihood of obtaining more income over a lifetime), having a college degree has disproportionately large and statistically significant partial effect on that dependent variable. This partial regression equation result only makes sense if one can assume a world with two possible realities for Person X that has a generally equal opportunity to occur. Person X and all of her characteristics that define her ability to perennially increase her income over her lifetime is confronted with two choices: Purchase higher education or do not purchase higher education. If Person X does not purchase higher education, her lifetime income will be "y," and if Person X purchases higher education, her lifetime income will be "y + v," where "v" is the return to purchasing higher education. But, in order for "y + v" to have any meaning, there must actually be a choice for Person X.

Further, if in fact there is a vibrant, functioning, spacious economy that does not (necessarily) require the consumption of higher education, then increased consumption of higher education by more consumers and higher education policy's advertising and facilitating of that increased consumption may create a depression in the personal returns to consuming higher education. If there are two (2) economies – one "knowledge economy" and one "blue-collar economy" – and both economies have sufficient space to accommodate a roughly equal portion of the labor supply, then one "economy-market" attracting an abundance of labor supply (the "knowledge economy") creates a shortage of labor supply in the other "economy-market" (the "blue-collar economy"). Basic economic theory is that as supply exceeds the demand of, in this case, the "knowledge economy," prices (incomes) are driven downward. Meanwhile, shortages in supply raises prices (incomes). (This also articulates an assumption behind "credential inflation.)

And here is where the contradiction arrives: Much higher education policy, generally, and certainly finance policy that advocates for student-consumer indebtedness, specifically, is implemented either directly toward the increased consumption of higher education by an increasing number of consumers or to facilitate increased consumption by an increasing number of consumers based upon the narrative that the economy is (or will become) so overwhelmingly "knowledge-based" that consumption (through indebtedness) of higher education virtually guarantees a return that exceeds almost any amount of the principal required plus interest to purchase higher education. (This is known because research compares lifetime incomes from those with college degrees to lifetime income from those with high school diplomas.) However, if the "knowledge economy" is (or will become) so overwhelmingly definitive of the overall economy, if now or in the future one can expect that effectively there will be little or insufficient labor that one without a college degree will be able to perform, then any talk of a "return" to consuming higher education or any talk of consumption of higher education being an "investment" is semantic and illusory. Consumption of higher education becomes necessary. Demand for consumption of higher education becomes price inelastic[69], i.e., a student is willing to pay almost any price in order to consume higher education because higher education becomes de facto a *need* in order to enter the "knowledge economy" that has swallowed whole and relegated to its pit of stomach acid any other characterization of the economy. If there is insufficient or negligible space within any other "economy" for which there is a demand for labor outside of the "knowledge economy," there is effectively no "return" on an "investment" required to enter said "knowledge economy" that becomes the only game in town. A person's "return" becomes the simple ability to see any income over her or his lifetime vis-à-vis utter destitution. In other words, selling simultaneously that consuming

[69] See Appendix A for a discussion on "elasticity."

higher education leads to greater income returns for the individual over her or his lifetime when compared to those that do not consume higher education *and* that higher education must be “universally” consumed or consumed by as many people as possible because either the present and/or the future of work is defined by the “knowledge economy” that requires higher education is contradictory. Just as society and policy does not talk of the personal returns to investing in food or in clothing or in shelter, it is meaningless to talk of the personal returns to investing in higher education if its purchase becomes necessary to work because work is defined by the “knowledge economy” and there effectively is no other option for an individual to earn an income.

Consumption of higher education becomes a tax or toll in order to enter the labor market. An individual loses income in the short-term (opportunity cost) and loses future income (in the form of interest on debt) in order to be able to earn income.

*An individual pays to work.*

## GENERAL LIMITATIONS TO THE RESEARCH

### Limitation:
### Diction Changes Over Time

In addition to the limitations discussed above and particular to the sets of results, generally, the main limitation to this research that needs to be addressed concerns diction used throughout this dissertation. This dissertation frequently uses the term "requirement" to describe education expectations for both current (2022 current to February 2024) and past occupations. It is argued here that "requirement" is appropriate for 2022 occupations. The entry-level education citation provided for each occupation within the current (2022) *Occupational Outlook Handbook* (OOH) is asserted confidently as "typical[70]" by the handbook itself. Using signaling theory and implications from credentialism theory, it is considered here a safe expectation that an individual is going to "play it safe" or be "risk-averse" and consume the amount of higher education that is indeed "typical," i.e., most widely expected from the firms comprising an occupation or field.

However, the Bureau of Labor Statistics has only recently asserted a "typical" education citation for entry into any one occupation. Reviewing hard copies of the *Occupational Outlook Handbook* produced before 2000, you will not see monosyllabic assertions of "typical" education expectations. Rather, you will see narratives regarding general training and education requirements/expectations of an occupation accompanied by qualifying statements.

The *Dictionary of Occupational Titles* (DOT) that was the source document for pre-2000 publications of the OOH obviously did assign education expectations to the occupations it catalogued. However, these education "scores" or "levels" were codifications of education "development" (i.e., of expected content and skills attainment

[70]Click on any occupation displayed on the *Occupational Outlook Handbook* website and an occupation profile is produced. This profile includes a "Summary" table that clarifies the entry-level education variable for the chosen occupation as "typical."

throughout years of schooling). Citing how much education was expected for any one occupation only allows implication for actual formal education consumption decisions. As discussed above, a case could be made for the 2022 OOH occupations that “typically” require a Bachelor’s Degree that citing the expectation of one (1) to two (2) years of college “development” for these occupations’ past complements in the DOT still could result in the typical college consumer 25 to 50 years ago purchasing a full four-year baccalaureate degree given that the “typical” college consumer was “atypical” to the average individual population-wide. So, it may be that many or all of the occupations currently listed as “typically” requiring a Bachelor’s Degree have always required the purchase of four years of college and the subsequent physical Bachelor’s Degree. It is just that intrinsically, the occupation’s day-to-day expectations do not require significant “development” above one (1) to two (2) years of college.

Still, with this caveat aside, the data source and method is useful and meaningful: The fact is the federal government through its Bureau of Labor Statistics has maintained a catalog of occupations supposedly comprising the American “economy.” This same agency over time has consistently attempted to quantify education expectations for this catalog of occupations. So, while it is possible that in practice or as a matter of individual economic decision an “Accountant or Auditor” from 1977 to 2024 may always have had or had expected a Bachelor’s Degree and the subsequent purchase of four years of college education, it is meaningful to note that the federal government during a significant span of time considered the “development” and subsequent set of skills, capabilities, and knowledge of an “Accountant or Auditor” as being equivalent to the purchase of one (1) to two (2) years of college.

If not strictly defined evidence of “credential inflation,” there is evidence of education and development expectation inflation.

## Limitation:
## Can This Research Be Used to Inform a Decision on Whether or Not to Purchase Higher Education Toward an Occupation?

The short answer to the above question that represents a particular limit to the results of this research is “no.”

The results of this research offer a way to determine whether a particular occupation residing in any sector of the United States “economy” may or may not have experienced an increase in formal academic degree expectations/requirements over time.

The results say nothing about whether this increase or lack of increase is justified or, conversely, whether an increase is not justified or if there should have been an increase.

It is expected that future research will better enable an accurate and fuller depiction of the United States “economy,” i.e. its needs and its real manifestation through the actions of individuals.

# APPENDIX A:
# TERM USAGES

The purpose of this appendix is to clarify and expound upon two (2) terms that are used throughout this dissertation. The first is “postsecondary” or “higher education.” The usage of “postsecondary” or “higher education” does not signify a specific meaning. It can signal different images or interpretations. The second is “inelastic” or “price inelastic.” “Inelasticity” is a very specific term used in economics and its meaning should be clarified here.

## POSTSECONDARY OR HIGHER EDUCATION

As a relevant clarifying matter and further definition for "postsecondary" and "higher education," this dissertation and its research question does not or cannot make any statements about higher education institution type granting the degree that will be assumed to have been and/or is required or expected for occupations identified by the Bureau of Labor Statistics in its *Occupational Outlook Handbook*. This dissertation, then, says nothing about the difference between a community college or trade school or institution offering MOOCs[71] or elite/ivy league or state (e.g., land-grant) baccalaureate-granting institution in earning a degree.

Further, and to be addressed more completely when discussing the sources of data for this research in this dissertation's methodology section (Chapter 3), the Bureau of Labor Statistics (BLS) partially organizes its listings of occupations defining most of the "labor market" according to the following "entry-level education" requirements or expectations:

- Doctoral or Professional Degree
- Master's Degree
- Bachelor's Degree
- Associate Degree
- Postsecondary Non-Degree Award
- Some College, No Degree
- High School Diploma or Equivalent
- No Formal Educational Credential

[71] MOOC refers to a "Massive Open Online Course."

Consequently, it is assumed for this dissertation that if a Bureau of Labor Statistics occupation lists an Associate Degree or Bachelor's Degree or Master's Degree as expected/typical/required, then it is assumed that entry-level education is limited only to Higher Education Institutions (HEI) granting specifically Associate, Bachelor's, or Master's degrees. In other words, if an institution type grants primarily "postsecondary non-degree awards" then this type of institution is irrelevant to the point of this research. However, this dissertation does not attempt to identify HEI type for any reason. If a particular institution or institution type grants Associate, Bachelor's, or Master's Degrees and if a particular institution or institution type grants said degrees in an occupation identified by the Bureau of Labor Statistics, then there is some space within the labor market for said identified occupation for which the Associate, Bachelor's, or Master's degree from any institution type will apply. The Bureau of Labor Statistics and its *Occupational Outlook Handbook* identifies occupations that require/expect an Associate, Bachelor's, or Master's degree. This research desires to discover if these occupations consistently (over a time period) have expected or required the current Associate, Bachelor's, or Master's degree. The "Dietitian and Nutritionist" occupation requires a Bachelor's degree using 2022 data. Whether this Bachelor's Degree is awarded from SNHU (Southern New Hampshire University) and its online campus, the University of Kentucky, or Cornell University is irrelevant for the question driving this research. The question to be addressed here is whether the "Dietitian and Nutritionist" occupation has always required or expected a Bachelor's degree. If it has not, then this leads to additional questions to be addressed in future research. These additional questions may need to include postsecondary/higher education institution type in its address.

But, for this research, “postsecondary” or “higher education” is not defined in terms of institutions. It is defined as any institution granting the Associate, Bachelor’s, or Master’s degrees said as expected or required by the Bureau of Labor Statistics for one of its identified occupations defining most of the labor market.

## INELASTICITY (ELASTICITY) or INELASTIC (ELASTIC) or PRICE INELASTIC (PRICE ELASTIC)

Basic economic theory assumes that as a default state and for a "normal[72]" good, the demand for that good is "elastic": As the price rises, the demand for a normal good falls. If as the price of a good rises, demand falls by increasingly less or does not fall at all, the good is becoming increasingly inelastic or becomes perfectly inelastic.

All individuals value all goods at different prices. Prices are relative. This is an inartful description of what economists call "willingness to pay": I love books on higher education and do not love books by Patricia Cornwell.[73] However, a member of my family does not love books on higher education and does love books by Patricia Cornwell. Thus, my "willingness to pay" for a book on higher education is much higher than the "willingness to pay" for such a book by my family member. Conversely, my "willingness to pay" for a book by Patricia Cornwell is less than the "willingness to pay" for such a book by my family member. The "willingness to pay" for any good is reflected in the price elasticity of demand. For my family member, the price for a book on higher education is far more elastic than the price of said book on higher education is for me.

Price elasticity is important for the marketing of a good. To expand the pool of consumers for a good, a primary mechanism for that expansion is the appeal to multiple "willingnesses to pay" and subsequent price elasticities. If the higher education book

[72] A "normal" good is a good that as income rises, more of the good is demanded. The "normal" good is defined according to "income elasticity of demand (YED)" and in relation to two other terms, "luxury" good and "inferior" good. A "normal" good has a YED that is greater than zero (0) and, as its name implies, most goods consumed are considered "normal" goods. If one earns more, one buys more stuff. One likes clothes, one purchases more clothes with more income. A "luxury" good has a YED that is greater than one (1). A "luxury" good is a "normal" good where as an individual's income rises, she or he spends a greater percentage of that income on the "normal" good. A car is a "normal" good: One earns more money, one purchases – maybe not "more" per se – but a better car, a new car, maybe another car, etc. But, a Mercedes-Benz is a "luxury" good: As income increases, a greater percentage of that increase in income goes to the purchase of the Mercedes-Benz. In other words, if one makes more money, one may not purchase four (4) Kias. Rather, one uses a greater percentage of that increased income to purchase one Mercedes-Benz. An "inferior" good is a good that is consumed less as an individual earns more money. Income elasticity of demand (YED) is less than zero (0). As one earns more money, one purchases fewer packets of $0.35 ramen noodle "dinners."

[73] This is a lie. Who does not love books by Patricia Cornwell?

industry seeks to expand its consumer base to include my family member, the higher education book industry cannot charge the much higher price that I am “willing to pay” for one of its books. Generally, then, increasing a consumer base requires the ability for prices to fluctuate (generally to lower) so as to include an increased array of “willingnesses to pay” and price elasticities of demand.

There are a number of implications to a good being price *in*elastic. If demand does not respond to price, then the good becomes a necessity, or there is no substitution for it, or it becomes universally applicable to most or all individuals, or is a combination of all three.

Gasoline is the classic textbook example of a price inelastic good. Anything running on a combustible engine needs it; there is no real substitute for it; gasoline does not have a vast array of uses, i.e., it pretty much has one universal function. So, if the price of gas rises, the number of individuals demanding gas and the amount of gas demanded per individual does not fluctuate considerably.

# APPENDIX B:
# DETAIL UNDERLYING THE RESULTS USED IN CHAPTER 4

Below are tabulated the details from which the results presented in Chapter 4 derive.

To remind of the methodology used so that the below tables are explained: All 179 Bureau of Labor Statistics (BLS) *Occupational Outlook Handbook* (OOH) occupations requiring a Bachelor's Degree for entry in 2022, all 39 Bureau of Labor Statistics (BLS) *Occupational Outlook Handbook* (OOH) occupations requiring a Master's Degree for entry in 2022, and all 49 Bureau of Labor Statistics (BLS) *Occupational Outlook Handbook* (OOH) occupations requiring an Associate Degree for entry in 2022 were disaggregated into their Standard Occupational Classification (SOC) System code counterparts. Then these SOC System code counterparts were further disaggregated into their *Dictionary of Occupational Titles* (DOT) counterparts. The nearly 2,500 DOT occupations (comprising the nearly 600 SOC System-coded occupations comprising the 267 2022 OOH occupations) then had recorded their educational requirements that were comprised of three (3) variables, Reasoning Development (R), Language Development (L), and Mathematical Development (M) from the "GED" "level".

Within each 2022 OOH occupation and their SOC System-coded counterparts, any duplicative DOT counterpart was deleted.

For each non-duplicative DOT occupation, the highest “GED” “level” value amidst the R, L, and M values was recorded as that occupation’s entry-level education requirement. Some non-duplicative DOT occupations did not have “GED” “level” values for R, L, and M assigned to them primarily because some DOT occupation codings ultimately were excluded from the DOT.

The tables below show the results of the abovementioned analysis: The final (i.e., highest) education requirement (“GED” “level”) values for each DOT occupation within each 2022 OOH occupation were tallied and recorded amidst the possible education categories, i.e., primarily High School Diploma, Associate Degree, and Bachelor’s Degree. DOT occupations that did not have education requirements were excluded from the tally and overall count (i.e., they are not included in the denominator when tallies of the highest “levels” of multiple DOT occupations were divided by the total number of DOT occupations comprising a 2022 OOH occupation). The final 1977-1999 education requirement assigned to each 2022 OOH occupation was the highest value of the three “GED” “levels” for each non-duplicative DOT occupation comprising the 2022 OOH occupation recorded the most times. If tallies of the highest value for the “GED” Scale for each non-duplicative DOT occupation comprising its 2022 OOH occupation counterpart produced a plurality, then the range of historic education requirements was recorded. Specifically, within each 2022 OOH occupation, if the tally of the highest value for the “GED” Scale for the DOT occupations comprising the 2022 OOH occupation produced two totals that were within 33% or 34% of each other (i.e., the first and second place historic education requirement assignment was a 67%/33% or 66%/34% split), then both historic education requirement equivalents were recorded.

Finally, for the results presented formally in Chapter 4, for those 2022 OOH occupations resultingly assigned a range of historic education requirements, the highest education requirement defining the range ultimately was used.

