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Essay

The Data-enabled Futures of Learning and Employment

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Abstract

There is great promise that data-enabled predictions and recommendations can improve learning outcomes and strengthen connections between education and workforce development. However, the work is emergent, and multiple futures remain possible depending on whether the needs of the market, the employer, or the individual are amplified. After a brief mapping of the history of such efforts, this essay employs a Futures Wheel and Causal Layered Analysis to create and analyze three possible scenarios for how the use of data and analytics could help or harm individuals in their quest to prepare themselves for and to find meaningful family-sustaining work.

Keywords

Learning Analytics, Futures of Higher Education, Futures of Work, Data Privacy and Ownership, Data Literacy

Introduction

In our "algorithmically pervaded society" (Knight & Buckingham Shum, 2017, p. 18), few aspects of daily life are untouched by the use and analysis of data. Learning and employment are no exception. In fact, the United States has been using data to understand and improve education since at least 1870 when the National Center for Education Statistics (NCES) began gathering data. Figure 1 presents a timeline summarizing major developments in this area since that time.

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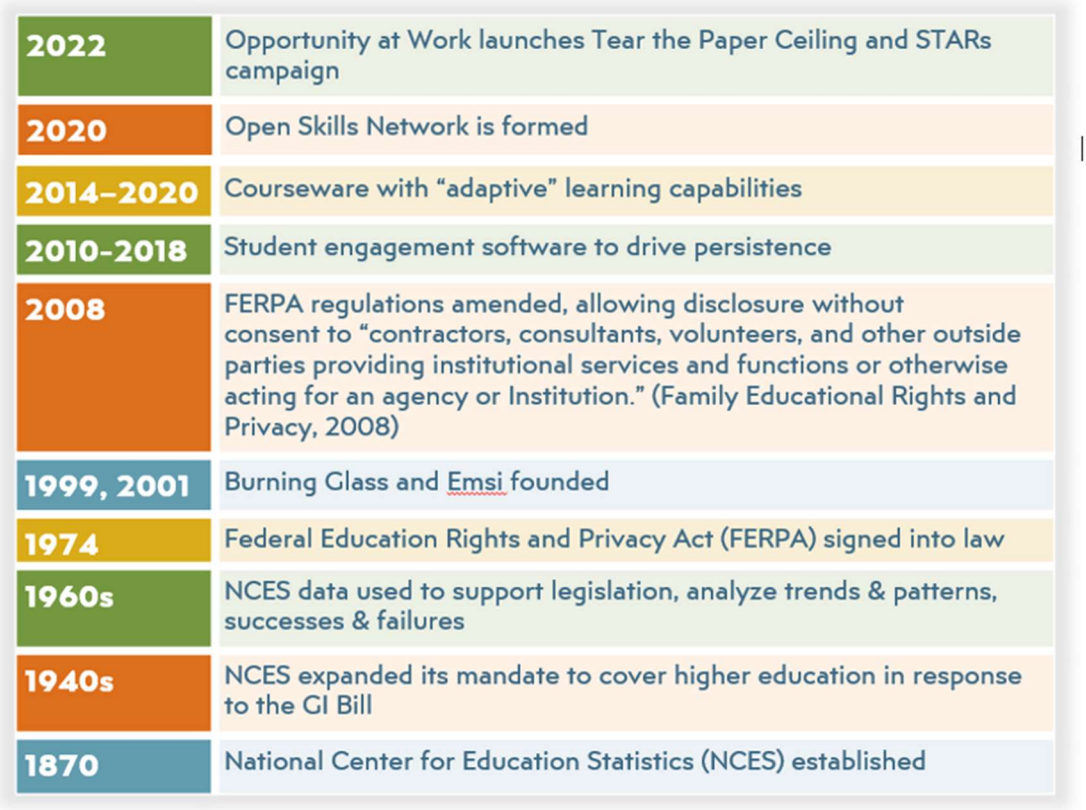

Fig. 1: Timeline of Highlighted Uses of Data in U.S. Education and Employment, ©Joann Rishel Kozyrev

The NCES mandate began with elementary and secondary school data and expanded to higher education after World War II. A significant change in policy took place in 1974 when the Family Educational Rights and Privacy Act, commonly known as FERPA, was enacted in response to concerns about ownership and usage of data in educational records. As of this writing, FERPA has been amended eleven times, and the most significant amendment may have been in 2008 when public private partnerships were allowed to utilize both personal and de-identified data without consent. This change empowered an explosion of commercial tools to encourage student engagement, drive learner persistence, and create courseware with adaptive learning capabilities to personalize learning.

