

Richard Arum<sup>1</sup>  
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### Developing Transformative Working-Learner Measurement Infrastructure

As people pursue educational opportunities at increasingly later stages of their life-course, they encounter a bewildering set of highly fragmented, differentiated and loosely regulated programmatic choices in the United States. For example, courses vary along multiple dimensions: specialized and generic; online and in person; for credit or non-credit; badges, certificate, license, or degree yielding; and offered at places of employment, union halls, private trade schools, public community colleges, continuing extension programs or for-profit entities. For working learners considering further education, the challenges of navigating this system are formidable. For educators, researchers and stakeholders working to ensure program quality or improve institutional and system performance, the infrastructure needed to measure educational experiences, trajectories and outcomes is largely non-existent.

Given system complexity and variability, it is perhaps not surprising that there has been so little investment in research infrastructure. However, new opportunities are emerging – largely as a result of technological innovation – that considered together illuminate a powerful pathway forward towards effectively monitoring, tracking, understanding and informing improvement in programming for working-learners. Given the importance of providing high quality educational opportunities for working-learners, investment in research infrastructure is sorely needed and will be potentially transformative for the sector.

What specific recent technological developments have occurred over the past decade that can serve as building blocks for the research infrastructure necessary to transform this sector? First, administrative data on educational attainment and employment outcomes have been effectively integrated in local, regional and national initiatives. Second, educational programming has begun to rely more heavily on learning management systems that generate click-stream data allowing fine grained measurement of educational processes. Third, longitudinal survey techniques have developed in ease of administration and use. Fourth, innovative performance assessments have been developed and fielded on a range of 21<sup>st</sup> Century workplace competencies. Finally, firms have developed internal systems to measure employee productivity.

#### **Linked Administrative Data on Education and Employment Outcomes**

The past decade has seen the emergence of myriad examples of the effective integration of postsecondary educational administrative records and individual employment outcomes. With the College Scorecard, for example, the Obama administration linked employment data of graduates to postsecondary institutions and degrees. This data has been made publicly available and was designed to provide students the ability to make informed assessments around the cost of programs, graduation

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<sup>1</sup> Professor of Sociology and Education and Dean of the School of Education, UC-Irvine

rates, the likelihood of loan repayment, and employment outcomes. Expanding access to this type of data is the cornerstone of national efforts, such as those of the Postsecondary Value Commission, which have advocated the need for greater transparency of information on student cost and graduate employment outcomes, broadening the discussion of value to include non-economic outcomes, and emphasizing the need to disaggregate results for “Black, Latinx, Indigenous, and underrepresented AAPI students, students from low-income backgrounds, and women” to track and ensure equity. Specifically, a Postsecondary Value Framework has included “a series of economic value thresholds that measure whether students experience different economic returns over time and...a set of indices—the Economic Value Index (EVI) and the Economic Value Contribution (EVC).” Economic value thresholds are determined by calculating whether economic returns exceed net price of attendance, EVI is calculated as the percent of students in a particular group that exceed a minimal economic value threshold, EVC is calculated as the level of returns exceeding this minimal threshold (Postsecondary Value Commission 2021; p. 29, 33-48).

As technological advances have brought increasing ease of integrating large-scale administrative education and employment datasets and political opposition wanes, similar developments have also been promoted at the local, state and regional levels. For example, the [Coleridge Initiative](#) have been working with multiple Midwest states to produce comparable dashboards linking educational attainment to postsecondary degrees.

Large scale social science research initiatives have been launched with a similar empirical logic. Two of the most prominent efforts are the Opportunity Insights project led by Raj Chetty at Harvard and the work of the Center on Education and the Workforce led by Anthony Carnevale at Georgetown. Chetty and colleagues merged college attainment data from the National Student Clearinghouse with tax records of parents and college graduates to calculate the odds of moving intergenerationally from one income quintile to another by institution attended (Chetty, Friedman, Saez, Turner, and Yagan 2017). Institution attended was derived from Form 1098-T filings for tuition paying students or the Department of Education’s National Student Loan Data System for students with student loans but no tuition payments. Carnevale utilized data from the College Scorecard to calculate economic returns of investments in terms of net present value by institution (Carnevale, Cheah and Van Der Werf 2019).

While research and policy advocacy in this area has been extraordinarily valuable and is a critical building block for assembling the necessary research infrastructure required to understand postsecondary and working-learner outcomes, several limitations to this approach are worth formally noting. First, selection of students into programs has generally been ignored. Second, local labor market conditions have not been adequately taken into consideration. Third, non-economic outcomes have received short shrift. Finally, little information was generated on educational processes and the development of student competencies that could be utilized to improve institutional performance.

### **Learning Management System, Longitudinal Surveys, Performance Assessments and Productivity Measures**

The capacity to measure student experiences, educational processes and the development of competencies has been expanded exponentially in recent years as online platforms have become ubiquitous and have come to mediate student educational experiences with instructors and curricular

materials. These systems allow for non-obtrusive data collection that can generate authentic measurement of student academic engagement, self-regulatory behavior, student peer interaction, instructional design and instructor feedback at scale. In the [Next Generation Undergraduate Success Measurement Project at the University of California Irvine](#) (UCI), we have been generating such measure for every student in each course taken. After validating our measurement approach, algorithms could be built into existing learning management systems to produce such measures routinely for research, program assessment and institutional improvement efforts at scale.