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 1 | Accountants and Auditors | 1 | 13 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 13 | | | High School Diploma | 0 | 0% |
| | | | 13 | | | **Associate Degree** | **13** | **100%** |
| | | | 13 | | | Bachelor's Degree | 0 | 0% |
| 2 | Actuaries | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 3 | Administrative Services Managers | 3 | 8 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 8 | | | **High School Diploma** | **3** | **38%** |
| | | | 8 | | | **Associate Degree** | **5** | **63%** |
| | | | 8 | | | Bachelor's Degree | 0 | 0% |
| 4 | Adult Basic Education, Adult Secondary Education, and English as a Second Language Instructors | 1 | 1 | Bachelor's Degree | High School Diploma | Eighth Grade | 0 | 0% |
| | | | 1 | | | **High School Diploma** | **1** | **100%** |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 5 | Advertising and Promotions Managers | 2 | 13 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 13 | | | High School Diploma | 1 | 8% |
| | | | 13 | | | **Associate Degree** | **9** | **69%** |
| | | | 13 | | | Bachelor's Degree | 1 | 8% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 6 | Aerospace Engineers | 1 | 9 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 9 | | | High School Diploma | 0 | 0% |
| | | | 9 | | | **Associate Degree** | **4** | **44%** |
| | | | 9 | | | **Bachelor's Degree** | **5** | **56%** |
| 7 | Agents and Business Managers of Artists, Performers, and Athletes | 1 | 9 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 9 | | | **High School Diploma** | **5** | **56%** |
| | | | 9 | | | **Associate Degree** | **4** | **44%** |
| | | | 9 | | | Bachelor's Degree | 0 | 0% |
| 8 | Agricultural Engineers | 1 | 4 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 0 | 0% |
| | | | 4 | | | **Associate Degree** | **4** | **100%** |
| | | | 4 | | | Bachelor's Degree | 0 | 0% |
| 9 | Agricultural Inspectors | 1 | 2 | Bachelor's Degree | High School Diploma | Eighth Grade | 0 | 0% |
| | | | 2 | | | **High School Diploma** | **2** | **100%** |
| | | | 2 | | | Associate Degree | 0 | 0% |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 10 | Airline Pilots, Copilots, and Flight Engineers | 2 | 8 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 8 | | | **High School Diploma** | **3** | **38%** |
| | | | 8 | | | **Associate Degree** | **5** | **63%** |
| | | | 8 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 11 | Animal Scientists | 3 | 13 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 13 | | | High School Diploma | 0 | 0% |
| | | | 13 | | | Associate Degree | 0 | 0% |
| | | | 13 | | | **Bachelor's Degree** | **13** | **100%** |
| 12 | Arbitrators, Mediators, and Conciliators | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 13 | Architects, except Landscape and Naval | 1 | 2 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **1** | **50%** |
| | | | 2 | | | **Bachelor's Degree** | **1** | **50%** |
| 14 | Architectural and Engineering Managers | 2 | 2 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **1** | **50%** |
| | | | 2 | | | **Bachelor's Degree** | **1** | **50%** |
| 15 | Art Directors | 1 | 3 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | **High School Diploma** | **1** | **33%** |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 16 | Atmospheric and Space Scientists | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 17 | Bioengineers and Biomedical Engineers | 1 | 2 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | Associate Degree | 0 | 0% |
| | | | 2 | | | **Bachelor's Degree** | **2** | **100%** |
| 18 | Biological Scientists, All Other | 5 | 8 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 8 | | | High School Diploma | 0 | 0% |
| | | | 8 | | | Associate Degree | 0 | 0% |
| | | | 8 | | | **Bachelor's Degree** | **8** | **100%** |
| 19 | Biological Technicians | 1 | 13 | Bachelor's Degree | Eighth Grade - High School Diploma | **Eighth Grade** | **7** | **54%** |
| | | | 13 | | | **High School Diploma** | **4** | **31%** |
| | | | 13 | | | Associate Degree | 0 | 0% |
| | | | 13 | | | Bachelor's Degree | 2 | 15% |
| 20 | Broadcast Announcers and Radio Disc Jockeys | 2 | 6 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 1 | 17% |
| | | | 6 | | | **High School Diploma** | **2** | **33%** |
| | | | 6 | | | **Associate Degree** | **3** | **50%** |
| | | | 6 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 21 | Budget Analysts | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 22 | Business Operations Specialist, All Other | 5 | 37 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 2 | 5% |
| | | | 37 | | | **High School Diploma** | **14** | **38%** |
| | | | 37 | | | **Associate Degree** | **15** | **41%** |
| | | | 37 | | | Bachelor's Degree | 3 | 8% |
| 23 | Buyers and Purchasing Agents | 4 | 17 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 17 | | | **High School Diploma** | **7** | **41%** |
| | | | 17 | | | **Associate Degree** | **10** | **59%** |
| | | | 17 | | | Bachelor's Degree | 0 | 0% |
| 24 | Camera Operators, Television, Video, and Film | 2 | 9 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 1 | 11% |
| | | | 9 | | | **High School Diploma** | **5** | **56%** |
| | | | 9 | | | **Associate Degree** | **3** | **33%** |
| | | | 9 | | | Bachelor's Degree | 0 | 0% |
| 25 | Career/Technical Education Teachers, Middle School | 3 | 20 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 4 | 20% |
| | | | 20 | | | **High School Diploma** | **10** | **50%** |
| | | | 20 | | | **Associate Degree** | **6** | **30%** |
| | | | 20 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 26 | Career/Technical Education Teachers, Postsecondary | 3 | 20 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 4 | 20% |
| | | | 20 | | | **High School Diploma** | **10** | **50%** |
| | | | 20 | | | **Associate Degree** | **6** | **30%** |
| | | | 20 | | | Bachelor's Degree | 0 | 0% |
| 27 | Career/Technical Education Teachers, Secondary School | 3 | 20 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 4 | 20% |
| | | | 20 | | | **High School Diploma** | **10** | **50%** |
| | | | 20 | | | **Associate Degree** | **6** | **30%** |
| | | | 20 | | | Bachelor's Degree | 0 | 0% |
| 28 | Cartographers and Photogrammetrists | 1 | 4 | Bachelor's Degree | High School Diploma | Eighth Grade | 0 | 0% |
| | | | 4 | | | **High School Diploma** | **3** | **75%** |
| | | | 4 | | | Associate Degree | 1 | 25% |
| | | | 4 | | | Bachelor's Degree | 0 | 0% |
| 29 | Chemical Engineers | 1 | 5 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 5 | | | High School Diploma | 0 | 0% |
| | | | 5 | | | **Associate Degree** | **3** | **60%** |
| | | | 5 | | | **Bachelor's Degree** | **2** | **40%** |
| 30 | Chemists | 2 | 4 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 0 | 0% |
| | | | 4 | | | Associate Degree | 1 | 25% |
| | | | 4 | | | **Bachelor's Degree** | **3** | **75%** |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 31 | Chief Executives | 3 | 73 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 73 | | | High School Diploma | 3 | 4% |
| | | | 73 | | | **Associate Degree** | **66** | **90%** |
| | | | 73 | | | Bachelor's Degree | 4 | 5% |
| 32 | Child, Family, and School Social Workers | 4 | 15 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 15 | | | High School Diploma | 1 | 7% |
| | | | 15 | | | **Associate Degree** | **13** | **87%** |
| | | | 15 | | | Bachelor's Degree | 0 | 0% |
| 33 | Civil Engineers | 3 | 13 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 13 | | | High School Diploma | 0 | 0% |
| | | | 13 | | | **Associate Degree** | **12** | **92%** |
| | | | 13 | | | Bachelor's Degree | 1 | 8% |
| 34 | Clergy | 1 | 1 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | **Bachelor's Degree** | **1** | **100%** |
| 35 | Clinical Technologists and Technicians | 6 | 13 | Bachelor's Degree | Associate Degree | Eighth Grade | 1 | 8% |
| | | | 13 | | | High School Diploma | 1 | 8% |
| | | | 13 | | | **Associate Degree** | **10** | **77%** |
| | | | 13 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 36 | Coaches and Scouts | 1 | 3 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | **High School Diploma** | **1** | **33%** |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 37 | Commercial and Industrial Designers | 1 | 9 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 9 | | | **High School Diploma** | **3** | **33%** |
| | | | 9 | | | **Associate Degree** | **6** | **67%** |
| | | | 9 | | | Bachelor's Degree | 0 | 0% |
| 38 | Community and Social Service Specialists, All Other | 1 | 0 | Bachelor's Degree | Bachelor's Degree (N/A) | Eighth Grade | 0 | N/A |
| | | | 0 | | | High School Diploma | 0 | N/A |
| | | | 0 | | | Associate Degree | 0 | N/A |
| | | | 0 | | | Bachelor's Degree | 0 | N/A |
| 39 | Compensation and Benefits Managers | 1 | 2 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | **High School Diploma** | **1** | **50%** |
| | | | 2 | | | **Associate Degree** | **1** | **50%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 40 | Compensation , Benefits, and Job Analysis Specialists | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 41 | Compliance Officers | 7 | 20 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 2 | 10% |
| | | | 20 | | | **High School Diploma** | **7** | **35%** |
| | | | 20 | | | **Associate Degree** | **11** | **55%** |
| | | | 20 | | | Bachelor's Degree | 0 | 0% |
| 42 | Computer and Information Systems Managers | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 43 | Computer Hardware Engineers | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 44 | Computer Network Architects | 2 | 3 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **1** | **33%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 45 | Computer Occupations, All Other | 10 | 7 | Bachelor's Degree | Eighth Grade; Associate Degree | **Eighth Grade** | **2** | **29%** |
| | | | 7 | | | High School Diploma | 1 | 14% |
| | | | 7 | | | **Associate Degree** | **3** | **43%** |
| | | | 7 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 46 | Computer Programmers | 1 | 3 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | **Bachelor's Degree** | **1** | **33%** |
| 47 | Computer Systems Analysts | 2 | 4 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 0 | 0% |
| | | | 4 | | | **Associate Degree** | **4** | **100%** |
| | | | 4 | | | Bachelor's Degree | 0 | 0% |
| 48 | Conservation Scientists | 4 | 6 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 6 | | | High School Diploma | 0 | 0% |
| | | | 6 | | | **Associate Degree** | **3** | **50%** |
| | | | 6 | | | **Bachelor's Degree** | **3** | **50%** |
| 49 | Construction Managers | 1 | 9 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 9 | | | **High School Diploma** | **4** | **44%** |
| | | | 9 | | | **Associate Degree** | **5** | **56%** |
| | | | 9 | | | Bachelor's Degree | 0 | 0% |
| 50 | Cost Estimators | 1 | 1 | Bachelor's Degree | High School Diploma | Eighth Grade | 0 | 0% |
| | | | 1 | | | **High School Diploma** | **1** | **100%** |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 51 | Credit Analysts | 1 | 3 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | **High School Diploma** | **1** | **33%** |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 52 | Credit Counselors | 1 | 0 | Bachelor's Degree | Bachelor's Degree (N/A) | Eighth Grade | 0 | N/A |
| | | | 0 | | | High School Diploma | 0 | N/A |
| | | | 0 | | | Associate Degree | 0 | N/A |
| | | | 0 | | | Bachelor's Degree | 0 | N/A |
| 53 | Data Scientists | 3 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 54 | Database Administrators | 3 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 55 | Database Architects | 3 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 56 | Designer, All Other | 1 | 0 | Bachelor's Degree | Bachelor's Degree (N/A) | Eighth Grade | 0 | N/A |
| | | | 0 | | | High School Diploma | 0 | N/A |
| | | | 0 | | | Associate Degree | 0 | N/A |
| | | | 0 | | | Bachelor's Degree | 0 | N/A |
| 57 | Dietitians and Nutritionists | 1 | 6 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 6 | | | High School Diploma | 0 | 0% |
| | | | 6 | | | **Associate Degree** | **5** | **83%** |
| | | | 6 | | | Bachelor's Degree | 1 | 17% |
| 58 | Directors, Religious Activities, and Education | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 59 | Editors | 1 | 18 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 18 | | | High School Diploma | 2 | 11% |
| | | | 18 | | | **Associate Degree** | **9** | **50%** |
| | | | 18 | | | **Bachelor's Degree** | **7** | **39%** |
| 60 | Education Administrators, All Other | 1 | 4 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 0 | 0% |
| | | | 4 | | | **Associate Degree** | **3** | **75%** |
| | | | 4 | | | Bachelor's Degree | 1 | 25% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 61 | Education and Childcare Administrators, Preschool and Daycare | 1 | 5 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 5 | | | High School Diploma | 1 | 20% |
| | | | 5 | | | **Associate Degree** | **3** | **60%** |
| | | | 5 | | | Bachelor's Degree | 1 | 20% |
| 62 | Educational Instruction and Library Workers, All Other | 1 | 4 | Bachelor's Degree | Eighth Grade - Associate Degree | **Eighth Grade** | **2** | **50%** |
| | | | 4 | | | **High School Diploma** | **1** | **25%** |
| | | | 4 | | | **Associate Degree** | **1** | **25%** |
| | | | 4 | | | Bachelor's Degree | 0 | 0% |
| 63 | Electrical Engineers | 3 | 27 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 27 | | | High School Diploma | 0 | 0% |
| | | | 27 | | | **Associate Degree** | **23** | **85%** |
| | | | 27 | | | Bachelor's Degree | 4 | 15% |
| 64 | Electronics Engineers, except Computer | 3 | 27 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 27 | | | High School Diploma | 0 | 0% |
| | | | 27 | | | **Associate Degree** | **23** | **85%** |
| | | | 27 | | | Bachelor's Degree | 4 | 15% |
| 65 | Elementary School Teachers, except Special Education | 2 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 66 | Emergency Management Directors | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 67 | Engineers, All Other | 9 | 13 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 13 | | | High School Diploma | 0 | 0% |
| | | | 13 | | | **Associate Degree** | **7** | **54%** |
| | | | 13 | | | **Bachelor's Degree** | **6** | **46%** |
| 68 | Entertainment and Recreation Managers, except Gambling | 1 | 81 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 1 | 1% |
| | | | 81 | | | **High School Diploma** | **35** | **43%** |
| | | | 81 | | | **Associate Degree** | **43** | **53%** |
| | | | 81 | | | Bachelor's Degree | 2 | 2% |
| 69 | Environmental Engineers | 1 | 2 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | Associate Degree | 0 | 0% |
| | | | 2 | | | **Bachelor's Degree** | **2** | **100%** |
| 70 | Environmental Scientists and Specialists, including Health | 4 | 2 | Bachelor's Degree | High School Diploma; Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | **High School Diploma** | **1** | **50%** |
| | | | 2 | | | Associate Degree | 0 | 0% |
| | | | 2 | | | **Bachelor's Degree** | **1** | **50%** |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 71 | Exercise Physiologists | 1 | 0 | Bachelor's Degree | Bachelor's Degree (N/A) | Eighth Grade | 0 | N/A |
| | | | 0 | | | High School Diploma | 0 | N/A |
| | | | 0 | | | Associate Degree | 0 | N/A |
| | | | 0 | | | Bachelor's Degree | 0 | N/A |
| 72 | Facilities Managers | 3 | 8 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 8 | | | **High School Diploma** | **3** | **38%** |
| | | | 8 | | | **Associate Degree** | **5** | **63%** |
| | | | 8 | | | Bachelor's Degree | 0 | 0% |
| 73 | Fashion Designers | 1 | 3 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | **High School Diploma** | **2** | **67%** |
| | | | 3 | | | **Associate Degree** | **1** | **33%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 74 | Film and Video Editors | 2 | 9 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 1 | 11% |
| | | | 9 | | | **High School Diploma** | **5** | **56%** |
| | | | 9 | | | **Associate Degree** | **3** | **33%** |
| | | | 9 | | | Bachelor's Degree | 0 | 0% |
| 75 | Financial and Investment Analysts | 2 | 3 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **3** | **100%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 76 | Financial Examiners | 1 | 3 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 77 | Financial Managers | 3 | 14 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 14 | | | High School Diploma | 1 | 7% |
| | | | 14 | | | **Associate Degree** | **13** | **93%** |
| | | | 14 | | | Bachelor's Degree | 0 | 0% |
| 78 | Financial Risk Specialists | 2 | 3 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **3** | **100%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 79 | Financial Specialists, All Other | 3 | 3 | Bachelor's Degree | High School Diploma - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | **High School Diploma** | **1** | **33%** |
| | | | 3 | | | **Associate Degree** | **1** | **33%** |
| | | | 3 | | | **Bachelor's Degree** | **1** | **33%** |
| 80 | Fine Arts, including Painters, Sculptors, and Illustrators | 3 | 19 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 19 | | | High School Diploma | 2 | 11% |
| | | | 19 | | | **Associate Degree** | **17** | **89%** |
| | | | 19 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 81 | Fish and Game Wardens | 7 | 40 | Bachelor's Degree | High School Diploma | Eighth Grade | 8 | 20% |
| | | | 40 | | | **High School Diploma** | **23** | **58%** |
| | | | 40 | | | Associate Degree | 7 | 18% |
| | | | 40 | | | Bachelor's Degree | 0 | 0% |
| 82 | Food Scientists and Technologists | 3 | 13 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 13 | | | High School Diploma | 0 | 0% |
| | | | 13 | | | Associate Degree | 0 | 0% |
| | | | 13 | | | **Bachelor's Degree** | **13** | **100%** |
| 83 | Forensic Science Technicians | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 84 | Foresters | 4 | 6 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 6 | | | High School Diploma | 0 | 0% |
| | | | 6 | | | **Associate Degree** | **3** | **50%** |
| | | | 6 | | | **Bachelor's Degree** | **3** | **50%** |
| 85 | Fundraisers | 1 | 0 | Bachelor's Degree | Bachelor's Degree (N/A) | Eighth Grade | 0 | N/A |
| | | | 0 | | | High School Diploma | 0 | N/A |
| | | | 0 | | | Associate Degree | 0 | N/A |
| | | | 0 | | | Bachelor's Degree | 0 | N/A |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 86 | Fundraising Managers | 2 | 5 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 5 | | | High School Diploma | 0 | 0% |
| | | | 5 | | | **Associate Degree** | **5** | **100%** |
| | | | 5 | | | Bachelor's Degree | 0 | 0% |
| 87 | General and Operations Managers | 3 | 73 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 73 | | | High School Diploma | 3 | 4% |