A concurrent interest in using data to strengthen the links in the ecosystem of education, employment, and learner/earners has existed since early in the 21st century when Burning Glass and Emsi (now merged into Lightcast) were formed to use workforce data to match people with jobs. The effort became more proactive and forward facing in recent years with the formation of the Open Skills Network and the campaign to promote people who are Skilled Through Alternative Routes (STARs) led by Opportunity at Work. These and other organizations are committed to solving this problem: "Much of the data needed to support skills-based education and hiring already exists; however, this skills data is siloed, not easily accessible nor machine-actionable, making the switch to skills-based practices for most employers and education institutions a manual and expensive endeavor" (Open Skills Network, 2023).

As these large-scale but first-generation uses of data to monitor and track engagement, personalize learning, and connect people with opportunity become more pervasive and effective, questions similar to those that brought about FERPA are emerging: Who owns learners' data? How is it being used? How might it be misused? What diversity, equity, and inclusion concerns should be considered? In such high growth and high-risk fields such as the use of data and analytics in the learning and earning ecosystem, a futures studies approach can drive better understanding of the complex interplay of social, technological, economic, policy, ethical, and demographic factors at play.

The Data-enabled Future of Learning and Employment

Previous futures scenario work in this space includes a Causal Layered Analysis (CLA) by Inayatullah (2017) of the future of teaching and learning in an employment ecosystem inexorably changed by automation. Of the four scenarios presented, two involve changes to policy and infrastructure. These include "Teach and train for emerging industries," which anticipates skills being needed for "new categories of jobs, some unimaginable through today's lenses," and "Teach and train for a world after jobs," in which "education (is) no longer about jobs but about purpose, adaptability and meaning" (p. 7). Inayatullah also cautions that inattention to inequality could cause the majority "to live in a state of fear and despair - perpetual job anxiety" (p. 8). Other authors present future scenarios from the perspective of the higher education institution (Mairal, 2020; Savic, 2023). Thus, the scenarios in this paper focus on how the data generated by online learners and job seekers will impact the learner-earner.

For this exploration, the author identified four drivers in this sphere which will impact the future uses of data and analytics in education: (1) Personalization, (2) Monitoring & Tracking, (3) Commercialization, and (4) Learner Owned Data. A Futures Wheel analysis was used to amplify and extend the implications and consequences of these four drivers (Figure 2). To inform futures scenarios, the related implications and consequences identified in the wheel were clustered. Three clusters emerged with shared characteristics about centers of control, loci of trust, and interpretations of equity. Finally these three clusters were developed into three plausible future scenarios. The goals of this work are to drive conscious, ethical decision making which favors futures that maximize the value of data and analytics for the learner and for society.

