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InSTEMnifying Youth STEM, Capital, and Power

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Abstract

This paper analyzes the push from the Obama administration to get more institutions of higher education to graduate greater numbers of science, technology, engineering, and mathematics (STEM) majors and educators. This push was based on research mostly coming from foundations and industries that employ STEM workers. Researchers question whether the STEM shortage is actually a reality or a myth driven by other factors. The author's anecdotal experiences with STEM in higher education are considered while offering a theory that policies and initiatives favoring STEM are but the latest instance of education being used as a tool of commerce. The theoretical implications of the push for STEM in universities are considered to question if a manufactured STEM "crisis" is just another insidious extension of neoliberal power into institutions and upon bodies.



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Critical scholarship about the increasing corporate takeover of the American university has been written by academics *ad infinitum*, and their complaints about universities increasingly being run like for-profit companies aren't necessarily wrong. Henry Giroux (2009) lamented that "higher education is increasingly administered in a corporate fashion, not only enabling a growing elitism by raising tuition fees but also dangerously embracing a narrow set of interests that put at risk the future of young people, education, and the nation as a whole" (p. 109). Stanley Aronowitz (2001) argued in *The Knowledge Factory* that corporate subservience is undertaken by academic leaders at the top who frequently "resemble CEOs rather than academic leaders" and who articulate their institutional mission in terms of shifting university curricula to serve both the job market and thereby the interests of the stock market (p. 62). A 2008 study called *Closed Minds? Politics and Ideology in American Universities* troublingly found that curricular offerings focusing on civic and democratic engagement are increasingly shunted aside in favor of coursework that leans towards that which can be made quantifiable (A. Lee Fritschler, 2008).

Liberal arts departments that used to have a more robust presence on the university campus are increasingly gutted and shrunk to the point of irrelevance. If a humanities program finds itself unable to articulate how it fits into the demands of the market then it should be prepared to justify its existence when curricular reforms are implemented. "Training students for new-economy jobs, applying for grants, and raising funds from donors on the side: these 'prosaic functions' are 'job 1'" for many of today's academic leaders (Nealon, *Post-Postmodernism: Or The Cultural Logic of Just-In-Time Capitalism*, 2012, p. 68). Leaders at public institutions face decreasing state funding and increased state scrutiny while academic leaders at private institutions face parents, students, and accreditors demanding to know, in a post ("post"-?, did the recession ever end or are recessionary economics the new normal of late capitalism?) recessionary academic environment, what return on investment they are getting for skyrocketing tuition expenses.

What is really happening here is emblematic of an intensification of American fiscal conservatism into institutions that might dare to challenge neoliberal orthodoxy of market dictates. It is the corporatization of higher education, or so it may seem on the surface. A nuanced treatment of the corporatization of American higher education requires looking at the detractors of the argument that the American university increasingly resembles a corporation.

When arguing about the corporatization of the university as fact other scholars argue that a more nuanced argument is necessary. A 2010 Chronicle of Higher Education article found that corporations actually tend to emulate academia as much as academia is emulating the corporate world (Ross, 2010). Andre Ross (2010), a professor of social and cultural analysis at NYU, points out that "corporations are fast moving species" that pick and choose the best practices from a variety of institutions, including academia. Ross found that corporations, especially those in the knowledge economy "have adopted many features of the traditional academic work mentality: open speech, the 24/7 cycle of generating ideas, the loose, overlapping live-work schedule, the custom of sharing knowledge – even the need for sabbaticals" (2010). Ross makes it appear as if the corporate world and academia might have a mutually beneficial relationship: the corporation teaches academia how to run efficiently while academia teaches the corporation how to create work environments that are attractive to employees.

Another scholar challenging the way corporatization of higher education is traditionally critiqued by academia is Jeffrey Nealon, English professor at Penn State University. Nealon makes the argument that for all the academic discourse decrying the corporatization of the

university, what corporatization actually entails is rarely factored into its criticisms (Nealon, 2012). Nealon details that if universities actually adopted the 1980s-era Reagan style corporate downsizing model then universities wouldn't be bloated in the middle with support staff and administrators as they currently are (Nealon, 2012). Nealon is actually interested in appropriating corporatization's methods in a manner that might further the progressive movement to return the university's focus to teaching and research and not the provision of services and employment of administrative scrutinizers. Nealon (2012) writes, "if higher education has to cut to stay alive in the near term, maybe it has something to learn from the people who brought you downsizing, '80s-style corporate practitioners" (p. 69).