| | | | 73 | | | **Associate Degree** | **66** | **90%** |
| | | | 73 | | | Bachelor's Degree | 4 | 5% |
| 88 | Geographers | 1 | 2 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | Associate Degree | 0 | 0% |
| | | | 2 | | | **Bachelor's Degree** | **2** | **100%** |
| 89 | Geoscientists, except Hydrologists and Geographers | 1 | 10 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 10 | | | High School Diploma | 1 | 10% |
| | | | 10 | | | Associate Degree | 0 | 0% |
| | | | 10 | | | **Bachelor's Degree** | **9** | **90%** |
| 90 | Graphic Designers | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 91 | Health and Safety Engineers, excepting Mining Safety Engineers and Inspectors | 2 | 6 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 6 | | | High School Diploma | 0 | 0% |
| | | | 6 | | | **Associate Degree** | **3** | **50%** |
| | | | 6 | | | **Bachelor's Degree** | **3** | **50%** |
| 92 | Health Education Specialists | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 93 | Human Resources Managers | 1 | 8 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 8 | | | High School Diploma | 1 | 13% |
| | | | 8 | | | **Associate Degree** | **5** | **63%** |
| | | | 8 | | | Bachelor's Degree | 2 | 25% |
| 94 | Human Resources Specialists | 1 | 12 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 1 | 8% |
| | | | 12 | | | **High School Diploma** | **4** | **33%** |
| | | | 12 | | | **Associate Degree** | **6** | **50%** |
| | | | 12 | | | Bachelor's Degree | 1 | 8% |
| 95 | Hydrologists | 1 | 4 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 0 | 0% |
| | | | 4 | | | Associate Degree | 0 | 0% |
| | | | 4 | | | **Bachelor's Degree** | **4** | **100%** |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 96 | Industrial Engineers | 4 | 21 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 21 | | | High School Diploma | 2 | 10% |
| | | | 21 | | | **Associate Degree** | **16** | **76%** |
| | | | 21 | | | Bachelor's Degree | 3 | 14% |
| 97 | Industrial Production Managers | 6 | 16 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 16 | | | High School Diploma | 4 | 25% |
| | | | 16 | | | **Associate Degree** | **12** | **75%** |
| | | | 16 | | | Bachelor's Degree | 0 | 0% |
| 98 | Information Security Analysts | 1 | 3 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | **High School Diploma** | **1** | **33%** |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 99 | Insurance Underwriters | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 100 | Interior Designers | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 101 | Interpreters and Translators | 1 | 3 | Bachelor's Degree | High School Diploma - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | **High School Diploma** | **1** | **33%** |
| | | | 3 | | | **Associate Degree** | **1** | **33%** |
| | | | 3 | | | **Bachelor's Degree** | **1** | **33%** |
| 102 | Kindergarten Teachers, except Special Education | 2 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 103 | Labor Relations Specialists | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 104 | Landscape Architects | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 105 | Legislators | 1 | 0 | Bachelor's Degree | Bachelor's Degree (N/A) | Eighth Grade | 0 | N/A |
| | | | 0 | | | High School Diploma | 0 | N/A |
| | | | 0 | | | Associate Degree | 0 | N/A |
| | | | 0 | | | Bachelor's Degree | 0 | N/A |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 106 | Life Scientists, All Other | 1 | 1 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | **Bachelor's Degree** | **1** | **100%** |
| 107 | Loan Officers | 1 | 5 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 5 | | | High School Diploma | 1 | 20% |
| | | | 5 | | | **Associate Degree** | **4** | **80%** |
| | | | 5 | | | Bachelor's Degree | 0 | 0% |
| 108 | Logisticians | 3 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 109 | Management Analysts | 1 | 9 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 9 | | | **High School Diploma** | **3** | **33%** |
| | | | 9 | | | **Associate Degree** | **6** | **67%** |
| | | | 9 | | | Bachelor's Degree | 0 | 0% |
| 110 | Managers, All Other | 7 | 84 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 1 | 1% |
| | | | 84 | | | **High School Diploma** | **36** | **43%** |
| | | | 84 | | | **Associate Degree** | **45** | **54%** |
| | | | 84 | | | Bachelor's Degree | 2 | 2% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 111 | Marine Engineers and Naval Architects | 1 | 7 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 7 | | | High School Diploma | 0 | 0% |
| | | | 7 | | | **Associate Degree** | **5** | **71%** |
| | | | 7 | | | Bachelor's Degree | 2 | 29% |
| 112 | Market Research Analysts and Marketing Specialists | 2 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 113 | Marketing Managers | 2 | 13 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 13 | | | High School Diploma | 1 | 8% |
| | | | 13 | | | **Associate Degree** | **9** | **69%** |
| | | | 13 | | | Bachelor's Degree | 1 | 8% |
| 114 | Materials Engineers | 1 | 10 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 10 | | | High School Diploma | 0 | 0% |
| | | | 10 | | | **Associate Degree** | **7** | **70%** |
| | | | 10 | | | Bachelor's Degree | 3 | 30% |
| 115 | Materials Scientists | 2 | 4 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 0 | 0% |
| | | | 4 | | | **Associate Degree** | **2** | **50%** |
| | | | 4 | | | **Bachelor's Degree** | **2** | **50%** |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 116 | Mathematical Science Occupations, All Other | 2 | 3 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **3** | **100%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 117 | Mechanical Engineers | 3 | 11 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 11 | | | High School Diploma | 0 | 0% |
| | | | 11 | | | **Associate Degree** | **10** | **91%** |
| | | | 11 | | | Bachelor's Degree | 1 | 9% |
| 118 | Medical and Health Services Managers | 1 | 9 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 9 | | | High School Diploma | 1 | 11% |
| | | | 9 | | | **Associate Degree** | **5** | **56%** |
| | | | 9 | | | Bachelor's Degree | 2 | 22% |
| 119 | Medical Dosimetrists | 1 | 7 | Bachelor's Degree | High School Diploma | Eighth Grade | 1 | 14% |
| | | | 7 | | | **High School Diploma** | **5** | **71%** |
| | | | 7 | | | Associate Degree | 0 | 0% |
| | | | 7 | | | Bachelor's Degree | 0 | 0% |
| 120 | Meeting, Convention, and Event Planners | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **1** | **50%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 121 | Microbiologists | 1 | 1 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | Bachelor's Degree | 1 | 100% |
| 122 | Middle School Teachers, except Special and Career/Technical Education | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 123 | Mining and Geological Engineers, including Mining Safety Engineers | 1 | 6 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 6 | | | High School Diploma | 1 | 17% |
| | | | 6 | | | **Associate Degree** | **5** | **83%** |
| | | | 6 | | | Bachelor's Degree | 0 | 0% |
| 124 | Museum Technicians and Conservators | 3 | 21 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 1 | 5% |
| | | | 21 | | | **High School Diploma** | **6** | **29%** |
| | | | 21 | | | **Associate Degree** | **11** | **52%** |
| | | | 21 | | | Bachelor's Degree | 3 | 14% |
| 125 | Music Directors and Composers | 1 | 7 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 7 | | | High School Diploma | 0 | 0% |
| | | | 7 | | | **Associate Degree** | **4** | **57%** |
| | | | 7 | | | **Bachelor's Degree** | **3** | **43%** |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 126 | Natural Sciences Managers | 3 | 4 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 0 | 0% |
| | | | 4 | | | **Associate Degree** | **2** | **50%** |
| | | | 4 | | | **Bachelor's Degree** | **2** | **50%** |
| 127 | Network and Computer Systems Administrators | 1 | 0 | Bachelor's Degree | Bachelor's Degree (N/A) | Eighth Grade | 0 | N/A |
| | | | 0 | | | High School Diploma | 0 | N/A |
| | | | 0 | | | Associate Degree | 0 | N/A |
| | | | 0 | | | Bachelor's Degree | 0 | N/A |
| 128 | News Analysts, Reporters, and Journalists | 1 | 4 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 0 | 0% |
| | | | 4 | | | **Associate Degree** | **3** | **75%** |
| | | | 4 | | | Bachelor's Degree | 1 | 25% |
| 129 | Nuclear Engineers | 1 | 11 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 11 | | | High School Diploma | 0 | 0% |
| | | | 11 | | | **Associate Degree** | **6** | **55%** |
| | | | 11 | | | **Bachelor's Degree** | **5** | **45%** |
| 130 | Occupational Health and Safety Specialists | 2 | 16 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 16 | | | **High School Diploma** | **6** | **38%** |
| | | | 16 | | | **Associate Degree** | **9** | **56%** |
| | | | 16 | | | Bachelor's Degree | 1 | 6% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 131 | Operations Research Analysts | 1 | 1 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | **Bachelor's Degree** | **1** | **100%** |
| 132 | Personal Financial Advisors | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 133 | Petroleum Engineers | 1 | 7 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 7 | | | High School Diploma | 0 | 0% |
| | | | 7 | | | **Associate Degree** | **5** | **71%** |
| | | | 7 | | | Bachelor's Degree | 2 | 29% |
| 134 | Physical Scientists, All Other | 2 | 2 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | Associate Degree | 0 | 0% |
| | | | 2 | | | **Bachelor's Degree** | **2** | **100%** |
| 135 | Probation Officers and Correctional Treatment Specialists | 1 | 4 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 1 | 25% |
| | | | 4 | | | **Associate Degree** | **3** | **75%** |
| | | | 4 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 136 | Producers and Directors | 4 | 24 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 24 | | | High School Diploma | 6 | 25% |
| | | | 24 | | | **Associate Degree** | **16** | **67%** |
| | | | 24 | | | Bachelor's Degree | 2 | 8% |
| 137 | Project Management Specialists | 1 | 118 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 3 | 3% |
| | | | 118 | | | **High School Diploma** | **48** | **41%** |
| | | | 118 | | | **Associate Degree** | **58** | **49%** |
| | | | 118 | | | Bachelor's Degree | 5 | 4% |
| 138 | Proofreaders and Copy Markers | 1 | 5 | Bachelor's Degree | Eighth Grade - High School Diploma | **Eighth Grade** | **2** | **40%** |
| | | | 5 | | | **High School Diploma** | **3** | **60%** |
| | | | 5 | | | Associate Degree | 0 | 0% |
| | | | 5 | | | Bachelor's Degree | 0 | 0% |
| 139 | Property Appraisers and Assessors | 2 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 140 | Public Relations Managers | 2 | 5 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 5 | | | High School Diploma | 0 | 0% |
| | | | 5 | | | **Associate Degree** | **5** | **100%** |
| | | | 5 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 141 | Public Relations Specialists | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 142 | Purchasing Managers | 4 | 17 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 17 | | | **High School Diploma** | **7** | **41%** |
| | | | 17 | | | **Associate Degree** | **10** | **59%** |
| | | | 17 | | | Bachelor's Degree | 0 | 0% |
| 143 | Recreational Therapists | 1 | 5 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 5 | | | High School Diploma | 1 | 20% |
| | | | 5 | | | **Associate Degree** | **4** | **80%** |
| | | | 5 | | | Bachelor's Degree | 0 | 0% |
| 144 | Registered Nurses | 5 | 13 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 13 | | | High School Diploma | 0 | 0% |
| | | | 13 | | | **Associate Degree** | **13** | **100%** |
| | | | 13 | | | Bachelor's Degree | 0 | 0% |
| 145 | Religious Workers, All Other | 1 | 6 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 6 | | | **High School Diploma** | **2** | **33%** |
| | | | 6 | | | **Associate Degree** | **4** | **67%** |
| | | | 6 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 146 | Sales Engineers | 1 | 10 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 10 | | | High School Diploma | 0 | 0% |
| | | | 10 | | | **Associate Degree** | **10** | **100%** |
| | | | 10 | | | Bachelor's Degree | 0 | 0% |
| 147 | Sales Managers | 1 | 9 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 9 | | | High School Diploma | 1 | 11% |
| | | | 9 | | | **Associate Degree** | **8** | **89%** |
| | | | 9 | | | Bachelor's Degree | 0 | 0% |
| 148 | Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products | 3 | 90 | Bachelor's Degree | High School Diploma | Eighth Grade | 1 | 1% |
| | | | 90 | | | **High School Diploma** | **80** | **89%** |
| | | | 90 | | | Associate Degree | 9 | 10% |
| | | | 90 | | | Bachelor's Degree | 0 | 0% |
| 149 | Secondary School Teachers, except Special and Career/Technical Education | 1 | 3 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **3** | **100%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 150 | Securities, Commodities, and Financial Services Sales Agents | 1 | 7 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 7 | | | High School Diploma | 2 | 29% |
| | | | 7 | | | **Associate Degree** | **5** | **71%** |
| | | | 7 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 151 | Set and Exhibit Designers | 1 | 7 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 7 | | | High School Diploma | 0 | 0% |
| | | | 7 | | | **Associate Degree** | **7** | **100%** |
| | | | 7 | | | Bachelor's Degree | 0 | 0% |
| 152 | Social and Community Service Managers | 1 | 13 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 13 | | | High School Diploma | 2 | 15% |
| | | | 13 | | | **Associate Degree** | **11** | **85%** |
| | | | 13 | | | Bachelor's Degree | 0 | 0% |
| 153 | Social Science Research Assistants | 1 | 0 | Bachelor's Degree | Bachelor's Degree (N/A) | Eighth Grade | 0 | N/A |
| | | | 0 | | | High School Diploma | 0 | N/A |
| | | | 0 | | | Associate Degree | 0 | N/A |
| | | | 0 | | | Bachelor's Degree | 0 | N/A |
| 154 | Social Scientists and Related Workers, All Other | 2 | 4 | Bachelor's Degree | High School Diploma - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | **High School Diploma** | **1** | **25%** |
| | | | 4 | | | **Associate Degree** | **1** | **25%** |
| | | | 4 | | | **Bachelor's Degree** | **2** | **50%** |
| 155 | Social Workers, All Other | 4 | 15 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 15 | | | High School Diploma | 1 | 7% |
| | | | 15 | | | **Associate Degree** | **13** | **87%** |
| | | | 15 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 156 | Software Developers | 2 | 2 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | **High School Diploma** | **1** | **50%** |
| | | | 2 | | | **Associate Degree** | **1** | **50%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 157 | Software Quality Assurance Analysts and Testers | 2 | 2 | Bachelor's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | **High School Diploma** | **1** | **50%** |
| | | | 2 | | | **Associate Degree** | **1** | **50%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 158 | Soil and Plant Scientists | 3 | 13 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 13 | | | High School Diploma | 0 | 0% |
| | | | 13 | | | Associate Degree | 0 | 0% |
| | | | 13 | | | **Bachelor's Degree** | **13** | **100%** |
| 159 | Special Education Teachers, All Other | 7 | 12 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 12 | | | High School Diploma | 0 | 0% |
| | | | 12 | | | **Associate Degree** | **12** | **100%** |
| | | | 12 | | | Bachelor's Degree | 0 | 0% |
| 160 | Special Education Teachers, Kindergarten and Elementary School | 7 | 12 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 12 | | | High School Diploma | 0 | 0% |
| | | | 12 | | | **Associate Degree** | **12** | **100%** |
| | | | 12 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 161 | Special Education Teachers, Middle School | 7 | 12 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 12 | | | High School Diploma | 0 | 0% |
| | | | 12 | | | **Associate Degree** | **12** | **100%** |
| | | | 12 | | | Bachelor's Degree | 0 | 0% |
| 162 | Special Education Teachers, Preschool | 7 | 12 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 12 | | | High School Diploma | 0 | 0% |
| | | | 12 | | | **Associate Degree** | **12** | **100%** |
| | | | 12 | | | Bachelor's Degree | 0 | 0% |
| 163 | Special Education Teachers, Secondary School | 7 | 12 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 12 | | | High School Diploma | 0 | 0% |
| | | | 12 | | | **Associate Degree** | **12** | **100%** |
| | | | 12 | | | Bachelor's Degree | 0 | 0% |
| 164 | Special Effects Artists and Animators | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 165 | Statistical Assistants | 1 | 7 | Bachelor's Degree | Eighth Grade | **Eighth Grade** | **6** | **86%** |
| | | | 7 | | | High School Diploma | 1 | 14% |
| | | | 7 | | | Associate Degree | 0 | 0% |
| | | | 7 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 166 | Substance Abuse, Behavioral Disorder, and Mental Health Counselors | 2 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **1** | **50%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 167 | Substitute Teachers, Short-Term | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 168 | Surveyors | 2 | 8 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 8 | | | High School Diploma | 0 | 0% |
| | | | 8 | | | **Associate Degree** | **6** | **75%** |
| | | | 8 | | | Bachelor's Degree | 2 | 25% |
| 169 | Tax Examiners and Collectors, and Revenue Agents | 1 | 2 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | **Associate Degree** | **2** | **100%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 170 | Teachers and Instructors, All Other | 1 | 1 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 171 | Teaching Assistants, Postsecondary | 1 | 1 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | **Bachelor's Degree** | **1** | **100%** |
| 172 | Technical Writers | 1 | 3 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | **Bachelor's Degree** | **1** | **33%** |
| 173 | Therapists, All Other | 3 | 6 | Bachelor's Degree | High School Diploma | Eighth Grade | 1 | 17% |
| | | | 6 | | | **High School Diploma** | **3** | **50%** |
| | | | 6 | | | Associate Degree | 1 | 17% |
| | | | 6 | | | Bachelor's Degree | 0 | 0% |
| 174 | Training and Development Managers | 1 | 4 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 1 | 25% |
| | | | 4 | | | **Associate Degree** | **3** | **75%** |
| | | | 4 | | | Bachelor's Degree | 0 | 0% |
| 175 | Training and Development Specialists | 1 | 5 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 5 | | | High School Diploma | 1 | 20% |
| | | | 5 | | | **Associate Degree** | **4** | **80%** |
| | | | 5 | | | Bachelor's Degree | 0 | 0% |