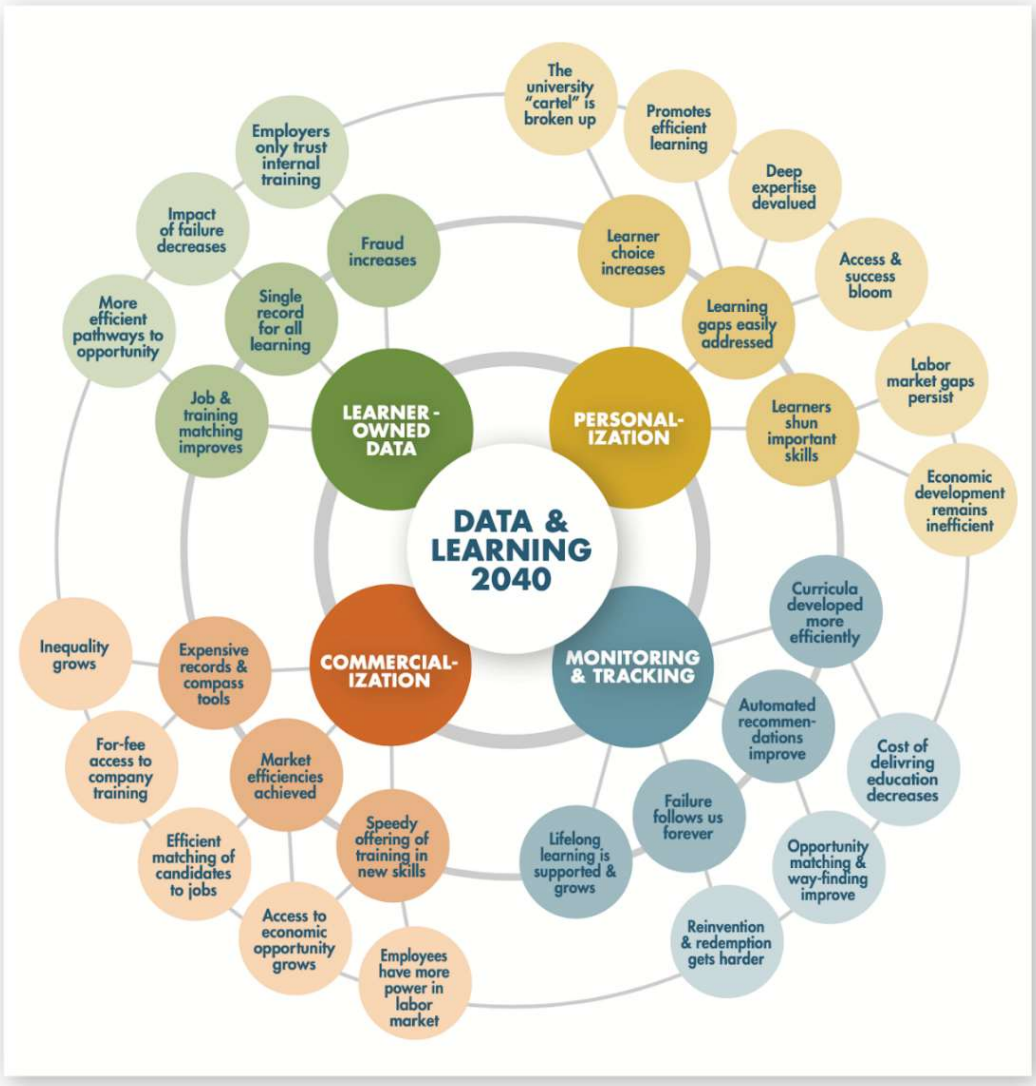

Fig. 2: A Futures Wheel Analysis of Four Drivers of the Use of Data in U.S. Education and Employment in 2040, ©Joann Rishel Kozyrev

The first driver analyzed in the Futures Wheel, personalization, could drive very positive effects, such as more choice and opportunity for learners and opportunities to fill in the skills and gaps learners need to reach their goals. This could lead to significant efficiency and an age of improved access and success for many. However, should colleges and universities fail to adapt to becoming learning providers that accompany individuals through their careers, the potential resulting decline in the higher education system would be more difficult for society to absorb.

Potential consequences of the monitoring and tracking drivers include the growth of lifelong learning, helpful automated recommendations, and more efficient development of learning experiences. However, taking the profiling and persistence inherent in many criminal justice systems as a cautionary tale, it is important to note the possibility that failure could follow the learner forever, making reinvention and redemption harder.

The economic driver toward greater commercialization might result in positive developments such as efficient matching of candidates to jobs, increased access to opportunities, speedy availability of affordable training in the newest skills, more power in the hands of employees, and market efficiencies. However, if the learner records and

compassing tools are not designed with care, there is a real possibility they will reinforce existing inequalities or become too expensive for use by those who need them most.

Finally, learners owning their own data will help avoid many ethical issues; however, there is also the potential for learners in charge of their own data and journeys to shun or ignore skills important to industry or society because they are difficult to obtain. Currently, we rely on expert educators to select the skills and knowledge important to a field and insist that certain things be taught and learned, but with the learner in charge, we may find ourselves relying on the market to increase the value of important skills to make obtaining them worthwhile. This could lead to a devaluing of expertise and persistence of current labor market gaps and economic development inefficiencies.

Upon completing this Futures Wheel exercise, consequences of the four drivers with shared characteristics and impacts were clustered together. Three scenarios emerged, and each was analyzed to determine how these factors would impact key stakeholders: learners, employers, and commercial interests. In Figure 3, these four color-coded drivers are shown clustered into three plausible scenarios: The Market Finds a Way, Distrust & Disillusionment, and The Empowered Learner.