Nealon's argument goes that sometime in the last four decades, faculty made a bargain with administrators that in return for having to perform fewer administrative functions and receive greater research perks, that administration would hire staff to fulfill the administrative duties and part-time educators to fill the course loads (Nealon, 2012, p. 74). Nealon's (2012) point is that the university actually isn't corporate enough, if academia were really to adopt corporate dictates then it would eliminate middle management and put more resources into delivering returns for those shareholders invested in the university: "the students paying tuition and the faculty invested in providing students with their knowledge" (p. 84).

The 2008 recession seems to have accelerated the trend towards making college more about getting a job and less about expanding the human faculties to consider the vast complexity of the human experience, where we've been, and where we may be headed. Too often the students in my history course, which is for now part of the liberal arts curriculum that every student must take, lament that historical topics and their relationships to current events are interesting, but what are they supposed to do with historical study? There's no one recruiting for history positions at the university job fair, I'm made to believe. It leads one to wonder how we got to this point, where even at an institution whose mission is committed to balancing the humanistic values of a liberal arts education with professional preparation that the latter is squeezing out the former.

In conversation after conversation at my institution I challenge students locked into the mindset that they have to study something "practical", whatever that means, because in the early 21st century American youth are told that college is how they get a job and get ahead. Never mind the crushing debt burden they increasingly have to take on just to complete their degree. Never mind that they're graduating into an economy where wages have been stagnant now for decades and will severely hamper their abilities to strike out on their own and achieve the "American dream" of homeownership, another consumerist trope that's increasingly being exposed as a fantasy or relic from the era of their baby boomer parents. A poll released by Harvard University found that half of "millennials" interviewed thought this particular American Dream to in fact be dead (Harvard Institute of Politics, 2015).

The treatment of the university as a job factory isn't limited to those administrators at the top under pressure to show that their students get jobs and prove to accreditors and government scrutinizers that learning outcomes are being met. Students now increasingly treat "the classroom experience as a kind of market exchange" (Rickford, 2010, para. 8). Henry Giroux (2009) takes to task right-wing Students for Academic Freedom founder David Horowitz and his right-leaning students who expressed incredulity at not controlling their own curriculum and being exposed to ideas challenging power structures that left them uncomfortable:

Education is about fostering the conditions in which youth can make up their own minds, not be indoctrinated. Horowitz's view of education as a one-way, top-down learning process is utterly facile, although it is telling: conservatives are most comfortable with precisely this kind of hierarchical authority structure and would like to see it emulated in the classroom. The complaints by conservative students often share the premise that because they are 'consumers' of education, they have a right to demand what should be taught, as if knowledge is simply a commodity to be purchased according to one's taste (p. 127).

Many students individually seek out their own courses, but often students are advised on which courses to take and freshman year advising can set students off on academic and career trajectories. To be very clear, there's nothing nefarious about advisers' influence over student curriculum. Staff advisers are most likely under enormous pressure to produce numbers showing that their universities' students graduate and get jobs. I understand quite well that the purpose of these offices is to ensure students successfully graduate and to connect students to gainful employment opportunities. Yet it's a practice that takes place in a broader context where very early in their college experience students are taught to value courses in business or the hard sciences as potential wealth maximizers. In these instances humanities courses that are part of the liberal arts curriculum can be treated as something to endure, best suffered through by taking a humanities course with a professor who's known for being "easier." Students are inculcated in these instances to treat course selection as a market to browse where they can purchase "knowledge capital that will enable [them] to maximize personal wealth" (Rickford, 2010, para. 8).

A major problem contributing to the corporatization of the university is attributable to what other scholars have deemed the *audit culture*. In this environment you're only as good as what the numbers say. The audit culture demands measurable outcomes, quantifiable objectives, and for institutions to police themselves in the name of efficiency and deliverable results.

Besotted with rituals that are characteristic of the corporate world, higher education has inaugurated an accountability regime – a politics of surveillance, control, and market management that disguises itself as value-neutral and scientific administration (Tuchman, 2010).