Table 11. Occupations Requiring a Bachelor's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # SOC Occupations | # DOT Occupations | 2022 Education Requirement | 1977-1999 Education Requirement | 1977-1999 Education Requirement Breakdown | | 1977-1999 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 176 | Web and Digital Interface Designers | 3 | 3 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 177 | Web Developers | 3 | 3 | Bachelor's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 178 | Writers and Authors | 2 | 14 | Bachelor's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 14 | | | High School Diploma | 0 | 0% |
| | | | 14 | | | **Associate Degree** | **5** | **36%** |
| | | | 14 | | | **Bachelor's Degree** | **9** | **64%** |
| 179 | Zoologists and Wildlife Biologists | 1 | 1 | Bachelor's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | **Bachelor's Degree** | **1** | **100%** |

Table 12. Occupations Requiring a Master's Degree in 2022:
Summary of Assignment of Historic Education Requirements

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 1 | Acupuncturists | 1 | 1 | Master's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | **Bachelor's Degree** | **1** | **100%** |
| 2 | Anthropologists and Archaeologists | 1 | 4 | Master's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 0 | 0% |
| | | | 4 | | | Associate Degree | 0 | 0% |
| | | | 4 | | | **Bachelor's Degree** | **4** | **100%** |
| 3 | Archivists | 3 | 21 | Master's Degree | High School Diploma - Associate Degree | Eighth Grade | 1 | 5% |
| | | | 21 | | | **High School Diploma** | **6** | **29%** |
| | | | 21 | | | **Associate Degree** | **11** | **52%** |
| | | | 21 | | | Bachelor's Degree | 3 | 14% |
| 4 | Art, Drama, and Music Teachers, Postsecondary | 35 | 4 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 0 | 0% |
| | | | 4 | | | **Associate Degree** | **3** | **75%** |
| | | | 4 | | | Bachelor's Degree | 1 | 25% |
| 5 | Athletic Trainers | 1 | 1 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |

Table 12. Occupations Requiring a Master's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 6 | Computer and Information Research Scientists | 1 | 4 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 4 | | | High School Diploma | 0 | 0% |
| | | | 4 | | | **Associate Degree** | **4** | **100%** |
| | | | 4 | | | Bachelor's Degree | 0 | 0% |
| 7 | Counselors, All Other | 1 | 0 | Master's Degree | Master's Degree | Eighth Grade | 0 | N/A |
| | | | 0 | | | High School Diploma | 0 | N/A |
| | | | 0 | | | Associate Degree | 0 | N/A |
| | | | 0 | | | Bachelor's Degree | 0 | N/A |
| 8 | Curators | 3 | 21 | Master's Degree | High School Diploma - Associate Degree | Eighth Grade | 1 | 5% |
| | | | 21 | | | **High School Diploma** | **6** | **29%** |
| | | | 21 | | | **Associate Degree** | **11** | **52%** |
| | | | 21 | | | Bachelor's Degree | 3 | 14% |
| 9 | Economists | 2 | 1 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 10 | Education Administrators, Kindergarten through Secondary | 1 | 7 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 7 | | | High School Diploma | 0 | 0% |
| | | | 7 | | | **Associate Degree** | **6** | **86%** |
| | | | 7 | | | Bachelor's Degree | 1 | 14% |

Table 12. Occupations Requiring a Master's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 11 | Education Administrators, Postsecondary | 1 | 14 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 14 | | | High School Diploma | 0 | 0% |
| | | | 14 | | | **Associate Degree** | **11** | **79%** |
| | | | 14 | | | Bachelor's Degree | 3 | 21% |
| 12 | Educational, Guidance, and Career Counselors and Advisors | 1 | 8 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 8 | | | High School Diploma | 0 | 0% |
| | | | 8 | | | **Associate Degree** | **7** | **88%** |
| | | | 8 | | | Bachelor's Degree | 0 | 0% |
| 13 | Epidemiologists | 1 | 2 | Master's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | High School Diploma | 0 | 0% |
| | | | 2 | | | Associate Degree | 0 | 0% |
| | | | 2 | | | **Bachelor's Degree** | **2** | **100%** |
| 14 | Farm and Home Management Educators | 1 | 5 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 5 | | | High School Diploma | 1 | 20% |
| | | | 5 | | | **Associate Degree** | **4** | **80%** |
| | | | 5 | | | Bachelor's Degree | 0 | 0% |
| 15 | Genetic Counselors | 1 | 0 | Master's Degree | Master's Degree | Eighth Grade | 0 | N/A |
| | | | 0 | | | High School Diploma | 0 | N/A |
| | | | 0 | | | Associate Degree | 0 | N/A |
| | | | 0 | | | Bachelor's Degree | 0 | N/A |

Table 12. Occupations Requiring a Master's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 16 | Healthcare Diagnosing or Treating Practitioners, All Other | 3 | 3 | Master's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | **High School Diploma** | **1** | **33%** |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 17 | Healthcare Social Workers | 4 | 15 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 15 | | | High School Diploma | 1 | 7% |
| | | | 15 | | | **Associate Degree** | **13** | **87%** |
| | | | 15 | | | Bachelor's Degree | 0 | 0% |
| 18 | Historians | 1 | 5 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 5 | | | High School Diploma | 0 | 0% |
| | | | 5 | | | **Associate Degree** | **5** | **100%** |
| | | | 5 | | | Bachelor's Degree | 0 | 0% |
| 19 | Industrial-Organizational Psychologists | 6 | 12 | Master's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 12 | | | High School Diploma | 0 | 0% |
| | | | 12 | | | Associate Degree | 2 | 17% |
| | | | 12 | | | **Bachelor's Degree** | **10** | **83%** |
| 20 | Instructional Coordinators | 1 | 6 | Master's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 6 | | | High School Diploma | 0 | 0% |
| | | | 6 | | | **Associate Degree** | **4** | **67%** |
| | | | 6 | | | **Bachelor's Degree** | **2** | **33%** |

Table 12. Occupations Requiring a Master's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 21 | Librarians and Media Collections Specialists | 1 | 16 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 16 | | | High School Diploma | 4 | 25% |
| | | | 16 | | | **Associate Degree** | **11** | **69%** |
| | | | 16 | | | Bachelor's Degree | 1 | 6% |
| 22 | Marriage and Family Therapists | 1 | 1 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 23 | Mathematicians | 3 | 3 | Master's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **1** | **33%** |
| | | | 3 | | | **Bachelor's Degree** | **2** | **67%** |
| 24 | Mental Health and Substance Abuse Social Workers | 4 | 15 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 15 | | | High School Diploma | 1 | 7% |
| | | | 15 | | | **Associate Degree** | **13** | **87%** |
| | | | 15 | | | Bachelor's Degree | 0 | 0% |
| 25 | Nurse Anesthetists | 3 | 3 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **3** | **100%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |

Table 12. Occupations Requiring a Master's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 26 | Nurse Midwives | 3 | 3 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **3** | **100%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 27 | Nurse Practitioners | 3 | 3 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **3** | **100%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 28 | Occupational Therapists | 2 | 3 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **3** | **100%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 29 | Orthotists and Prosthetists | 1 | 5 | Master's Degree | High School Diploma - Associate Degree | Eighth Grade | 1 | 20% |
| | | | 5 | | | **High School Diploma** | **2** | **40%** |
| | | | 5 | | | **Associate Degree** | **2** | **40%** |
| | | | 5 | | | Bachelor's Degree | 0 | 0% |
| 30 | Physician Assistants | 2 | 2 | Master's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 2 | | | **High School Diploma** | **1** | **50%** |
| | | | 2 | | | **Associate Degree** | **1** | **50%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |

Table 12. Occupations Requiring a Master's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 31 | Political Scientists | 1 | 1 | Master's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | **Bachelor's Degree** | **1** | **100%** |
| 32 | Psychologists, All Other | 6 | 12 | Master's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 12 | | | High School Diploma | 0 | 0% |
| | | | 12 | | | Associate Degree | 2 | 17% |
| | | | 12 | | | **Bachelor's Degree** | **10** | **83%** |
| 33 | Rehabilitation Counselors | 1 | 3 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **3** | **100%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 34 | School Psychologists | 6 | 12 | Master's Degree | Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 12 | | | High School Diploma | 0 | 0% |
| | | | 12 | | | Associate Degree | 2 | 17% |
| | | | 12 | | | **Bachelor's Degree** | **10** | **83%** |
| 35 | Sociologists | 1 | 3 | Master's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **1** | **33%** |
| | | | 3 | | | **Bachelor's Degree** | **2** | **67%** |