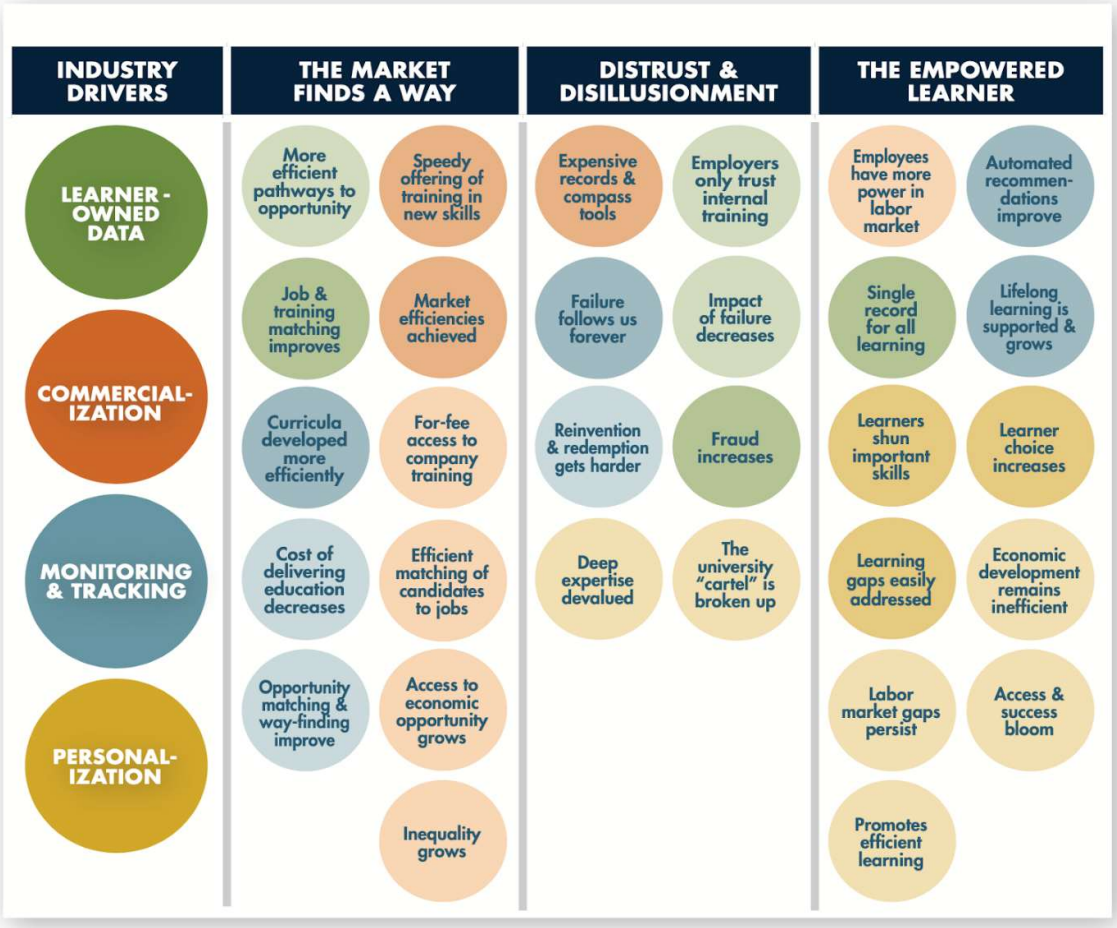

Fig. 3: Extended Impacts of the Four Drivers Sorted into Scenarios, ©Joann Rishel Kozyrev

CLA was then employed, first to document the status quo, and then to compare each of the three resulting scenario clusters (Figure 4). The CLA of the current state of affairs surfaces the litany which is that this is a field emerging from adolescence with great promise and potential that has not yet settled into its full identity. For most people there is still more belief than proof, although the proof is emerging quickly.