This culture of management has its roots in industrial-era techniques of worker control. Scientific management techniques manipulating worker conduct and labor in order to improve outputs and efficiency go back to the late 19th century (Shore, 2008). K-12 schooling broadly has taken up this culture of students to be controlled through teachers who are controlled through administrators who are controlled through education boards who serve dictates mandated by the state that are in turn influenced by legislation and policy handed down from the federal level. Though obviously there is nuance to this model depending on geographical, financial, and temporal context on the whole I believe it to be an apt description of power and control characterizing present-day higher education as well. The choice facing academia in the corporate university debate is really about the university's mission and who the university is designed to serve. In the early 21st century where late capitalism has intensified its grip at all levels of governance, those at the highest levels of governance have taken up a top-down push for universities to graduate greater numbers of STEM graduates.

In December of 2012 the Obama Administration released an announcement that “increasing the number of students who receive undergraduate degrees in science, technology, engineering, and math (STEM) by 1 million over the next decade has been formally designated as a Cross-Agency Priority (CAP) goal” (Feder, 2012). The announcement’s author was Michael Feder. Some quick internet research found Mr. Feder to be a then-senior policy analyst at the White House Office of Science and Technology Policy who later returned to a position he held before as a senior policy analyst at the Board on Science Education (BOSE) at Carleton College’s Scientific Education Resource Center (Science Education Resource Center at Carleton College, 2015).

The White House Office of Science and Technology Policy (OSTP), for whom Mr. Feder was working when he published the White House declaration that policies were needed to increase STEM graduates, was established in 1976 and a major part of its mission is to “ensure that Federal investments in science and technology are making the greatest possible contribution to economic prosperity, public health, environmental quality, and national security” (Office of Science and Technology Policy, 2015). The 1976 mission discourse of the White House using the Office to contribute to economic prosperity and national security seems designed to placate the right, while the contributions to public health and environmental quality placate the left. However, while the OSTP is structured to contribute to these aforementioned issues, it doesn’t seem structured to ask the critical reasons behind why economic prosperity produces winners and losers, or what are the structural components contributing to poor public health, etc. Economic prosperity, public health, environmental quality, and national security are treated as problems in a vacuum devoid of context or underlying structural factors. Running over and past these questions, during the Obama administration the OSTP acted as chief cheerleader for the push for STEM in higher education. Consider how the Cross Agency Priority for increasing STEM graduates proposed to focus its efforts:

Identifying and implementing evidence-based practices to improve STEM teaching and to attract students to STEM courses; Providing more opportunities for students to engage in meaningful STEM activities through research experiences, especially in their first two years of college; Addressing the mathematics preparation gap that students face when they arrive at college, using evidence-based practices that generate improved results; Providing educational opportunities and supports for women and historically underrepresented minorities; and Identifying and supporting innovation in higher education (Feder, 2012).

However, the office as a branch of the federal government could not address these priorities alone. The federal government asked for collaboration and investments from groups of stakeholders across academia, industry, and “other partners in the education community” (Feder, 2012). The identification of the government, academia, and industry having a partnership in education is nothing less than a tacit admission that the government considers education as a tool of commerce. Education as a tool of commerce is supported by further statements that came out of Performance.gov’s iteration of how STEM will be a Cross-Agency Priority Goal (United States Government, 2012).

Performance.gov described itself as “a window to the Administration’s efforts to deliver a more effective, smarter, and leaner government. The site gives the public, government agencies, Members of Congress, the media, and others a view of the progress underway in cutting waste,

streamlining government, and improving performance” (United States Government, 2009). At this point I’d like to point out a reminder that this website was a tool of a supposedly liberal, Democratic administration. The fact that Performance.gov (2009) stated that its role is to serve as a guide on “Acquisition, Financial Management, Human Resources, Technology, Performance Improvement, Open Government, Sustainability, and Customer Service” tells one all they need to know about not just how the federal government considers education to be a tool of commerce, but in this website the federal government openly admits it runs itself like a commercial operation (United States Government). Lest there be any doubt that the government is committed to turning education into that which can be quantified and managed in the name of managerial efficiency, in huge block letters at the top of Performance.gov’s “About” section is a 2009 quote from President Obama that reads, “Success should be judged by results, and data is a powerful tool to determine results. We can’t ignore facts. We can’t ignore data” (United States Government, 2009). The website has since been listed as “historical material frozen in time” with the current Trump administration lumbering from one chaotic frenzied episode to the next before putting out any coherent education policy.