In addition to administrative records and learning management system data that could be routinely gathered from all programs, more targeted research could be done on a subset of programs that employed other standard methodologies. For example, longitudinal surveys could be administered to identify student perceptions of instructional and program experiences. These instruments could also be used to gather information on a holistic set of components of student growth and development. Researchers involved in the UCI Next Generation Undergraduate Success Measurement Project have been measuring and advocating that all postsecondary students, regardless of specific program or individual social background, should strive to achieve human development in a broad set of areas necessary for success in 21<sup>st</sup> Century economy and society. “[The] project is premised on an assumption that the value of postsecondary education should include the development of general and specialized cognitive competencies, intellectual dispositions, identity formation, self-direction, self-regulation, productive social relationships, civic engagement, wellbeing, flourishing, and the attainment of self-defined goals,” Arum, Eccles, Heckhausen, Orona, von Keyserlingk, Wegemer, Wright, and Yamaguchi-Pedroza (2021:18) has asserted: “It is believed that all students regardless of social background have the right to aspire to postsecondary value along these dimensions and that these aspects of human development are linked to the increased likelihood of living healthy and productive lives.”

There is great value in deploying a set of performance assessments in targeted programs to advance understanding of cognitive development of working learners – growth that often is timed for a later period in the life stage when cognitive processes are different than for youth. Research in the science of learning suggests that while “cortical thickness, mass, and connectivity do appear to decrease with age, older adults are able to compensate for declines in some abilities by recruiting different or additional neural mechanisms.” That is, older working-learners, as well as older social scientists, rely on “neural plasticity, which is the ability of the brain to reorganize itself physically and functionally across the life span in response to the environment, individual behavior, thinking, and emotions—in effect, what is colloquially called ‘wisdom’ (National Academies of Sciences, Engineering, and Medicine 2018:67).”

Innovative performance tasks are also being developed to enhance researchers’ ability to measure competencies that have become normatively valued because of their alignment with contemporary economic and social conditions. For example, at UCI we are working in partnership with colleagues at ETS to assess students’ collaborative problem-solving ability by having four random students logged into a virtual platform where they are each given a set of documents to consult and a complex problem to consider. The students first solve the task individually, communication within the group occurs and is tracked, then individuals are given another opportunity to solve the problem. Both the actual collaborative problem-solving *process* as well as the collaborative problem-solving *outcome* are assessed. In addition to collaborative problem-solving, we are working with ETS to assess perspective taking by asking students to identify perspectives of actors different from themselves in a complex social scenario. We are also assessing confirmation bias to observe the extent to which students develop the

ability to change a prior opinion when new information is presented. Finally, we are using a standard existing ETS measure to assess the development of critical thinking skills. These sorts of assessments could be strategically deployed to track the extent to which working-learners are developing generic competencies.

Ideally, researchers could also partner with local industry to gather information from a select number of firms on employee productivity. Many large firms now routinely track productivity measures at the individual level. It would be extraordinarily valuable to the larger research effort if information on employee productivity from a subset of firms could be incorporated into the larger effort to assess the extent to which the overall measurement system is accurately identifying the processes and mechanisms whereby working-learners' educational experiences matter for individuals and society.

### **Structuring Working-Learner Research Infrastructure**

Existing research infrastructure on working-learners has already yielded valuable and important empirical findings. Researchers have been forced to rely on parse information existing in national longitudinal cohort studies or the forging of relationships with local or national stakeholders to achieve access to administrative records. For example, Baum, Holzer and Luetmer (2021) recently reviewed prior research and conducted original analyses with National Postsecondary Student Aid Study (NPSAS), the Beginning Postsecondary Students (BPS) Survey, and The Adult Training and Education Survey (ATES) datasets, to examine the labor market value of short-term postsecondary certificate programs. Baum, Holzer and Luetmer found evidence that these programs for working-learners in general yielded significantly value, that Pell grant eligibility for these programs should be expanded, but that variability across programs and fields was high. Katz, Roth, Hendra and Schaberg (2020) examined a set of four random control trial interventions conducted on established sectoral employment programs that train working-learners for "high-quality" employment in specific industries and occupational clusters that are believed to have strong current local labor demand and opportunities for longer-term career advancement." They found that these programs, which provided transferable and certifiable competencies, allowed enhanced mobility into jobs in higher paying fields and thus significant economic benefits. While these efforts have yielded highly relevant and important findings, they often fail to contribute to the cumulative development of a research field that can systematically work to improve program design and effectiveness.

As Arum and Stevens (2020) have argued elsewhere, research infrastructure could be built in one of two ways. Ambitiously, increased federal funding targeted on the expansion of working-learner opportunities could be tied to requirements that improved data on student educational experiences, trajectories and outcomes was shared with a research entity established to utilize and structure researcher access to this resource. Alternatively, one could rely on a more targeted local or regional approach, where targeted grants were distributed to research universities that partnered with local institutional providers of working-learner educational opportunities, employers, professional associations, unions, and other stakeholders. The latter approach would have the advantage of capitalizing on local interest in regional economic development and workforce development to mobilize necessary efforts. De-identified data from regional efforts could be deposited in data archives, such as the University of Michigan's [Inter-university Consortium for Political and Social Research](#) (ICPSR) to promote greater access, usage and cumulative advances for the field as a whole.

The value of increased investment in the development of research infrastructure for this sector should not be underestimated. While expenditures on postsecondary education in the U.S. are large, research and development investments have been meager. “The delivery of high-quality education in the coming years and decades will be dependent not on brick-and-mortar infrastructure, but on data-driven learning systems that make use of ongoing analysis of click-stream data, artificial intelligence, and learning analytics,” Arum and Stevens (2020:19) have asserted in a recent Brookings Hamilton Project brief: “The nation’s ongoing economic vitality requires that the federal government invest in that infrastructure, just as in prior eras it made capital investments in other technologies.”

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