	STATUS QUO	THE MARKET FINDS A WAY	DISTRUST & DISILLUSIONMENT	THE EMPOWERED LEARNER
LITANY	• Much experimentation and growing awareness of value • There is much belief in the power and economic value of learning analytics, with emergent proof • Many small-scale projects and product; no "killer-app" has emerged	• The cost of learning decreases • Workforce development and society's needs are supported • Best advantage in the marketplace can be bought by having the most expensive, widely used tools • Records exist primarily to generate profits	• Learner data and records are unavoidable but are not trustworthy; they are so important that fakes and falsehoods have proliferated • Records are as much for recording failures as successes • There is distrust in the claims of education	• Choice & Personalization • Society's needs are secondary to the desire of the individual • Learner records are primarily for recording and sharing successes • The learner is a customer whose demands must be met
SYSTEMIC	• Much of the policy in the U.S. on which the use of this data is based is from 2008 • Technologies are isolated and not yet integrated or interoperable • Much interest in economic value • Potential to drive or decrease equity • Clarity on necessary policy and ethics is emergent	• Market and profit centered • Trust is placed in economics and the free market • Both the tools and the impact on individuals and employers can be commercialized • Equity is secondary to the right to leverage the market and products • Laws protect the market and those with capital	• Company and employer centered • Trust is limited because the seeming unfairness of the system toward the individual causes a fraud backlash • Equity is understood in terms of access, not the design & outcomes of the tools • Laws protect companies rather than the individual and are designed to fight fraud,	• Individual centered • Trust is placed in technology • Equality may be greater if policy and technologies are designed with equity and underserved learners in mind • Laws are biased toward protecting the individual
DOMINANT WORLDVIEW	Data and analytics could be very good to improve learning, but the methods and uses of learning analytics tools are still emergent and understood only by trained practitioners.	• The inherent intelligence of the market drives efficient use of data for learning and career	• The employer has all of the power, and the system is rigged against the individual	• The individual makes rational choices and should be in complete control of their data; Individuals should be empowered to make their own decisions about learning and work.
UNDERLYING METAPHOR	Practitioners are like the explorers of the Middle Ages and are traveling with incomplete maps to which they are rapidly adding.	• Liquidity: Planning learning and a career is as easy as watching water run downhill, but that liquidity can easily be dammed or diverted for those who can't or won't pay	• Three-card monte: The system is rigged, and you can't win without cheating	• Each learner is ruler of their own castle; education, career services, and society adjust to the will of the individual

Fig 4: Causal Layered Analysis for the Status Quo and Three Future Scenarios, ©Joann Kozyrev

Systemically, as the science and applications emerge, policy will have to catch up, and decisions will need to be

made to guide the way data and analytics are used economically and to drive greater equality, or less. Technologies and platforms are not yet interoperable, reminiscent of days when documents created on a Mac computer could not be read on a PC and vice versa. There is almost undoubtedly a need for greater attention to regulation, policy, and ethics, but little action has been taken.

The current dominant worldview varies. At this time, it is still possible to ignore or discount the value of data and analytics to education and employment and ignore emerging trends and signals, but that worldview is quickly shifting to greater awareness and adoption of these tools. All but the most dogmatic of academicians acknowledge that higher education must help connect learners to careers and that data can play a positive role. The underlying metaphor is that of the great explorers who traveled the seas and explored lands being visited for the first time by people from their countries. Some went for economic gain and others for grand ideas. They were all traveling with incomplete maps, to which they contributed—sometimes accurately and sometimes not—as their information and experience expanded.

For the scenarios that emerged from the Futures Wheel, the litany and system levels of the CLA examined the aforementioned characteristics that differentiate the clusters of impacts: center of control, loci of trust, and interpretations of equity. This CLA was then used to inform the creation of scenarios including dominant worldviews, metaphors and a "day in the life" vignette to bring the scenario into focus.

Scenario 1: The Market Finds A Way

Center of control: The market
Locus of trust: Technology
Interpretation of equity: Secondary to the right to pursue commercial advantage

In this scenario, the pull of commercialization has been amplified, and the benefits of data and analytics are incredibly valuable and widely available—for a substantial fee. Even in 2023, research showed that there was growing trust and intention to follow career and education recommendations from an AI tool especially with younger study participants (Gedrimiene et al., 2023). By 2040, data from the career trajectories and successes of early adopters of such technology have contributed to significant improvements in the tools.

In the scenario The Market Finds a Way, the dominant worldview is that the inherent intelligence of the market will drive efficient use of learning data and that this kind of analysis and recommendations will be worth paying for. A metaphor in play in this scenario is that planning an education and career is as easy as watching water run downhill—but the water can easily be dammed or diverted for those who can't or won't pay.

Headlines that represent the lived social and individual experience in this scenario include "Cost of College and Job Training Falls for Fifth Year in a Row," "Efficient Compassing Tools to Match Education, Workers, and Jobs Reduce Underemployment and Boost Local Economies," and "The Neediest are Shut Out of Learner Earner Records by High Costs."