A 2013 article in the Chronicle of Higher Education questioned whether the monotheistic faith that America had a shortage of STEM majors that the federal government and its partners in academia and industry had to rectify via policy was itself based in fact or due to the influence of an industry dependent upon STEM graduates (Anft, 2013). The policy wonks advising the president to make STEM a Cross Agency Priority were the President’s Council of Advisors on Science and Technology (PCAST), who produced a report entitled *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics* (Feder, 2012). The PCAST members include nearly two dozen academics in the hard sciences and corporate titans in technology and aerospace (Office of Science and Technology Policy, 2012). This Council essentially recommended to the president to craft a policy that would favor their professional and academic interests. What resulted was the adoption of discourse from the President and the politico-class that the next great challenge in American education was that there weren’t enough college graduates in STEM and that the government in collaboration with industry and academia must craft policy to address this STEM shortage lest America suffer in the global economic competition. In regards to the current administration, a recent perusal of the U.S. Department of Education’s website found nothing new from current Secretary of Education Betsy DeVos regarding STEM-related policy, initiatives, or any clear break from Obama-era STEM promotion. Considering the Trump administration’s outright hostility to climate science and environmental protection, one can surmise that new STEM initiatives will come with strings attached that are pro-fossil fuels.

A 2013 Chronicle of Higher Education report questioned where widely-accepted acknowledgement of an American STEM shortage came from. The Chronicle quoted Michael Teitelbaum, Wertheim Fellow in science policy at Harvard as saying that “[m]ost of the claims of such broad-based shortages in the U.S. STEM work force come from employers of STEM personnel and from their lobbyists and trade associations...Such claims have convinced some politicians and journalists, who echo them” (Anft, 2013, para. 10). That same scholar goes on to argue that if there really were a STEM shortage in the labor force, then this would be reflected in rising wages in the STEM sector, something which as of 2013 was not happening (Anft, 2013).

The 2013 Chronicle article goes on to state that there are problems with claiming a STEM worker crisis by looking at the education of those laborers who are actually employed in

STEM fields in the U.S. An analysis by the National Center for Education Statistics Data done for the Economic Policy Institute found that “the bulk of homegrown STEM employees do not even hold STEM degrees – some 36 percent of IT workers do not have a college degree at all” (Anft, 2013, para. 19). Another take on the federal policy push for STEM graduates says that an overproduction of STEM workers actually will work to suppress wages, something beneficial to STEM industries. Norman S. Matloff, professor of computer science at UC-Davis who studied how IT industry employers import lower-paid foreign STEM workers while offshoring the STEM jobs of older American workers claimed, “This is all about industry wanting to lower wages...We have a surplus of homegrown STEM workers now...We’ve had it in the past and we’re likely to have it in the future...The Washington consensus is that there is a broad-based shortage of STEM workers, and it’s just not true” (Anft, 2013, para. 16).

At best, the article found that for those who advocate the push for STEM, their reasons have less to do with STEM graduates filling work in STEM fields and more about STEM workers being more likely to find success working in non-STEM fields. The *Chronicle* quoted a research professor studying education and the workforce at Georgetown University who stated, “Having experience in technical matters helps them land good non-STEM jobs. They might work in places like marketing or medical-device sales, where their technical backgrounds helped them get in” (Anft, 2013, para. 22).

What is most telling about the *Chronicle*’s exhaustive analysis about the STEM debate is a quote from Robert Atkinson, one-time president of the Information Technology & Innovation Foundation. Mr. Atkinson’s group is an advocate for greater cooperation between government and academia in producing greater numbers of STEM graduates and is supported by a group of various technology companies (Anft, 2013). Mr. Atkinson argues that it’s foolish to let students choose their own courses of study, “Shouldn’t we be steering [students] into degree types that are of more value to society, such as computer science or engineering? The American tradition is one of hard-core pragmatism. We’re at risk of losing that, and we’re in trouble now in regards to competitiveness” (Anft, 2013, para. 38).