Table 12. Occupations Requiring a Master's Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 36 | Speech-Language Pathologists | 1 | 3 | Master's Degree | Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 37 | Statisticians | 3 | 3 | Master's Degree | Associate Degree - Bachelor's Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **1** | **33%** |
| | | | 3 | | | **Bachelor's Degree** | **2** | **67%** |
| 38 | Survey Researchers | 1 | 0 | Master's Degree | Master's Degree | Eighth Grade | 0 | N/A |
| | | | 0 | | | High School Diploma | 0 | N/A |
| | | | 0 | | | Associate Degree | 0 | N/A |
| | | | 0 | | | Bachelor's Degree | 0 | N/A |
| 39 | Urban and Regional Planners | 1 | 3 | Master's Degree | High School Diploma - Associate Degree | Eighth Grade | 0 | 0% |
| | | | 3 | | | **High School Diploma** | **1** | **33%** |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 1 | Aerospace Engineering and Operations Technologists and Technicians | 1 | 4 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 4 | | | Eighth Grade | 0 | 0% |
| | | | 4 | | | **High School Diploma** | **3** | **75%** |
| | | | 4 | | | Associate Degree | 1 | 25% |
| | | | 4 | | | Bachelor's Degree | 0 | 0% |
| 2 | Agricultural Technicians | 3 | 11 | Associate Degree | Eighth Grade - High School Diploma | Sixth Grade | 0 | 0% |
| | | | 11 | | | **Eighth Grade** | **5** | **45%** |
| | | | 11 | | | **High School Diploma** | **6** | **55%** |
| | | | 11 | | | Associate Degree | 0 | 0% |
| | | | 11 | | | Bachelor's Degree | 0 | 0% |
| 3 | Air Traffic Controllers | 1 | 5 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 5 | | | Eighth Grade | 0 | 0% |
| | | | 5 | | | **High School Diploma** | **3** | **60%** |
| | | | 5 | | | **Associate Degree** | **2** | **40%** |
| | | | 5 | | | Bachelor's Degree | 0 | 0% |
| 4 | Architectural and Civil Drafters | 4 | 43 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 43 | | | Eighth Grade | 1 | 2% |
| | | | 43 | | | **High School Diploma** | **17** | **40%** |
| | | | 43 | | | **Associate Degree** | **24** | **56%** |
| | | | 43 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 5 | Avionics Technicians | 2 | 10 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 10 | | | Eighth Grade | 2 | 20% |
| | | | 10 | | | **High School Diploma** | **8** | **80%** |
| | | | 10 | | | Associate Degree | 0 | 0% |
| | | | 10 | | | Bachelor's Degree | 0 | 0% |
| 6 | Broadcast Technicians | 4 | 28 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 28 | | | Eighth Grade | 3 | 11% |
| | | | 28 | | | **High School Diploma** | **20** | **71%** |
| | | | 28 | | | Associate Degree | 5 | 18% |
| | | | 28 | | | Bachelor's Degree | 0 | 0% |
| 7 | Calibration Technologists | 1 | 9 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 9 | | | Eighth Grade | 0 | 0% |
| | | | 9 | | | **High School Diploma** | **6** | **67%** |
| | | | 9 | | | **Associate Degree** | **3** | **33%** |
| | | | 9 | | | Bachelor's Degree | 0 | 0% |
| 8 | Cardiovascular Technologists | 2 | 10 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 10 | | | Eighth Grade | 3 | 30% |
| | | | 10 | | | **High School Diploma** | **5** | **50%** |
| | | | 10 | | | Associate Degree | 2 | 20% |
| | | | 10 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 9 | Chemical Technicians | 1 | 10 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 10 | | | Eighth Grade | 2 | 20% |
| | | | 10 | | | **High School Diploma** | **4** | **40%** |
| | | | 10 | | | **Associate Degree** | **4** | **40%** |
| | | | 10 | | | Bachelor's Degree | 0 | 0% |
| 10 | Civil Engineering Technologists and Technicians | 1 | 4 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 4 | | | Eighth Grade | 0 | 0% |
| | | | 4 | | | **High School Diploma** | **2** | **50%** |
| | | | 4 | | | **Associate Degree** | **2** | **50%** |
| | | | 4 | | | Bachelor's Degree | 0 | 0% |
| 11 | Computer Network Support Specialists | 2 | 9 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 9 | | | Eighth Grade | 0 | 0% |
| | | | 9 | | | **High School Diploma** | **5** | **56%** |
| | | | 9 | | | Associate Degree | 2 | 22% |
| | | | 9 | | | Bachelor's Degree | 0 | 0% |
| 12 | Dental Hygienists | 1 | 1 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 1 | | | Eighth Grade | 0 | 0% |
| | | | 1 | | | **High School Diploma** | **1** | **100%** |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 13 | Desktop Publishers | 1 | 1 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 1 | | | Eighth Grade | 0 | 0% |
| | | | 1 | | | **High School Diploma** | **1** | **100%** |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 14 | Diagnostic Medical Sonographers | 2 | 10 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 10 | | | Eighth Grade | 3 | 30% |
| | | | 10 | | | **High School Diploma** | **5** | **50%** |
| | | | 10 | | | Associate Degree | 2 | 20% |
| | | | 10 | | | Bachelor's Degree | 0 | 0% |
| 15 | Dietetic Technicians | 1 | 1 | Associate Degree | Associate Degree | Sixth Grade | 0 | 0% |
| | | | 1 | | | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 16 | Drafters, All Other | 4 | 43 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 43 | | | Eighth Grade | 1 | 2% |
| | | | 43 | | | **High School Diploma** | **17** | **40%** |
| | | | 43 | | | **Associate Degree** | **24** | **56%** |
| | | | 43 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 17 | Electrical and Electronic Engineering Technologists and Technicians | 1 | 18 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 18 | | | Eighth Grade | 0 | 0% |
| | | | 18 | | | **High School Diploma** | **11** | **61%** |
| | | | 18 | | | **Associate Degree** | **7** | **39%** |
| | | | 18 | | | Bachelor's Degree | 0 | 0% |
| 18 | Electrical and Electronics Drafters | 4 | 43 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 43 | | | Eighth Grade | 1 | 2% |
| | | | 43 | | | **High School Diploma** | **17** | **40%** |
| | | | 43 | | | **Associate Degree** | **24** | **56%** |
| | | | 43 | | | Bachelor's Degree | 0 | 0% |
| 19 | Electro-Mechanical and Mechatronics Technologists and Technicians | 2 | 4 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 4 | | | Eighth Grade | 0 | 0% |
| | | | 4 | | | **High School Diploma** | **3** | **75%** |
| | | | 4 | | | Associate Degree | 1 | 25% |
| | | | 4 | | | Bachelor's Degree | 0 | 0% |
| 20 | Embalmers | 1 | 2 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 2 | | | Eighth Grade | 0 | 0% |
| | | | 2 | | | **High School Diploma** | **2** | **100%** |
| | | | 2 | | | Associate Degree | 0 | 0% |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 21 | Engineering Technologists and Technicians, except Drafters, All Other | 3 | 11 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 11 | | | Eighth Grade | 0 | 0% |
| | | | 11 | | | **High School Diploma** | **7** | **64%** |
| | | | 11 | | | **Associate Degree** | **4** | **36%** |
| | | | 11 | | | Bachelor's Degree | 0 | 0% |
| 22 | Environmental Engineering Technologists and Technicians | 1 | 2 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 2 | | | Eighth Grade | 0 | 0% |
| | | | 2 | | | **High School Diploma** | **1** | **50%** |
| | | | 2 | | | **Associate Degree** | **1** | **50%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 23 | Environmental Science and Protection Technicians, including Health | 1 | 8 | Associate Degree | Associate Degree | Sixth Grade | 0 | 0% |
| | | | 8 | | | Eighth Grade | 0 | 0% |
| | | | 8 | | | High School Diploma | 2 | 25% |
| | | | 8 | | | **Associate Degree** | **4** | **50%** |
| | | | 8 | | | Bachelor's Degree | 1 | 13% |
| 24 | Food Science Technicians | 3 | 11 | Associate Degree | Eighth Grade - High School Diploma | Sixth Grade | 0 | 0% |
| | | | 11 | | | **Eighth Grade** | **5** | **45%** |
| | | | 11 | | | **High School Diploma** | **6** | **55%** |
| | | | 11 | | | Associate Degree | 0 | 0% |
| | | | 11 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 25 | Forest and Conservation Technicians | 1 | 2 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 2 | | | Eighth Grade | 0 | 0% |
| | | | 2 | | | **High School Diploma** | **1** | **50%** |
| | | | 2 | | | **Associate Degree** | **1** | **50%** |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 26 | Funeral Home Managers | 2 | 1 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 1 | | | Eighth Grade | 0 | 0% |
| | | | 1 | | | **High School Diploma** | **1** | **100%** |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 27 | Geological Technicians, except Hydrologic Technicians | 2 | 24 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 24 | | | Eighth Grade | 3 | 13% |
| | | | 24 | | | **High School Diploma** | **14** | **58%** |
| | | | 24 | | | Associate Degree | 7 | 29% |
| | | | 24 | | | Bachelor's Degree | 0 | 0% |
| 28 | Health Information Technologists and Medical Registrars | 1 | 8 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 8 | | | Eighth Grade | 0 | 0% |
| | | | 8 | | | **High School Diploma** | **3** | **38%** |
| | | | 8 | | | **Associate Degree** | **4** | **50%** |
| | | | 8 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 29 | Human Resources Assistants, except Payroll and Timekeeping | 10 | 63 | Associate Degree | Eighth Grade - High School Diploma | Sixth Grade | 1 | 2% |
| | | | 63 | | | **Eighth Grade** | **38** | **60%** |
| | | | 63 | | | **High School Diploma** | **20** | **32%** |
| | | | 63 | | | Associate Degree | 3 | 5% |
| | | | 63 | | | Bachelor's Degree | 0 | 0% |
| 30 | Hydrologic Technicians | 2 | 24 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 24 | | | Eighth Grade | 3 | 13% |
| | | | 24 | | | **High School Diploma** | **14** | **58%** |
| | | | 24 | | | **Associate Degree** | **7** | **29%** |
| | | | 24 | | | Bachelor's Degree | 0 | 0% |
| 31 | Industrial Engineering Technologists and Technicians | 2 | 6 | Associate Degree | Associate Degree | Sixth Grade | 0 | 0% |
| | | | 6 | | | Eighth Grade | 1 | 17% |
| | | | 6 | | | High School Diploma | 0 | 0% |
| | | | 6 | | | **Associate Degree** | **4** | **67%** |
| | | | 6 | | | Bachelor's Degree | 0 | 0% |
| 32 | Legal Support Workers, All Other | 1 | 3 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 3 | | | Eighth Grade | 0 | 0% |
| | | | 3 | | | **High School Diploma** | **2** | **67%** |
| | | | 3 | | | **Associate Degree** | **1** | **33%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 33 | Life, Physical, and Social Science Technicians, All Other | 3 | 10 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 10 | | | Eighth Grade | 2 | 20% |
| | | | 10 | | | **High School Diploma** | **4** | **40%** |
| | | | 10 | | | **Associate Degree** | **4** | **40%** |
| | | | 10 | | | Bachelor's Degree | 0 | 0% |
| 34 | Magnetic Resonance Imaging Technologists | 2 | 6 | Associate Degree | Associate Degree | Sixth Grade | 0 | 0% |
| | | | 6 | | | Eighth Grade | 0 | 0% |
| | | | 6 | | | High School Diploma | 0 | 0% |
| | | | 6 | | | **Associate Degree** | **6** | **100%** |
| | | | 6 | | | Bachelor's Degree | 0 | 0% |
| 35 | Mechanical Drafters | 4 | 43 | Associate Degree | High School Diploma - Associate Degree | Sixth Grade | 0 | 0% |
| | | | 43 | | | Eighth Grade | 1 | 2% |
| | | | 43 | | | **High School Diploma** | **17** | **40%** |
| | | | 43 | | | **Associate Degree** | **24** | **56%** |
| | | | 43 | | | Bachelor's Degree | 0 | 0% |
| 36 | Mechanical Engineering Technologists and Technicians | 2 | 8 | Associate Degree | Associate Degree | Sixth Grade | 0 | 0% |
| | | | 8 | | | Eighth Grade | 0 | 0% |
| | | | 8 | | | High School Diploma | 1 | 13% |
| | | | 8 | | | **Associate Degree** | **7** | **88%** |
| | | | 8 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 37 | Medical Equipment Repairers | 1 | 5 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 5 | | | Eighth Grade | 1 | 20% |
| | | | 5 | | | **High School Diploma** | **3** | **60%** |
| | | | 5 | | | Associate Degree | 1 | 20% |
| | | | 5 | | | Bachelor's Degree | 0 | 0% |
| 38 | Morticians, Undertakers, and Funeral Arrangers | 2 | 1 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 1 | | | Eighth Grade | 0 | 0% |
| | | | 1 | | | **High School Diploma** | **1** | **100%** |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 39 | Nuclear Medicine Technologists | 1 | 3 | Associate Degree | Associate Degree | Sixth Grade | 0 | 0% |
| | | | 3 | | | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **3** | **100%** |
| | | | 3 | | | Bachelor's Degree | 0 | 0% |
| 40 | Nuclear Technicians | 2 | 9 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 9 | | | Eighth Grade | 1 | 11% |
| | | | 9 | | | **High School Diploma** | **7** | **78%** |
| | | | 9 | | | Associate Degree | 1 | 11% |
| | | | 9 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 41 | Occupational Therapy Assistants | 2 | 2 | Associate Degree | Eighth Grade - High School Diploma | Sixth Grade | 0 | 0% |
| | | | 2 | | | **Eighth Grade** | **1** | **50%** |
| | | | 2 | | | **High School Diploma** | **1** | **50%** |
| | | | 2 | | | Associate Degree | 0 | 0% |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 42 | Paralegals and Legal Assistants | 1 | 3 | Associate Degree | Associate Degree - Bachelor's Degree | Sixth Grade | 0 | 0% |
| | | | 3 | | | Eighth Grade | 0 | 0% |
| | | | 3 | | | High School Diploma | 0 | 0% |
| | | | 3 | | | **Associate Degree** | **2** | **67%** |
| | | | 3 | | | **Bachelor's Degree** | **1** | **33%** |
| 43 | Physical Therapist Assistants | 2 | 2 | Associate Degree | Eighth Grade - High School Diploma | Sixth Grade | 0 | 0% |
| | | | 2 | | | **Eighth Grade** | **1** | **50%** |
| | | | 2 | | | **High School Diploma** | **1** | **50%** |
| | | | 2 | | | Associate Degree | 0 | 0% |
| | | | 2 | | | Bachelor's Degree | 0 | 0% |
| 44 | Preschool Teachers, except Special Education | 1 | 1 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 1 | | | Eighth Grade | 0 | 0% |
| | | | 1 | | | **High School Diploma** | **1** | **100%** |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 45 | Radiation Therapists | 1 | 1 | Associate Degree | Associate Degree | Sixth Grade | 0 | 0% |
| | | | 1 | | | Eighth Grade | 0 | 0% |
| | | | 1 | | | High School Diploma | 0 | 0% |
| | | | 1 | | | **Associate Degree** | **1** | **100%** |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 46 | Radio, Cellular, and Tower Equipment Installers and Repairers | 3 | 28 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 28 | | | Eighth Grade | 6 | 21% |
| | | | 28 | | | **High School Diploma** | **21** | **75%** |
| | | | 28 | | | Associate Degree | 0 | 0% |
| | | | 28 | | | Bachelor's Degree | 0 | 0% |
| 47 | Radiologic Technologists and Technicians | 2 | 6 | Associate Degree | Associate Degree | Sixth Grade | 0 | 0% |
| | | | 6 | | | Eighth Grade | 0 | 0% |
| | | | 6 | | | High School Diploma | 0 | 0% |
| | | | 6 | | | **Associate Degree** | **6** | **100%** |
| | | | 6 | | | Bachelor's Degree | 0 | 0% |

Table 13. Occupations Requiring an Associate Degree in 2022:
Summary of Assignment of Historic Education Requirements (Continued)

| | OOH Occupation Category | # of SOC Occupations | # of DOT Occupations | 2022 Education Requirement | 1977-2000 Education Requirement | 1977-2000 Education Requirement Breakdown | | 1977-2000 Education Requirement % of DOT |
|---|---|---|---|---|---|---|---|---|
| 48 | Respiratory Therapists | 1 | 1 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 1 | | | Eighth Grade | 0 | 0% |
| | | | 1 | | | **High School Diploma** | **1** | **100%** |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |
| 49 | Veterinary Technologists and Technicians | 1 | 1 | Associate Degree | High School Diploma | Sixth Grade | 0 | 0% |
| | | | 1 | | | Eighth Grade | 0 | 0% |
| | | | 1 | | | **High School Diploma** | **1** | **100%** |
| | | | 1 | | | Associate Degree | 0 | 0% |
| | | | 1 | | | Bachelor's Degree | 0 | 0% |

## APPENDIX C:
## GENERAL EDUCATIONAL DEVELOPMENT (GED)

The entry-level education requirements assigned to the *Dictionary of Occupational Titles* (DOT) occupations derives from the following conception of "General Educational Development" (GED).

This appendix is a hand-typed reprint of "Appendix C" from the *Dictionary of Occupational Titles, Fourth Edition, Revised 1991*, pages 1009 – 1012.

Each DOT occupation is accompanied by one of the below GED "levels" assigned for *Reasoning Development* (R), *Mathematical Development* (M), and *Language Development* (L).

“General Education Development embraces those aspects of education (formal and informal) which are required of the worker for satisfactory job performance. This is education of a general nature which does not have a recognized, fairly specific occupational objective. Ordinarily, such education is obtained in elementary school, high school, or college. However, it may be obtained from experience and self-study.

“The GED Scale is composed of three divisions: Reasoning Development, Mathematical Development, and Language Development. The description of the various levels of language and mathematical development are based on the curricula taught in schools throughout the United States. An analysis of mathematics courses in school curricula reveals distinct levels of progression in the primary and secondary grades and in college. These levels of progression facilitated the selection and assignment of six levels of GED for the mathematical development scale.

“However, though language courses follow a similar pattern of progression in primary and secondary school, particularly in learning and applying the principles of grammar, this pattern changes at the college level. The diversity of language courses offered at the college level precludes the establishment of distinct levels of language progression for these four years. Consequently, language development is limited to five defined levels of GED inasmuch as levels 5 and 6 share a common definition, even though they are distinct levels” (DOT, 1991, pp. 1009; 1012).

Table 14. Scale of General Education Development (GED)

| Level | Reasoning Development | Mathematical Development | Language Development |
|---|---|---|---|
| 6 | Apply principles of logical or scientific thinking to a wide range of intellectual and practical problems. Deal with nonverbal symbolism (formulas, scientific equations, graphs, musical notes, etc.) in its most difficult phases. Deal with a variety of abstract and concrete variables. Apprehend the most abstruse classes of concepts. | Advanced Calculus:<br>Work with limits, continuity, real number systems, mean value theorems, and implicit functions theorems.<br><br>Modern Algebra:<br>Apply fundamental concepts of theories of groups, rings, and fields. Work with differential equations, linear algebra, infinite series, advanced operations methods, and functions of real and complex variables.<br><br>Statistics:<br>Work with mathematical statistics, mathematical probability and applications, experimental design, statistical inference, and econometrics. | Reading:<br>Read literature, book and play reviews, scientific and technical journals, abstracts, financial reports, and legal documents.<br><br>Writing:<br>Write novels, plays, editorials, journals, speeches, manuals, critiques, poetry, and songs.<br><br>Speaking:<br>Conversant in the theory, principles, and methods of effective and persuasive speaking, voice and diction, phonetics, and discussion and debate. |

Table 14. Scale of General Education Development (GED) (Continued)

| Level | Reasoning Development | Mathematical Development | Language Development |
|---|---|---|---|
| 5 | Apply principles of logical or scientific thinking to define problems, collect data, establish facts, and draw valid conclusions. Interpret an extensive variety of technical instructions in mathematical or diagrammatic form. Deal with several abstract and concrete variables. | Algebra:<br>Work with exponents and logarithms, linear equations, quadratic equations, mathematical induction and binomial theorem, and permutations.<br><br>Calculus:<br>Apply concepts of analytic geometry, differentiations, and integration of algebraic functions with applications.<br><br>Statistics:<br>Apply mathematical operations to frequency distributions, reliability and validity of tests, normal curve, analysis of variance, correlation techniques, chi-square application and sampling theory, and factor analysis. | Same as Level 6. |

Table 14. Scale of General Education Development (GED) (Continued)

| Level | Reasoning Development | Mathematical Development | Language Development |
|---|---|---|---|
| 4 | Apply principles of rational systems to solve practical problems and deal with a variety of concrete variables in situations where only limited standardization exists. Interpret a variety of instructions furnished in written, oral, diagrammatic, or schedule form. | Algebra:<br>Deal with system of real numbers; linear, quadratic, rational, exponential, logarithmic, angle and circular functions, and inverse functions; related algebraic solution of equations and inequalities; limits and continuity, and probability and statistical inference.<br><br>Geometry:<br>Deductive axiomatic geometry, plane and solid; and rectangular coordinates.<br><br>Shop Math:<br>Practical application of fractions, percentages, ratio and proportion, mensuration, logarithms, slide rule, practical algebra, geometric construction, and essentials of trigonometry. | Reading:<br>Read novels, poems, newspapers, periodicals, journals, manuals, dictionaries, thesauruses, and encyclopedias.<br><br>Writing:<br>Prepare business letters, expositions, summaries, and reports, using prescribed format and conforming to all rules of punctuation, grammar, diction, and style.<br><br>Speaking:<br>Participate in panel discussions, dramatizations, and debates. Speak extemporaneously on a variety of subjects. |