A day in the life of The Market Finds a Way: Simone settles onto the couch; it had been a long day. After a full day at the warehouse preparing shipments, she had gone to healthcare robotics class. The fatigue was real, especially as her pregnancy entered the third trimester. But her plan made a little fatigue worth it.

According to the Learner Earner App, the skills she gained in the warehouse, paired with those gained in class, would make her a great candidate for emergent jobs. She was especially interested in stocking the healthcare robots assisting older adults because the trend toward having day care centers combined with assisted living villages meant she could likely work near her infant son after her parental leave expired. The plan she had laid out in her app showed how she could move from stocking the robots to learning the technical skills to become a maintenance specialist and then an engineer. An alternate route would be to become a geriatric medical assistant and eventually a practitioner. Fortunately, she didn't have to decide now. She could continue on her path, and the app would help her make efficient decisions informed by the market and her own strengths as she progressed along her pathway.

The app alerted her that one of her documented skills had just increased in value. She sighed. She was glad that her pregnancy allowed her three-month free trial to be extended to six months. But it was so costly. She hoped she wouldn't be at a disadvantage during the time she'd be without it until she could find a job that provided the app as

a perk or she earned enough to pay the expensive subscription herself.

Scenario 2: Distrust and Disillusionment

Center of control: The employer
Locus of trust: Limited trust
Interpretation of equity: Equivalent to access

If, in 2040, purveyors of tools that provide early alerts and personalization of learning have not heeded the warnings to infuse equity into their products and practices and to build trustworthiness and transparency into recommendation systems (Lee & Gargroetzi, 2023; Patterson et al., 2023), a much more negative scenario might emerge. In this scenario, universities are no longer the sole "brand" entrusted with education. More sources of education are considered valuable and worthwhile, but other entities have gained even more power, perhaps seeding more inequality and encouraging backlash and distrust.

The dominant worldview in this scenario is that data can and will be leveraged for personal gain and is not to be trusted. The associated metaphor is that the data-driven system is rigged, just like in Three-Card Monte. Since you can't beat the system, you might as well join in cheating and gaming the system or not play at all. In this scenario, the keepers of the records serve the keepers of opportunity more than they serve students, and those with privilege and perfect records grow in power and privilege, while those who have failures, missteps, and gaps in their record find it even harder to get past the algorithms to reach opportunities. Much as credit score improvement and debt reduction services currently range from altruistic to predatory, similar services spring up around learning and employment data. The importance of having "the right data" opens the door for those willing to commit fraud and those desperate enough to pay them to find ways around the rigidity of the system.

The lived experience in this scenario is represented by headlines like "Fabricated or False Data Found in 25%+ of Learner Earner Records," "Of the 3982 Degree-Granting Institutions in the U.S. in 2019, Fewer than 2000 Remain," and "Purging College Failure, Incarceration, and Employment Gaps from the Learner Earner Record Becomes More Difficult."

A day in the life of Distrust and Disillusionment: Sonja wakes up and steels herself for another day of job hunting. She opens the Learner Earner app and searches for employment matches. As a formerly incarcerated person, her access to the app is free, as is her access to verified skill-building tools and opportunities. She signs up for a few and determines to start them in the afternoon. Most of the skills she hasn't studied yet are really challenging, and she doesn't have the academic background to attack them. She thinks about applying for college, but the recent wave of institution consolidations and closures means admissions opportunities are thin.

Her inbox of possible job matches seems thinner this week. This may be because of search criteria that employers use to weed her out because of her incarceration, because her school failures haven't passed the "purge term" yet, and because the skills she can prove are not in high demand.

She sighs and thinks: This app is supposed to help me, but it seems all about my past and not about my future at all. She picks up the grainy flier a fellow former inmate gave her that says, "Boost your Learner Earner Record with High-Value Skills and Accelerate Your Purge Term Instantly for a Small Fee." She clenches her teeth and thinks: Maybe it's worth it?