The problem is that there exists little information to back up Mr. Atkinson’s claims. A review of information from the National Math and Science Initiative (NMSI) shows claims that Americans are falling behind other countries in the numbers of students deemed proficient in math and science, but these figures lack citations (National Math & Science Initiative, 2015). The alarming statistics laid out on NMSI’s website have more to do with poorly performing high school graduate scores in math and science and overall graduation rates than they have to do with any sort of STEM labor shortage affecting some mythical *competitiveness*. The STEM crisis, if one were to read the NMSI website, appears to be more of a condemnation of the American K-12 system for its math and science test scores than anything suggesting that America is losing some nebulously defined STEM competition.

Let’s take a look at the larger picture of what I think is happening, though. I consider policies to be a collection of standard practices designed to achieve consistent outcomes benefiting elites in control of institutions. By extension then, the Obama administration’s Cross Agency Priority to graduate 1 million more STEM graduates by the next decade via federal grants and collaborative industry sector funding is an example of a series of principles and directives designed to achieve a specific outcome: serving the market in the name of global competitiveness. Regardless of what the STEM push achieves according to the *Chronicle* article’s analysis, either creating graduates for phony STEM labor shortages that drive down

labor costs for STEM-related industries or reorienting curriculums away from those that encourage study of human culture and cultivate dissent towards curricula that can be scrutinized, quantified, and justified via hard data, advocates of pro-STEM curricular and policy reforms are still serving capital's interests.

Jeffrey Nealon (2008) wondered “how can we possibly say ‘yes’ to the brutality and inequality of capitalism? But the insistent Foucaultian question, I would submit, is more troubling: ‘How can we say ‘no’ to capital? It’s who we are’” (p. 21). Nealon would later argue in *Post-Postmodernism: Or the Logic of Just in Time Capitalism* that capitalism isn’t something to be rejected or even accepted, it’s axiomatic in that it is something that we can only respond to (Nealon, 2012). In this case the STEM policy push is both the state responding to the market, and the university responding to the market as directed and encouraged by the state. I believe the state in this instance has encouraged universities to develop routine STEM-based curriculum in turn encouraging student thought to consider STEM as professional success, read: adjusting to what the market wants. This acceptance of STEM as a field of study and the guarantor of a career and the conceptualization of the university as merely a preparation ground for entering the market increasingly becomes accepted as the new norm.

I believe that the push for STEM is a prime example of the totalizing power of neoliberal capital to make higher education respond to market dictates via state coercion. I think STEM needs to be considered as another form of the intensified power of capital through the market finding another way to colonize the university mission and what counts as knowledge. “[T]he saturation of a set of practices within a field—the slow expansion of a given practice into a dominant mode”, which is a very accurate labeling of STEM being accepted as a guarantor of employment, “is the primary mechanism for which historical change happens” (Nealon, 2008, p. 38). In this historical instance, what I think we’re seeing is the intensifying solidification of what counts as knowledge as that which can be quantified into data and get one employed, in short, STEM.

Universities are naturally looked at by students as sources of knowledge. The student definition of knowledge can take different forms, though. It is not monolithic and is individualized according to the student. The knowledge provided by the university, in the mind of the student, can be knowledge about the world, humanity, and natural systems. It can also be very generalized knowledge that a student seeks to prepare the student to be a citizen and an employable professional. I think my institution of higher education in its mission statement does an admirable job of trying to balance the two while arguing that liberal arts study and professional preparation don’t have to be incompatible. However, in the broader world of higher education, I’m concerned about the power of too much STEM adoption ultimately transforming the university into more of a site for professional preparation and less of a site for developing humanistic and intellectual capacities. This is because STEM fields are quantitative disciplines and I wholeheartedly reject that a true understanding of the human experience, an education for that matter, is a purely quantitative endeavor. After all, surely education and comprehending the human experience are qualities instead of quantities.

If universities are investing more in their STEM fields and encouraging students to enroll in these disciplines, while investing less in their humanities and fine arts as well as doing less to qualitatively defend their humanistic significance, then that is a subtle yet very intense form of power being exerted over students’ bodies and minds. Universities that buy into some quantifiable notion (that in my opinion doesn’t necessarily exist) that the majority of jobs in the

future are going to come from the STEM fields are in fact setting a mission norm. Adoption of policies and initiatives that favor STEM is actually the creation of two norms: that the university exists to serve the market, and what the market wants is STEM. This is a very powerful and dangerous message for the future of the university as a site dedicated to inculcating critical thought and democratic engagement.