Table 14. Scale of General Education Development (GED) (Continued)

| Level | Reasoning Development | Mathematical Development | Language Development |
|---|---|---|---|
| 3 | Apply commonsense understanding to carry out instructions furnished in written, oral, or diagrammatic form. Deal with problems involving several concrete variables in or from standardized situations. | Compute discount, interest, profit and loss; commission, markup, and selling price; ratio and proportion, and percentage. Calculate surfaces, volumes, weights, and measures.<br><br>Algebra:<br>Calculate variables and formulas; monomials and polynomials; ratio and proportion variables; and square roots and radicals.<br><br>Geometry:<br>Calculate plane and solid figures; circumference, area, and volume. Understand kinds of angles, and properties of pairs of angles. | Reading:<br>Read a variety of novels, magazines, atlases, and encyclopedias. Read safety rules, instructions in the use and maintenance of shop tools and equipment, and methods and procedures in mechanical drawing and layout work.<br><br>Writing:<br>Write reports and essays with proper format, punctuation, spelling, and grammar, using all parts of speech.<br><br>Speaking:<br>Speak before an audience with poise, voice control, and confidence, using correct English and well-modulated voice. |

Table 14. Scale of General Education Development (GED) (Continued)

| Level | Reasoning Development | Mathematical Development | Language Development |
|---|---|---|---|
| 2 | Apply commonsense understanding to carry out detailed but uninvolved written or oral instructions. Deal with problems involving a few concrete variables in or from standardized situations. | Add, subtract, multiply, and divide all units of measure. Perform the four operations with like common and decimal fractions. Compute ratio, rate, and percent. Draw and interpret bar graphs. Perform arithmetic operations and involving all American monetary units. | Reading:<br>Passive vocabulary of 5,000 – 6,000 words. Read at rate of 190 – 215 words per minute. Read adventure stories and comic books, looking up unfamiliar words in dictionary for meaning, spelling, and pronunciation. Read instructions for assembling model cars and airplanes.<br><br>Writing:<br>Write compound and complex sentences, using cursive style, proper end punctuation, and employing adjectives and adverbs.<br><br>Speaking:<br>Speak clearly and distinctly with appropriate pauses and emphasis, correct pronunciation, variations in word order, using present, perfect, and future tenses. |

Table 14. Scale of General Education Development (GED) (Continued)

| Level | Reasoning Development | Mathematical Development | Language Development |
|---|---|---|---|
| 1 | Apply commonsense understanding to carry out simple one- or two-step instructions. Deal with standardized situations with occasional or no variables in or from these situations encountered on the job. | Add and subtract two-digit numbers. Multiply and divide 10's and 100's by 2, 3, 4, 5. Perform the four basic arithmetic operations with coins as part of a dollar. Perform operations with units such as cup, pint, and quart; inch, foot, and yard; and ounce and pound. | Reading:<br>Recognize meaning of 2,500 (two- or three-syllable) words. Read at rate of 95 – 120 words per minute. Compare similarities and differences between words and between series of numbers.<br><br>Writing:<br>Print simple sentences containing subject, verb, and object, and series of numbers, names, and addresses.<br><br>Speaking:<br>Speak simple sentences, using normal word order, and present and past tenses. |

# APPENDIX D:
# NOICC VOCATIONAL PREPARATION AND OCCUPATIONS

GED grade level reference - SEE REFERENCE D


NOICC

National Occupational
Information Coordinating
Committee

# VOCATIONAL PREPARATION AND OCCUPATIONS

Third Edition

## VOLUME 1

Educational and Occupational
Code Crosswalk

DEPARTMENT OF LABOR

Commissioner
Bureau of Labor Statistics

Assistant Secretary
Employment and Training Administration

DEPARTMENT OF EDUCATION

Administrator
National Center for Education Statistics

Assistant Secretary
Office of Vocational and Adult Education

REFERENCE D

## Relating General Education Development (GED) to Career Planning

Each occupation in the DOT has been assigned a series of subcodes which provide supplementary information about the occupation. One of these subcodes is for General Education Development (GED). The GED code is a three-digit number which indicates the reasoning (R), mathematical (M) and language (L) development levels that a worker should possess upon entering a given job.

GED levels range from one (1), the lowest level of complexity, to six (6), the highest level of complexity. The GED levels are cumulative; that is, each ascending level indicates a set of abilities and knowledges which are required in addition to all the abilities described at the lower levels. For example, a GED level of (R) 3, (M) 3, and (L) 3 means that a person must possess all the abilities listed in GED levels 1, 2 and 3 for reasoning, mathematics and language.

The following charts, taken from Relating General Educational Development to Career Planning,[41] further detail each of the GED's six levels for each factor (reasoning, mathematics and language) in terms of a composite of what is currently being taught in traditional academic settings in the United States. These charts do not address experimental or highly specialized training programs; therefore, the mathematical and language terminology may differ from that utilized in nontraditional settings.

It should be noted that the descriptions of the GED levels associated with the educational achievement composites differ from those in the GED scale on page 41. This difference is due to the fact that the publication which contained the educational composites was published in 1971 while the revised GED scale was issued one year later. The Department of Labor, at the present time, does not have any plans to revise the publication, Relating General Educational Development to Career Planning, in which the educational attainment composites are related to the GED levels. However, the basic principles and concepts remain the same and educators have found that they are still useful. Therefore, the charts relating educational attainment and GED levels are being included in this publication.

The information contained on the following pages can aid in the development of a curriculum which is reflective of occupational requirements in terms of levels of reasoning, mathematics and language needed for successful performance on the job. Pages 17 and 18 of this publication provide additional information about and specific examples for the utilization of GED levels for curriculum development.

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[41] U.S. Department of Labor, Relating General Educational Development to Career Planning (Washington: U.S. Government Printing Office, 1971).

(Grades 1-3)

# GED level I

| REASONING DEVELOPMENT: | MATHEMATICAL DEVELOPMENT: | LANGUAGE DEVELOPMENT: |
|---|---|---|
| Apply common sense understanding to carry out simple one- or two-step instructions. Deal with standardized situations with occasional or no variables in or from these situations encountered on the job. | Counting and addition and subtraction of two-place numbers. Develop familiarity with standard units of measurement, and with basic measuring equipment, such as clocks, rulers, and scales. | Read, speak and print simple sentences containing subject, verb, and object, using present and past tenses. |

## MATHEMATICS CURRICULUM

**Counting:** By twos, threes, fours, and fives.

**Space Value:** Understanding the principle of place value of whole numbers. Column value (in multiples of 10) in a series of digits: the number 6437 presents 7 ones; 3 tens; 4 hundreds; and 6 thousands. Value of zero as placeholder; difference between 470, 407, 47.

**Roman Numerals:** Understanding principles of notation. Symbol to right, add: XI = 10+1. Symbol to left, subtract: IX = 10-1.

**Ordinal Numbers:** To 31st. Learning proper endings: 1st; 2nd; 3rd; 4th.

**Addition:** 3-place numbers:
$$\begin{array}{r} 567 \\ +642 \\ \hline \end{array}$$
Decimal as ¢:
$$\begin{array}{r} 1.25 \\ +\ .35 \\ \hline \end{array}$$

**Subtraction:** 3-place numbers:
$$\begin{array}{r} 359 \\ -216 \\ \hline \end{array}$$
Decimal as ¢:
$$\begin{array}{r} 3.27 \\ -1.16 \\ \hline \end{array}$$

**Multiplication:** 1-digit multiplier:
$$\begin{array}{r} 2.05 \\ \times\ .3 \\ \hline \end{array}$$

**Division:** 1-digit divisor: $2 \overline{)426}$

**Fractions:** Addition of simple fractions.

**Terms and Symbols:** Knowledge of signs such as −, +, =, x, $\overline{)}$. Introduction to terms such as sum, remainder, difference, multiplier, divisor.

**Measurement:** Read clock, calendar, thermometer, yardstick, scales. Knowledge of units such as teaspoon, tablespoon, cup, pint, quart, inch, foot, yard, dozen, ounce.

| | |
|---|---|
| Geometric Concepts: | Recognize geometric forms such as line, square, triangle, rectangle, cube, cylinder, sphere. Understand meaning of terms such as "volume" and "perimeter." |
| Practical Applications: | Perform the four basic arithmetic operations with parts of dollar. |

LANGUAGE CURRICULUM

| | |
|---|---|
| Punctuation: | Use of period, question mark, comma, exclamation point, quotation marks. |
| Capitalization: | Names of places, persons, days, months, years, titles. |
| Grammar: | Rote learning of correct usage of present and past tenses of common verbs, such as: run, do and go; and pronouns, such as: I, me, he, him, they, them. |
| Reference Works: | Introduction to the use of the dictionary and encyclopedia. |
| Spelling: | Learning to spell, through repetition and correction, words which are part of everyday vocabulary. Learning phonetic and structural principles. |
| Reading: | Introduction to the printed word. Emphasis placed on relating written word to spoken word; acquisition of vocabulary; reinforcing correct grammatical usage; stimulating thought. |
| Composition: | Emphasis on legibility, spelling punctuation and initial capitalization, word order, and forming complete sentences and paragraphs. |
| Speaking: | Learning to participate in conversations and discussions. Emphasis on clarity, enunciation, pronunciation, grammar, and voice modulation. Oral reports, such as "Show and Tell," including information such as "who, what, where, when, why." |
| Handwriting: | Mainly manuscript printing; introduction to cursive writing in 2nd or 3rd grade. |

(Grades 4-6)

# GED level 2

| REASONING DEVELOPMENT: | MATHEMATICAL DEVELOPMENT: | LANGUAGE DEVELOPMENT: |
|---|---|---|
| Apply common sense understanding to carry out detailed but uninvolved written or oral instructions. Deal with problems involving a few concrete variables in or from standardized situations. | Perform the four basic arithmetic operations, using whole numbers, and common and decimal fractions. Develop knowledge of standard units of measure, and their interrelationships. | Read, write, and speak compound and complex sentences using adjectives and adverbs, and varying word order in phrases, clauses and sentences. Discern and organize facts and opinions for written and oral communication. |

MATHEMATICS CURRICULUM

| | |
|---|---|
| Numbers: | Read and write 7-digit numbers. Learn ordinals through "thousands." |
| Counting: | By fractions and decimal fractions. |
| Place Value: | Place values of numbers to left and right of decimal point. |
| Addition: | Multi-digit columns. |
| Subtraction: | Multi-digit columns. |
| Multiplication: | Two or three-digit multipliers. |
| Division: | Two or three-digit divisors. |
| Fractions: | Add, subtract, multiply, and divide common and decimal fractions, mixed numbers, improper fractions. Introduction to ratio and rate, percent; change fractions to decimal fractions and to percent. |
| Part-Whole Relationships: | Introduction to reasoning and analysis of problems such as finding a part of a number; finding the whole when a part is given. |
| Geometric Concepts: | Learning meanings of terms such as radius, diameter, perimeter, circumference, area of rectangle and volume. Construct graphs, charts, and tables. Construct simple geographic forms such as arcs, triangles and perpendiculars. |
| Measurement: | Learn relationships of standard units of measurement to each other. Convert units of measure to smaller or larger units, such as inches to feet, acres to square miles, hours to days, minutes to seconds, or ounces to pounds. |

LANGUAGE CURRICULUM

| | |
|---|---|
| Punctuation: | Apostrophe, hyphen, colon. |
| Grammar: | Learn to use mature sentence forms (compound and complex) with variation of word order in phrases, clauses, and sentences. Introduction to comparison of objectives and adverbs; compound subject and predicate; agreement of subject and verb; common and proper nouns; personal pronouns; singular and plural forms. |
| Reference Works: | Study of the dictionary to learn syllabication accent and diacritial marks such as macron (-), breve (v), double dot and single dot as an aid to pronunciation. Study of road maps, time tables, and entertainment guides to determine distances between cities, report on transportation schedules and discuss merits of available entertainment. Obtain library card and locate books, using index file. |
| Reading: | Learn roots, prefixes, and suffixes. Learn to read discriminately, distinguishing between essential and unessential material. Enrich vocabulary with wide selection of reading material. Introduction to magazines, newspaper, bulletins, etc. |
| Composition: | Write reports on class discussions, hobbies, and trips, with emphasis on variety of sentence structure, grammar, selection of words to clearly express thought, and reinforcing and increasing vocabulary. Make outlines; practice techniques of letter writing and news writing. |
| Speaking: | Practice reading aloud to improve enunciation, pronunciation, inflection, and phrasing. Play part in a skit, or act out a scene based on own experience to learn to express feelings vocally. Learn and practice courtesies in social situations such as allowing others to express their viewpoints without interruption or ridicule. Relate personal experiences to group. |
| Handwriting: | Cursive writing; emphasis on legibility and facility in writing. |

(Grades 7-8)

# GED level 3

| REASONING DEVELOPMENT: | MATHEMATICAL DEVELOPMENT: | LANGUAGE DEVELOPMENT: |
|---|---|---|
| Apply common sense understanding to carry out instructions furnished in written, oral, or diagrammatic form. Deal with problems involving several concrete variables in or from standardized situations. | Compute discount, interest, percentage, surface areas, values, weights, and measures, using four basic arithmetic operations. | Selective reading of text books, and other material to extract essential theme or idea. Compose themes, reports and essays following rules of grammar, spelling, neatness and format. |

## MATHEMATICS CURRICULUM

**Whole Numbers:**

Mastery of the four basic arithmetic operations. Emphasis on speed and accuracy in computation. Extension to 4- and 5-digit multipliers and divisors.

**Fractions:**

Mastery of the four basic arithmetic operations in common, decimal and improper fractions and mixed numbers. Apply knowledge to solve "story problems." Develop speed and accuracy in changing fractions into percent and percent into fractions. Memorize most common equivalents, such as halves, quarters, eighths, fifths, thirds, sixths, and twelfths, and mentally convert time to decimal fractions and percents.

**Percentage Formulas:**

Memorize and apply formulas to solve "story problems," as:

$$P = RB \qquad R=\frac{P}{B} \qquad B=\frac{P}{R}$$

**Measurements:**

Perform the four basic arithmetic functions to solve problems involving different units of same type of measurement, as:

Time: 4 wks. 6 days 32 hrs.
+2 wks. 3 days 25 hrs.

**Graphs:**

Learn to construct and interpret line, bar, and picture graph. Convert degrees to percent to draw circle graphs.

**Percentage**

Apply knowledge of percentage to compute interest, discount, etc.

| | |
|---|---|
| Geometry: | Recognize and understand meanings of terms such as horizontal, vertical, perpendicular, oblique and obtuse. Learn number of degrees in a circle, relationship between angles and degrees, types of triangles: equilateral, isosceles, right and obtuse. Types of parallelograms: oblong, square, rhomboid, and rhombus. Learn formulas for finding area of geometric figures. |
| Algebra: | Learn use of symbols for numbers, terms such as exponent and power. Learn to find square roots. |
| Ratio & Proportion: | Learn to use ratio and proportion to solve problems. |
| | LANGUAGE CURRICULUM |
| Punctuation: | Comma, colon, semi-colon, dash, parentheses, quotation marks, hyphen, abbreviations. |
| Reference Works: | Utilize dictionary to learn alphabetical order, guide works, diacritical marks, synonyms and antonyms. Use encyclopedia, atlases, magazines, and source books to perpare class assignments. |
| Handwriting: | Develop individualized style of writing. |
| Grammar: | Learn concepts of person, gender, number, case, tense, mood, and voice. Learn kinds of verbs, nouns, pronouns, adjectives, adverbs, conjunctions, prepositions. Learn to diagram sentences. Learn normal inverted word order, contractions, agreement of subjects and verbs, pronouns, and antecedents. |
| Reading: | Read to find main thought or idea of a paragraph. Locate topic and summary sentence, and identify details and relate them to central thought. |
| Composition: | Prepare themes, reports, and essays, with greater emphasis placed on punctuation, spelling, grammar, format, style, neatness, arrangement, and comprehensive coverage of subject matter. |
| Speaking: | Practice speaking before an audience to acquire poise, self-control, and confidence. Participate as group leader or group member in planned informal discussion. Participate in class elections and persuade others to vote for him or his candidate. |

(Grades 9-12)

# GED level 4

| REASONING DEVELOPMENT: | MATHEMATICAL DEVELOPMENT: | LANGUAGE DEVELOPMENT: |
|---|---|---|
| Apply principles of rational systems to solve practical problems and deal with a variety of concrete variables in situations where only limited standardization exists, interpret a variety of instructions furnished in written, oral, diagrammatic or scheduled form. | Perform arithmetic, algebraic and geometric operations as applied to standard situations; perform shop mathematics operations in practical application to the manual arts. | Speak on a variety of subjects, or compose business letters, reports, summaries or expositions conforming to rules of grammar, continuity, diction, coordination, length of harmony and sequences of sentences and paragraphs. |

## MATHEMATICS CURRICULUM

**Algebra:** Formal study of number systems; sets, and set operation. Operations on polynomials and rational expressions; solution of equations and inequalities; use of deduction and proof. Study of the systems of real numbers; linear, quadratic, rational, exponential, logarithmic, angle, and circular functions; inverse functions; related algebraic functions, limits and continuity, probability, and statistical inference.