Scenario Future 3: The Empowered Learner

Center of control: The individual
Locus of trust: Technology
Interpretation of equity: Designed into the tools

In this scenario, laws, policy, and practice have gravitated away from data being owned by the platform on which it was created to a world in which data is owned by the user or creator (Nycyk, 2020). Thus, the individual has an unprecedented amount of control over what they choose to learn and how they make data-informed decisions as they make those choices. The dominant worldview of this scenario is that the individual is best entrusted to manage their own data and will make rational choices. An apt metaphor is that each learner is the ruler of their own (data)

castles. A learner can gather all of their skills, no matter where they were gained, into a single record of their choice, and decide what they will and will not share with any given audience. Automated recommendations help learners select microlearning to gain skills, fill gaps in their learning, and make decisions about what careers and jobs to target with great efficiency. The ease with which one can avoid learning difficult skills, however, means that in spite of the increasing payoff for gaining these skills, labor market gaps persist to an even greater degree than when faculty members and curriculum coordinators were deciding what skills to include in a class or degree.

The lived experience in The Empowered Learner future includes representative headlines like "18-Year-Olds Born in 2024 Marvel at How School and Work 'Used to Be Done'" and include a number of self-help articles, including "How to Personalize Your Learner Journey in 4 Easy Steps." There are many success stories of personalized learning tools, such as this one: "Former Refugees Excel through Learning Gap Repair App in Spite of Missing Important Middle School Years."

A day in the life of Empowered Learners: Roberto, Sesh, and Alia, now in their 30s but friends since their teens, gather virtually to catch up. Roberto shares that he's started a new program at work that allows him to match his Learner Earner Record against management roles and get assigned to projects and learning opportunities, which will support his case for a promotion.

Alia asks if her friends remembered how she struggled with writing. Of course they remember—both of them tutored her, helped her with her writing, and talked through her writing assignments to help her prepare her answers. "Well," she says, "I realized that it was time to stop complaining and do something." She started a program that used her Learner Earner Record and an AI tool to identify the gaps in her skills and abilities so she could build exactly the skills she needed most at work. A different generative AI tool created example documents to which she could compare to her own writing to develop the ability to distinguish clear and precise writing from vague and confusing writing.

The friends asked Sesh how his young son was doing in school. He reported that the new dashboards made it easy to know when tutoring and assistance was required. However, the teachers were all a bit worried that none of the children wanted to engage with the challenging STEM skills society and industry need because the app made it too easy to see alternatives that require less effort. "The matching and incentives do seem to be improving with time, though," Sesh says. "By the time he's in high school and college, perhaps it will be easier for kids to see the value of learning skills like math, coding, and even skills we don't know about yet. Now, if only I could get a dashboard that would make him eat vegetables!"

Conclusion

The point of departure for this analysis is that the use of data in education and employment has reached an important inflection point. The historical review surfaced important warnings about data ownership, questionable usage by authorities, and the potential to reinforce inequity as new capabilities emerge.

The implications and consequences discovered using the Futures Wheel and sorted into scenarios raise two questions with which the field must engage to ensure it ethically maximizes value for the individual and for society:

- How is the field addressing questions of trust, control, and interpretations of equity?
- Which stakeholders stand to win and lose as commercialization marches forward and rules about monitoring and tracking the data in the system are set?

This analysis has several limitations, not the least of which is that it is only a preliminary analysis carried out by the author. It is intended to set a starting point from which to inform empirical action research with members of the main stakeholder groups. This futures work should be deepened through research with various demographics who stand to benefit–or not–from the greater use of analytics in education and workforce development. Care must be taken to include those usually excluded from such conversations, including learners who have stopped out of higher education or decided not to participate altogether, and there is likely value in performing this research with both homogenous and mixed stakeholder groups. Because the questions of power, in the forms of control and trust, are so important to this topic, the Sarkar Game may be a useful exercise for helping better understand these dynamics. Teaching backcasting to those developing the technologies and models in this space may also help to ensure that:

- Models, dashboards, and tools are built so that they limit bias and avoid simply reinforcing privilege.
- Policies are set that balances personal, corporate, and public interests.
- The economics and incentives of the tools and commercial opportunities related to education and employment are developed with all stakeholders in mind.

It is coincidental–but instructive–that each of the three scenarios favors one of the three groups of stakeholders in this scenario. The Empowered Learner, of course, favors learners. Distrust and Disillusionment favors employers, until some use fraud to try to balance the scales, and The Market Finds a Way favors the businesses leveraging the data. Considering the three scenarios together, it is entirely possible for all three scenarios to play out simultaneously, and the primary drivers of a rosy or bleak scenario has to do with the protagonists' status and circumstances in society. It will be important to balance the way we use these data and tools to tie the weight of an individual's history against the pull of their future to make the most of the potential for learners and for society.

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