The question of the critical transformative educational project, of which I am a part, could ask what is to be done. This, for me, is complicated. I think STEM is actually just another flash-in-the-pan as capital's latest flavor of the month. Twenty-five years ago students needed to be trained for a market that depended on other disciplines related to the service economy, twenty-five years before that university students needed to be prepared to manage the industrial economy. I think any abandonment of the humanistic liberal arts and the fine arts in response to market dictates is just more reactionary policy. I'm all for having students get jobs, but never at the expense of intensely defending and improving the variety of humanistic studies available to the students, yet this is what I'm afraid is broadly happening in higher education. I think a fair response would be the encouragement of a healthy skepticism to education serving what the market wants. I'm of the belief that market capture of educational institutions has gone too far to be systemically reversed, but that localized dissent in the form of never abandoning the humanities that teach that market dictates go through cycles is imperative.

I believe in carving out spheres of resistance that don't necessarily take on institutional transformation directly, but exist to educate about broader phenomena in political economy that are well-informed by a solid historical appraisal of what has happened, what is happening, and what is likely to happen to higher education responding to market dictates again. Said spheres of resistance can take many forms. I offer two pedagogical examples while acknowledging that challenging the current structure can take many forms.

Allowing students to engage in a careful study of Thomas Kuhn's (1962) *The Structure of Scientific Revolutions* in a history, philosophy, or education course could force students to consider if science only aims to answer those questions for which it can be assumed that answers exist. Deconstructing STEM via Kuhn could demonstrate that science truly has revolutionary progress only when it transitions from puzzle-solving within a paradigm until enough anomalies arise that push the paradigm's conceptual schemata into crisis that eventually force a revolutionary new paradigm. These revolutionary moments are not your everyday science, nor will these moments likely occur in one scientist's lifetime. Majors in the hard sciences could debate if what scientists "do" is less revolutionary or more puzzle-solving. Puzzle-solving has value, to be sure, but a reconceptualization of science that undermines its status as bedrock and revolutionary could open up minds to consider other paths of critical humanistic study.

A course in religion could take up questions of divine providence. Students could take vocational comfort through considering if the divine leads in an imperceptible way and over a long period of time so that one commitment leads to another in a way unforeseen. The first generation 18 to 22 year-old college student under pressure to study something *practical*, which is really a catch-all term for studying something that serves the market, could defend their choice of study with a sense of inquisitive confidence. That student will have the peace-of-mind that comes from believing that courses that are intellectually engaging to them are worthwhile in the here and now and that providence will deliver the material in time. Think of how relieved students would be if they heard and believed in a message that they don't have to use higher

education exclusively to avoid falling into the precariat. Challenging the current structure means pushing back on the narrative that courses in STEM are the best guarantors of getting a job.

I am not saying courses in STEM do not hold societal value. Certainly STEM-related research leads to medical, environmental, and physical safety-related progress. Healthier populations in cleaner and safer environments is a societal positive on a certain level to be sure. Yet to solely focus on improving the human condition in medical or environmental terms is to do nothing to address growing economic inequality and unequal access to the fruits of STEM-related study. Saying that healthy, pristine, safe environments are needed before social justice questions can be addressed is to be constantly moving the goal posts before critical debate can take place. STEM study and positivistic inquiry can coexist with qualitative humanistic endeavors, but when STEM supersedes disciplines that ask questions as to why people can't access improved health care, why an environment has been spoiled, or why broader structural issues render certain populations less safe, then the underlying causes of the problems STEM aims to rectify remain unaddressed. When an institution promotes STEM the institution is celebrated as being forward-thinking and practical, but to critically question STEM and the creation of *homo economicus* is to be labeled quixotic. Critically transformative educators need to constantly remain skeptical and push back against dominant modes that use the university to serve capital, for "[i]f we reduce the value of higher education to the material return on our financial investment, we will impoverish our culture and diminish ourselves" (Nietzsche, 2016, p. xvii).

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