**Geometry:** Study of deductive axiomatic geometry, plane, and solid, using the properties of real numbers; the introduction and use of rectangular coordinates. Extension of trigonometry and solid geometry.

### Technical/Vocational School

**Shop Math:** Review and extension of principles of common and decimal fractions, percentage, ratio, and proportion. Practical computation, logarithms, slide rule. Practical algebra. Metric geometry. Essentials of trigonometry. Formulas for computing ratios of pulleys and gears. Practical physics: formulas for work and power, etc.

## LANGUAGE CURRICULUM

**Punctuation:** Review and mastery of all rules of punctuation and capitalization.

**Reference Works:** Dictionary, encyclopedia, atlas, thesaurus, manuals, periodicals, newspapers, journals, books, and play reviews.

| | |
|---|---|
| Grammar: | Mastery and facility in the use of the rules and concepts of person, gender, number, case, tense and mood. |
| Parts of Speech: | Verbs: Strong and weak, transitive and intransitive, auxiliary, regular. Conjugation. |
| | Nouns: Common and proper, collective, concrete and abstract inflections; gender. |
| | Pronouns: Personal, demonstrative, relative, numerical, reciprocal. |
| | Adjectives: Common, proper, descriptive, limiting, articles position in sentence; comparative degrees. |
| | Adverbs: Simple, conjunctive; forms; comparison. |
| | Conjunctions: Coordinating, subordinating. |
| | Interjections. |
| | Prepositions. |
| Reading: | Variety of textbooks; fiction and non-fiction; newspapers; magazines. |
| Compositions: | Preparation of outlines; preparation of themes, emphasizing length, harmony, sequence, and variety of sentences and paragraph structure. Selection of wordage according to subject matter and audience. Coordination, subordination and parallelism of thoughts. |
| Speaking: | Participation in panel discussions and dramatizations. Practice of social introductions and other amenities. Presentation of impromptu speeches to develop skill in extemporaneous speaking. |

(College 1-2)

# GED level 5

| REASONING DEVELOPMENT: | MATHEMATICAL DEVELOPMENT: | LANGUAGE DEVELOPMENT: |
|---|---|---|
| Apply principles of logical or scientific thinking to define problems, collect data, establish facts and draw valid conclusions. Interpret an extensive variety of technical instructions, in books, manuals, or mathematical or diagrammatic form. Deal with several abstract or concrete variables. | Apply knowledge of established statistical and mathematical techniques in the analysis and evaluation of data. | Read or write speeches, book and play reviews, scientific and technical materials, abstracts, financial reports and legal documents. Be conversant in the theory principles and methods of effective and persuasive speaking including voice, diction and phonetics, in discussion and debate. |

MATHEMATICS CURRICULUM

| | |
|---|---|
| College Algebra: | Exponents and logarithms; linear equations, quadratic equation, mathematical induction, and binomial theorem. |
| General Math: | General introduction to the concepts of algebra, plane geometry, trigonometry, and calculus. |
| Calculus: | Elementary concepts of analytic geometry; differentiation and integration of algebraic functions and transcendental functions with application. Vector concepts; improper integrals, polar coordination and infinite series. Integration and partial differentiations; solid geometry; differential equation. |
| Introduction to Mathematical Logic: | Development of propositional and predicate calculi, basic sematic concepts and elementary intuitive set theory. |
| Introduction to Matrix Theory: | Elementary theory of finite vector spaces, determinates, equivalence, matrices with polynomial elements, similarity of matrices. |
| Statistics: | Graphic presentations illustrating average, dispersions, quartiles and percentiles, frequency distribution, reliability, and validity of tests. Applied to psychology and education, analysis of variance, correlation techniques, chi-square, and sampling techniques. Applied to busienss and economics, introduction to the principles and use of linear programming, game theory and queuing theory. |

| | |
|---|---|
| Mathematics of Finance: | Interest and discount, annuities, valuation of stocks and bonds; sinking funds, amortization, valuation of depletable assets. |
| Factor Analysis: | Matrix theory as applied to factor analysis; introduction to concepts of factor analysis and their utility in phases of research. |
| Quality Control Techniques: | Application of probability and distribution theory to industrial control problems; use of quality charts; acceptance sampling plans. |
| Introduction to Mathematical Probability: | Probability distributions, Bayes' theorem and postulate Bernoulli's theorem and its experimental verification; mathematical expectation; laws of large numbers. |

LANGUAGE CURRICULUM

| | |
|---|---|
| Reading: | Literature, book, and play reviews, scientific and technical journals, abstract, financial reports, legal, historical and medical documents, periodicals. |
| Composition: | Analysis and practice of expository techniques with emphasis on organization of material and development of unity. |
| Logic: | Study of the principles of inductive and deductive reasoning such as testing evidence, validity of generalizations, and cause and effect relationships to detect fallacies in arguments and to avoid these errors in own writing. |
| Rhetoric: | Study of the collection, arrangement, and expression of subject matter to persuade or instill an acceptance of ideas in the mind of the reader. |
| Creative Writing: | Develop a free and independent skill in writing, based on own knowledge and experience. |
| Narrative Writing: | Develop a sequential and descriptive style of writing. |
| Playwriting: | Study and application of theory of dramatic writing. |
| Speaking: | Effective Speaking: Study in the selection, organization of material and delivery of speech. Development of voice control, poise, and confidence.<br><br>Persuasive Speaking: Emphasis on composition of speech and principles of persuasion.<br><br>Phonetics: Study and classification of sounds of speech. |

| | |
|---|---|
| Speaking: | Discussion and Debate: Study of types and principles of public and group discussions. Methods in leading discussion; practice in argumentation and debate.<br><br>Voice and Diction: Study of standards of speech. Record speech and study recording to develop voice quality and control volume, pitch, and rate. |

# GED level 6

(College 3-4)

| REASONING DEVELOPMENT: | MATHEMATICAL DEVELOPMENT: | LANGUAGE DEVELOPMENT: |
|---|---|---|
| Apply principles of logical and scientific thinking to a wide range of intellectual and practical problems. Deal with nonverbal symbolism (formulas, scientific equations, graphs, musical notes, etc.) in its most difficult phases. Deal with a variety of abstract and concrete variables. Comprehend the most abstruse classes of concepts. | Apply knowledge of established and theoretical mathematical and statistical concepts in the field of research and development. | Same as level V |

MATHEMATICS CURRICULUM:

| | |
|---|---|
| Advanced Calculus: | Limits, continuity, real number system, mean value theorems, partial differentiation, implicit function theorems, transformations, mappings, vector fields, multiple integrals, line and surface integrals, point set theory, theory of integration improper integrals. |
| Generalized Functions & Operational Methods: | Theory of generalized functions in one variable. Operational calculus of generalized functions. Applications to partial differential and convolution equations of applied mathematics. |
| Modern Algebra: | Fundamental concepts of theories of groups, rings, and fields, theory of finite fields, extension fields, Galois groups, factorization theory in Gaussian domains. |
| Topics in Matrix Theory: | Theory of linear transformations (vector spaces over a division ring), advanced classical theory, matrix representation of groups and rings. |
| Other: | Theory of linear transformations and equations; theory of numbers; infinite series; mathematical logic; theory of functions of a complex variable; differential geometry; introduction to algebraic geometry; calculus of variation; general topology; numerical analysis. |
| Mathematical Statistics: | Distribution theory, sampling theory, estimation, hypothesis testing, confidence methods, regression analysis, experimental design. Distribution functions; sequences of random variables and their analysis; characteristic functions, linear statistical estimation. Time series, multivariate theory, probability spaces, random variables. |

D/12

| | |
|---|---|
| Mathematical Probability and Application: | Combinatorial analysis, conditional probability and stochastic independence, probability distribution, laws of large numbers, recurrent events, random walks. |
| Statistical Inference: | Estimation: Methods in point estimation-moments, last squares, maximum likelihood, confidence and fiducial intervals, odds and odds ratio, Bayesian inference, ignorance and diffuse prior distributions. |

LANGUAGE CURRICULUM

Same as level V

# APPENDIX E:
# OCCUPATIONS REQUIRING/EXPECTING
# "SOME COLLEGE, NO DEGREE"
# AND
# "POSTSECONDARY NON-DEGREE AWARDS"

The following tables list the occupations identified by the United States Bureau of Labor Statistics (BLS) through its *Occupational Outlook Handbook* (OOH) as requiring/expecting/typifying the purchase of "Some College, No Degree" or of possessing a "Postsecondary Non-Degree Award" for entrance into the occupation.

The following occupations represent 2023 occupations and resulting statistics.

Table 15. Occupations Requiring a "Postsecondary Non-Degree Award in 2023

| Count | Occupation | Entry-Level Education |
|---|---|---|
| 1 | Aircraft Mechanics and Service Technicians | Postsecondary Non-Degree Award |
| 2 | Audio and Video Technicians | Postsecondary Non-Degree Award |
| 3 | Audiovisual Equipment Installers and Repairers | Postsecondary Non-Degree Award |
| 4 | Automotive Service Technicians and Mechanics | Postsecondary Non-Degree Award |
| 5 | Barbers | Postsecondary Non-Degree Award |
| 6 | Captains, Mates, and Pilots of Water Vessels | Postsecondary Non-Degree Award |
| 7 | Commercial Divers | Postsecondary Non-Degree Award |
| 8 | Commercial Pilots | Postsecondary Non-Degree Award |
| 9 | Computer Numerically Controlled Tool Programmers | Postsecondary Non-Degree Award |
| 10 | Cooks, Private Household | Postsecondary Non-Degree Award |
| 11 | Court Reporters and Simultaneous Captioners | Postsecondary Non-Degree Award |
| 12 | Dental Assistants | Postsecondary Non-Degree Award |
| 13 | Electrical and Electronics Installers and Repairers, Transportation Equipment | Postsecondary Non-Degree Award |
| 14 | Electrical and Electronic Repairers, Commercial and Industrial Equipment | Postsecondary Non-Degree Award |
| 15 | Electrical and Electronic Repairers, Powerhouse, Substation, and Relay | Postsecondary Non-Degree Award |
| 16 | Emergency Medical Technicians | Postsecondary Non-Degree Award |
| 17 | Fire Inspectors and Investigators | Postsecondary Non-Degree Award |
| 18 | Firefighters | Postsecondary Non-Degree Award |
| 19 | First-Line Supervisors of Firefighting and Prevention Workers | Postsecondary Non-Degree Award |
| 20 | Hairdressers, Hairstylists, and Cosmetologists | Postsecondary Non-Degree Award |
| 21 | Health Technologists and Technicians, All Other | Postsecondary Non-Degree Award |
| 22 | Healthcare Practitioners and Technical Workers, All Other | Postsecondary Non-Degree Award |

Table 15. Occupations Requiring a
"Postsecondary Non-Degree Award" in 2023 (Continued)

| Count | Occupation | Entry-Level Education |
|---|---|---|
| 23 | Heating, Air Conditioning, and Refrigeration Mechanics and Installers | Postsecondary Non-Degree Award |
| 24 | Heavy and Tractor-Trailer Truck Drivers | Postsecondary Non-Degree Award |
| 25 | Insurance Appraisers, Auto Damage | Postsecondary Non-Degree Award |
| 26 | Library Technicians | Postsecondary Non-Degree Award |
| 27 | Licensed Practical and Licensed Vocational Nurses | Postsecondary Non-Degree Award |
| 28 | Lighting Technicians | Postsecondary Non-Degree Award |
| 29 | Makeup Artists, Theatrical and Performance | Postsecondary Non-Degree Award |
| 30 | Manicurists and Pedicurists | Postsecondary Non-Degree Award |
| 31 | Massage Therapists | Postsecondary Non-Degree Award |
| 32 | Medical Assistants | Postsecondary Non-Degree Award |
| 33 | Medical Records Specialists | Postsecondary Non-Degree Award |
| 34 | Medical Transcriptionists | Postsecondary Non-Degree Award |
| 35 | Motorboat Operators | Postsecondary Non-Degree Award |
| 36 | Motorcycle Mechanics | Postsecondary Non-Degree Award |
| 37 | Nursing Assistants | Postsecondary Non-Degree Award |
| 38 | Ophthalmic Medical Technicians | Postsecondary Non-Degree Award |
| 39 | Paramedics | Postsecondary Non-Degree Award |
| 40 | Phlebotomists | Postsecondary Non-Degree Award |
| 41 | Prepress Technicians and Workers | Postsecondary Non-Degree Award |
| 42 | Psychiatric Technicians | Postsecondary Non-Degree Award |
| 43 | Ship Engineers | Postsecondary Non-Degree Award |
| 44 | Skincare Specialists | Postsecondary Non-Degree Award |

Table 15. Occupations Requiring a
“Postsecondary Non-Degree Award” in 2023 (Continued)

| Count | Occupation | Entry-Level Education |
|---|---|---|
| 45 | Sound Engineering Technicians | Postsecondary Non-Degree Award |
| 46 | Surgical Assistants | Postsecondary Non-Degree Award |
| 47 | Surgical Technologists | Postsecondary Non-Degree Award |
| 48 | Telecommunications Equipment Installers and Repairers, except Line Installers | Postsecondary Non-Degree Award |
| 49 | Tool and Die Makers | Postsecondary Non-Degree Award |
| 50 | Wind Turbine Service Technicians | Postsecondary Non-Degree Award |

Table 16. Occupations Requiring "Some College, No Degree" in 2023

| Count | Occupation | Entry-Level Education |
|---|---|---|
| 1 | Actors | Some College, No Degree |
| 2 | Bookkeeping, Accounting, and Auditing Clerks | Some College, No Degree |
| 3 | Computer User Support Specialists | Some College, No Degree |
| 4 | Computer, Automated Teller, and Office Machine Repairers | Some College, No Degree |
| 5 | Order Clerks | Some College, No Degree |
| 6 | Teaching Assistants, except Postsecondary | Some College, No Degree |
| 7 | Tutors | Some College, No Degree |

Abel, J. R., & Dietz, R. (2019, June 5). *Despite rising costs, college still is a good investment*. Federal Reserve Bank of New York: Liberty Street Economics. https://libertystreeteconomics.newyorkfed.org/2019/06/despite-rising-costs-college-is-still-a-good-investment/.

Akerlof, G. A. (1970). The market for "lemons": Quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, *84*(3), 488-500.

American School Counselor Association. (2022[74]). *ASCA ethical standards for school counselors*. ASCA. https://www.schoolcounselor.org/About-School-Counseling/Ethical-Responsibilities/ASCA-Ethical-Standards-for-School-Counselors-(1).

Araki, S., & Kariya, T. (2022). Credential inflation and decredentialization: Re-examining the mechanism of the devaluation of degrees. *European Sociological Review*, *38*, 904-919.

Arrow, K. J. (1973). The theory of discrimination. In O. Ashenfelter, & D. Card (Eds.), *Discrimination in labor markets* (pp. 3-33). Princeton University Press.

Atkinson, R., & Andes, S. (2010). *The 2010 state new economy index*. (ERIC No. ED515552). ERIC Institute of Education Sciences/The Information Technology and Innovation Foundation. https://eric.ed.gov/?id=ED515552.

Avery, C., & Turner, S. (2012). Student loans: Do college students borrow too much – or not enough? *The Journal of Economic Perspectives*, *26*(1), 165-192.

Barr, N. A. (1993). Alternative funding resources for higher education. *Economic Journal*, *103*(418), 718-728.

Barr, N. A. (2000). The benefits of education: What we know and what we don't. Economic Growth Seminar 2000, paper presented at HM Treasury seminar held at 11 Downing Street, October 2000. Retrieved June 16, 2020, from http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/media/C/B/252.pdf.

Becker, G. S. (1958). *The economics of discrimination*. University of Chicago Press.

Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. University of Chicago Press.

Bell, D. (1973). *The coming of post-industrial society*. Basic Books.

[74] This citation is the 2022 revision of the 1992 original revision of the 1984 set of ethical standards. The 1992 set of ethical standards was peer-reviewed and is cited below:
American School Counselor Association. (1992). Ethical standards for school counselors. *The school counselor*, 84-88.

Berg, I. (1971). *Education and jobs: The great training robbery*. Beacon Press.

Berndt, E. R., & Morrison, C. J. (1995). High-tech capital formation and economic performance in U.S. manufacturing industries: An exploratory analysis. *Journal of Econometrics*, *65*(1), 9-43.

Bhuller, M., Mogstad, M., & Salvanes, K. G. (2014). Life cycle earnings, education premiums and internal rates of return. *NBER Working Paper No. 20250*.

Bills, D. B. (2016). Congested credentials: The material and positional economies of schooling. *Research in Social Stratification and Mobility*, *43*, 65-70.

Bills, D. B., & Brown, D. K. (2011). New directions in educational credentialism. *Research in Social Stratification and Mobility*, *29*, 1-4.

Bowen, W. G. (1964). *Economic aspects of education: Three essays*. Industrial Relations Section Princeton University.

Brown, D. K. (1995). *Degrees of control: A sociology of educational expansion and occupational credentialism*. Teachers College Press.

Brown, D. K. (2001). The social sources of educational credentialism: Status cultures, labor markets, and organizations. *Sociology of Education*, *74*, 19-34.

Brynjolfsson, E., & Hitt, L. M. (2000). Beyond computation: Information technology, organizational transformation and business performance. *Journal of Economic Perspectives*, *14*(4), 23-48.

Burrage, M. (Ed.). (2010). *Martin Trow – Twentieth century higher education: Elite to mass to universal.* The Johns Hopkins University Press.

Burning Glass Technologies. (2014). Moving the goalposts: How demand for a Bachelor's degree is reshaping the workforce. Mimeo.

Caplan, B. (2018). *The case against education: Why the education system is a waste of time and money*. Princeton University Press.

Carneiro, P., Hansen, K., & Heckman, J. (2003). Estimating distributions of treatment effects with an application to the returns to schooling and measurement of the effects of uncertainty on college choice. *International Economic Review*, *44*(2), 361-422.

Carneiro, P., & Heckman, J. (2002). The evidence on credit constraints in post-secondary schooling. *Economic Journal*, *112*(482), 705-734.

Chang, H. (2010). *23 things they don't tell you about capitalism*. Bloomsbury Press.

Clark, B. R. (1960). The "cooling-out" function in higher education. *American Journal of Sociology*, *65*(6), 569-576

Clark, B. R. (2008). *On higher education: Selected writings, 1956-2006*. The Johns Hopkins University Press.

Collins, R. (1979). *The credential society: An historical sociology of education and stratification*. Academic Press.

Collins, R. (2011). Credential inflation and the future of universities. *Italian Journal of Sociology of Education*, *2*, 228-251.

Cunha, F., Heckman, J., & Navarro, S. (2005). Separating uncertainty from heterogeneity in life cycle earnings. *Oxford Economic Papers*, *57*(2), 191-261.

Di Stasio, V. (2017). Who is ahead in the labor queue? Institutions' and employers' perspective on overeducation, undereducation, and horizontal mismatches. *Sociology of Education*, *90*(2), 109-126.

DiPrete, T. A., Eller, C. C., Bol, T., Werfhorst, H. G. V. D. (2017). School-to-work linkages in the United States, Germany, and France. *American Journal of Sociology*, *122*(6), 1869-1938.

Dore, R. (1976). *The diploma disease: Education, qualifications and development*. University of California Press.

Dore, R. (1980). The diploma disease revisited. *The IDS Bulletin*, *11*(2), 55-61.

Drucker, P. F. (1993). *Post-capitalist society*. Harper Business.

Dunnette, M. D. (1966). *Personnel selection and placement*. Wadsworth.

Durkheim, E. (1956). *Education and sociology*. Simon and Schuster.

Emmel, A., & Cosca, T. (2010). The 2010 Standard Occupational Classification (SOC): A classification system gets an update. *Occupational Outlook Quarterly*, *54*(2), 13-19.

Eyster, E., Li, S., & Ridout, S. (2021). A theory of ex post rationalization. *arXiv preprint arXiv: 2107.07491*.

Federal Student Aid. (n.d.). *Interest rates and fees for federal student loans*. Retrieved February 24, 2024, from https://studentaid.gov/understand-aid/types/loans/interest-rates.

Fernandez, F., & Umbricht, M.R. (2016). *Education and work in the 21st century: Credential inflation or transformation?* United States Program for the International Assessment of Adult Competencies (U.S. PIAAC). Retrieved from: https://www.piaacgateway.com/researchpapers/#2016.

Fuller, J., Raman, M., et al. (October 2017). *Dismissed by degrees*. Accenture, Grads of Life, Harvard Business School.

Goldin, C., & Katz, L. (2008). *The race between education and technology*. Harvard University Press.

Goldrick-Rab, S., & Cook, M. A. E. (2011). College students in changing contexts. In P. G. Altbach, P. J. Gumport, & R. O. Berdahl (Eds.), *American higher education in the twenty-first century: Social, political, and economic challenges* (pp. 255-278). The Johns Hopkins University Press.

Gordon, R. J. (2000). Does the "new economy" measure up to the great inventions of the past? *Journal of Economic Perspectives*, *14*(4), 49-74.

Gumport, P. J. (2001). Built to serve: The enduring legacy of public higher education. In P. G. Altbach, P. J. Gumport, & D. B. Johnstone (Eds.), *In defense of American higher education* (pp. 85-109). The Johns Hopkins University Press.

Hirsch, F. (1976). *Social limits to growth*. Routledge & Keegan Paul.

Hogan, T. (2011). *An overview of the knowledge economy, with a focus on Arizona*. Arizona State University, W.P. Carey School of Business. https://wpcarey.asu.edu/sites/default/files/uploads/research/competitiveness-prosperity-research/Knowledge-Economy.pdf. *Report from the Productivity and Prosperity Project (P3).*

Johnstone, D. B. (1986). *Sharing the costs of higher education: Student financial assistance in the United Kingdom, the Federal Republic of Germany, France, Sweden, and the United States*. College Entrance Examination Board.

Johnstone, D. B., & Marcucci, P. N. (2010). *Financing higher education worldwide: Who pays? Who should pay?*. The Johns Hopkins University Press.

Jorgenson, D. W., Stiroh, K. J., Gordon, R. J., & Sichel, D. E. (2000). Raising the speed limit: U.S. economic growth in the information age. *Brookings papers on economic activity*, 2000(1), 125-235.

Kariya, T. (2011). Credential inflation and employment in 'universal' higher education: Enrolment, expansion and (in)equity via privatization in Japan. *Journal of Education and Work*, *24*(1-2), 69-94.

Kiersz, A., (2019, June 6). Going to college is one of the best investments you can make – even if it doesn't feel like it. *Business Insider*. https://www.businessinsider.com/college-is-still-a-good-investment-2019-6?op=1.

Labaree, D. F. (1995). Forward. In D. K. Brown, *Degrees of control: A sociology of educational expansion and occupational credentialism* (ix-xvi). Teachers College Press.

Labaree, D. F. (2010). *Someone has to fail: The zero-sum game of public schooling*. Harvard University Press.

Lochner, L. J., & Monge-Naranjo, A. (2011). The nature of credit constraints and human capital. *American Economic Review*, *101*(6), 2487-2529.

Louisville Business First. (1998, July 20). *"Education pays" right message for Kentucky*. The Business Journals. https://www.bizjournals.com/louisville/stories/1998/07/20/editorial2.html.

Loveman, G. W. (1994). An assessment of the productivity impact of information technologies. In T. J. Allen, & M. S. Morton (Eds). *Information technology and the corporation of the 1990s: research studies* (84-110). Oxford University Press.

Machlup, F. (1962). *The production and distribution of knowledge in the United States.* Princeton University Press.

Mariani, M. (1999). Replace with a database: O*NET replaces the Dictionary of Occupational Titles. *Occupational Outlook Quarterly*, *43*, 2-9

Marginson, S. (2012). The "public" contribution of universities in an increasingly global world. In B. Pusser, K. Kempner, S. Marginson, & I. Ordorika (Eds.), *Universities and the public sphere: Knowledge creation and state building in the era of globalization* (pp. 7-26). Routledge.

Meer, P. H. V. D. (2001). Bureaucracy, overschooling and credentials inflation. s.n.

Mincer, J. (1974). *Schooling, experience, and earnings*. Columbia University Press.

Morrison, C. J. (1997). Assessing the productivity of information technology equipment in U.S. manufacturing industries. *Review of Economics and Statistics*, *79*(3), 471-481.

National Center for Education Statistics. (2023). Undergraduate enrollment. *Condition of Education*. U.S. Department of Education, Institute of Education Sciences. Retrieved April 1, 2024, from https://nces.ed.gov/programs/coe/indicator/cha.

National Occupational Information Coordinating Committee (NOICC). (1982). *Vocational Preparation and Occupations (VPO)*. (3rd ed.).

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford University Press.

Noyelle, T. J. (Ed.) (1990). *Skills, wages, and productivity in the service sector*. Westview Press.

Office of Management and Budget. (n.d.). *Notice of final decisions: 1998 Standard Occupational Classification*

Oliner, S. D., & Sichel, D. E. (2000). The resurgence of growth in the late 1990s: Is information technology the story? *Journal of Economic Perspectives*, *14*(4), 3-22.

O*NET. (2022, November 22). *O*NET Resource Center: Crosswalk files*[75]. Retrieved December 6, 2022 from https://www.onetcenter.org/crosswalks.html.

[75] The 2000 SOC to 2010 SOC crosswalk is available here: https://www.bls.gov/soc/2010/#crosswalks . The 2010 SOC to 2018 SOC crosswalk is available here: https://www.bls.gov/soc/2018/#crosswalks

Ortiz, L., & Rodriguez-Menés, J. (2016). The positional value of education and its effect on general and technical fields of education: Educational expansion and occupational returns to education in Spain. *European Sociological Review*, *32*(2), 216-237.

Paolini, A. (2019). School counselors promoting college and career readiness for high school students. *Journal of School Counseling*, *17*(2), n2.

Pappano, L. (2011). The Master's as the new Bachelor's. *The New York Times*, 16-17.

Phelps, E. S. (1972). The statistical theory of racism and sexism. *The American Economic Review*, *62*(4), 659-661.

Porat, M. U. (1977, May). *The information economy: Definition and measurement*. (OT Special Publication 77-12 (1)). United States Department of Commerce Office of Telecommunications. https://files.eric.ed.gov/fulltext/ED142205.pdf.

Posselt, J. R., & Grodsky, E. (2017). Graduate education and social stratification. *Annual Review of Sociology*, *43*, 353-378.

Powell, W. W., & Snellman, K. (2004). The knowledge economy. *Annual Review of Sociology*, *30*, 199-220.

Prusak, L. (1997). *Knowledge in organizations*. Routledge.

Roach, S. S. (1987). *America's technology dilemma: A profile of the information economy.* Morgan Stanley.

Schultz, T. W. (1959). Investment in man: An economist's view. *The Social Service Review*, *33*(2), 109-117.

Schultz, T. W. (1961). Investment in human capital. *American Economic Review*, *51*(1), 1-17.

Schultz, T. W. (1963). *The economic value of education*. Columbia University Press.

Scott, P. (2019). Martin Trow's elite-mass-universal triptych: Conceptualising higher education development. *Higher Education Quarterly*, *73*, 496-506.

Sen, Amartya. (1992). *Inequality reexamined*. Harvard University Press.

Solow, R. M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics*, *39*(3), 312-320.

Spence, A. M. (1973). Job market signaling. *The Quarterly Journal of Economics*, *87*(3), 355-374.

Spence, A. M. (1974). *Market signaling: Informational transfer in hiring and related screening processes*. Harvard University Press.

Stanback, T. M. (1979). *Understanding the service economy: Employment, productivity, location*. Johns Hopkins University Press.

Stigler, G. J. (1987). *The theory of price* (4th ed.). Macmillan Publishing Company.

Stiglitz, J. E. (1999). Knowledge as a global public good. In I. Kaul, I. Grunberg, & M.A. Stern (Eds.), *Global public goods: International cooperation in the 21st century* (pp. 308-325). Oxford University Press.

Taylor, A. (2019, November 11). *The history and uses of the Occupational Outlook Handbook*. People Managing People. Retrieved December 7, 2020, from https://peoplemanagingpeople.com/general/occupational-outlook-handbook/.

Tholen, G. (2017). Symbolic closure: Towards a renewed sociological perspective on the relationship between higher education, credentials and the graduate labor market. *Sociology*, *51*(5), 1067-1083.

Thomas, L. G. (1956). *The occupational structure and education*. Prentice-Hall.

Thorndike, R. L. (1967). The prediction of vocational success. In J. T. Flynn & H. Garber (Eds.), *Assessing behavior: Readings in educational and psychological measurement* (pp. 240-255). Addison-Wesley.

Trow, M. A. (2000). From mass higher education to universal access: The American advantage. *Minerva*, *37*, 1-26.

Trow, M. A. (2005). Reflections on the transition from elite to mass to universal access: Forms and phases of higher education in modern societies since WWII. Forthcoming in Philip Altbach, ed., International Handbook of Higher Education. *International Handbook of Higher Education, Kluwer*.[76]

University of Kentucky. (n.d.). *Student financial aid and scholarships*. Retrieved February 24, 2024, from https://studentsuccess.uky.edu/financial-aid-and-scholarships.

U.S. Bureau of Labor Statistics. (n.d.). *CPI Inflation Calculator*. https://www.bls.gov/data/inflation_calculator.htm.

U.S. Bureau of Labor Statistics. (2022, September 8). *Employment projects: Methods: Measures of education and training*. Retrieved December 6, 2022 from https://www.bls.gov/emp/documentation/education/tech.htm.

U.S. Bureau of Labor Statistics. (2014). *Occupational outlook handbook* (2014-2015 ed.). U.S. Department of Labor.

[76] This citation is used in order to reflect accurately page numbers used in the dissertation body. The article can be accessed here: https://scholar.archive.org/work/yxhq5poqsbe5pdqy4wp37cdlh4/access/wayback/http://escholarship.org/uc/item/96p3s213.pdf [Last accessed 4/8/2024]. Following is the citation of the article from the eventual book within which it was included:

Trow, M. A. (2007). Reflections on the transition from elite to mass to universal access: Forms and phases of higher education in modern societies since World War II. In P. Altbach (Ed.), *International Handbook of Higher Education* (pp. 243-280). Springer, Dordrecht.

U.S. Bureau of Labor Statistics. (n.d.). *Standard Occupational Classification*. Retrieved December 4, 2022 from https://www.bls.gov/soc/.

U.S. Department of Labor. (1971). Relating General Education Development to career planning. U.S. Government Printing Office.

U.S. Department of Labor, Employment and Training Administration, U.S. Employment Service. (1991). *Dictionary of Occupational Titles Fourth Edition, Revised 1991*.

U.S. Senate Sergeant at Arms. (2023, June 14). *NEWS: Sanders, Jayapal and colleagues introduce legislation to make college tuition- and debt-free for working families.* Bernie Sanders U.S. Senator for Vermont Press Release. https://www.sanders.senate.gov/press-releases/news-sanders-jayapal-and-colleagues-introduce-legislation-to-make-college-tuition-and-debt-free-for-working-families/.

Viswanath, J., Reddy, K. L. N., & Pandit, V. (2009). Human capital contributions to economic growth in India: An aggregate production function analysis. *Indian Journal of Industrial Relations*, *44*(3), 473-486.

Wei, C. C., & Horn, L. (2013). *Federal student loan debt burden of noncompleters*. (ERIC No. ED541249). ERIC Institute of Education Sciences. https://eric.ed.gov/?id=ED541249. *Stats In Brief. NCES 2013-155.*

Wolff, E. N. (2006). *Does education really help? Skill, work, and inequality*. Oxford University Press.

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  Lead Author (with Kentucky Geological Survey and
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  Approved by Federal Emergency Management Agency October 2018
- "Are We Still Measuring Returns-to-(Higher)-Education?", Unpublished,
  Presented at College of Education Spring Research Conference, Lexington, KY 2016
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- “Is the Choice of Debt a Public Choice?: On Whether Choosing Nonguaranteed Debt Is Inevitable”, Unpublished,

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