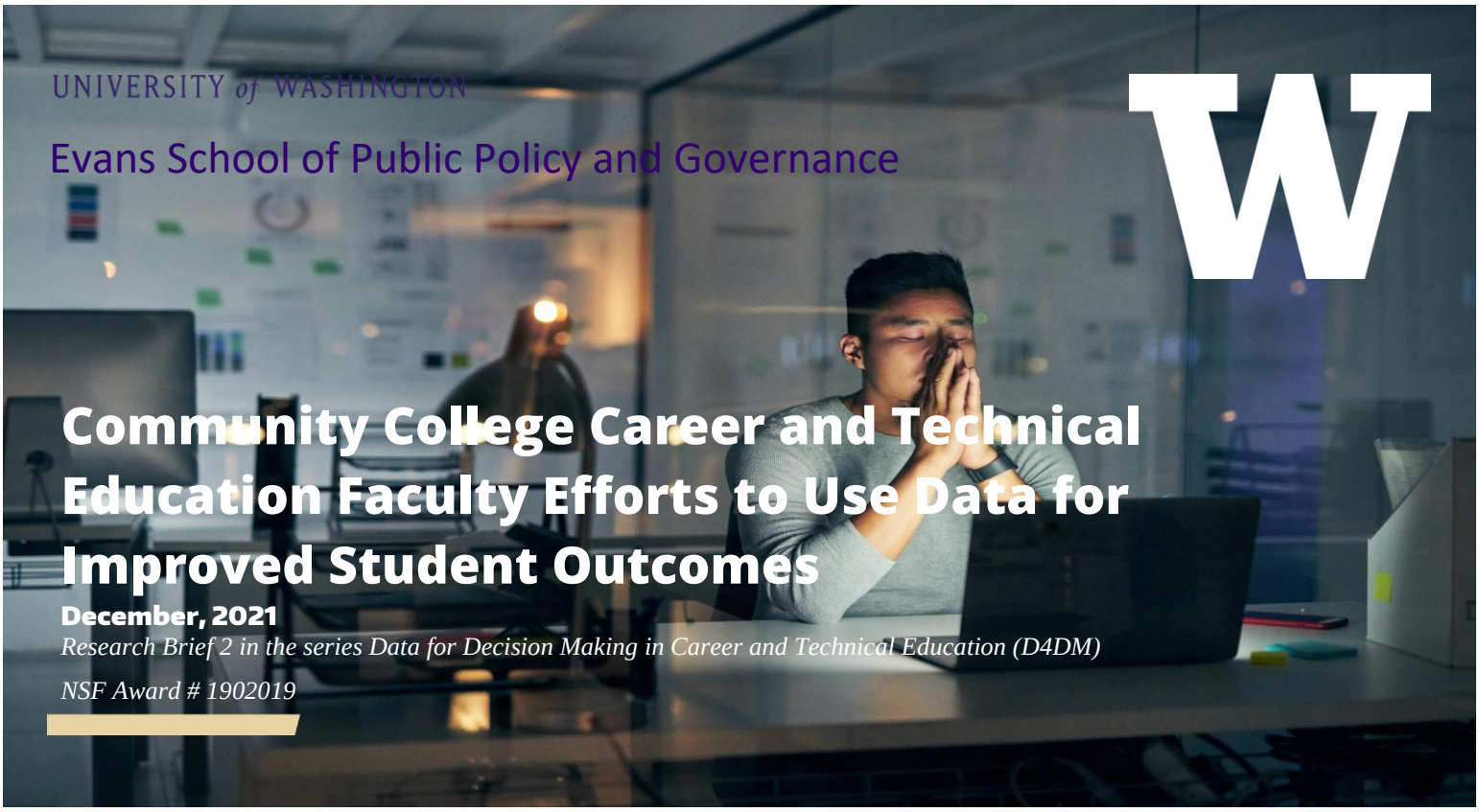


UNIVERSITY of WASHINGTON

Evans School of Public Policy and Governance

Community College Career and Technical Education Faculty Efforts to Use Data for Improved Student Outcomes

December, 2021

Research Brief 2 in the series Data for Decision Making in Career and Technical Education (D4DM)

NSF Award # 1902019

Introduction

Grant Blume & Elizabeth Meza, University of Washington
Kendrick Hang, Green River College

The use of data in higher education decision making is increasingly marked by conversations about student momentum through programs (Belfield, Jenkins, & Fink, 2019; Calcagno, Crosta, Bailey, & Jenkins, 2007), data analytics (Attaran, Stark, & Stotler, 2018; Ekowo & Palmer, 2017) and dashboards (Marshall, 2016; Roberts, Howell, & Seaman, 2017). Such approaches to data analysis are undoubtedly useful but also hinge on both a dependable and steady flow of student-level data and the institutional resources to implement such strategies, two assets that are not commonly systematically available to career and technical education (CTE) faculty in community colleges (Meza et al., 2021).

And yet data use in CTE community college programs is increasingly necessary. Many CTE programs are plagued by low retention and completion rates, face external requirements from accreditation bodies, and increased calls for accountability by grantmaking agencies, federal and state bodies, their own institutions, and the public. In Washington state, where this research is based, just 30% of first-time CTE students earned an associate degree or certificate within four years (Prince, 2019). Many faculty have embraced data as means of improving their programs with the ultimate goal of improving student outcomes and equity but there exists a missed opportunity to systematically imbibe data in the hands of CTE faculty for program improvement (Blume, Meza, & Mast, 2021). Faculty often serve as a primary program administrator (Meza et al., 2021) and are intimately connected to curriculum, classroom pedagogy, and industry trends (Fletcher, Djajalaksana, & Eison, 2012; Fletcher, 2018; Kerna, 2012). CTE faculty armed with usable data are a potentially influential and untapped resource to improve student outcomes.

Entrepreneurial efforts to analyze data among technical faculty demonstrate that limited access to data and resources do not have to prevent meaningful analysis efforts. We use the term “entrepreneurial” to describe the innovation, creativity, and experimentation (Windrum, 2008) faculty bring to their data analysis initiatives that fall outside the scope of conventional organizational practices such as data provided by a college’s institutional research office for the purpose of program review or accreditation. Such innovation is, by definition, idiosyncratic within a college’s bureaucratic

processes and thus may be considered a potential catalyst for an organization's cultural change (Mack, Green, & Vedlitz, 2008).

Methods

In case studies of three NSF-funded Advanced Technological Education programs in Washington state we reveal a range of innovative and creative approaches that CTE faculty use to access, analyze, and sometimes even create data on which they can make informed decisions about program improvement. The findings presented here are part of a multi-year research project funded by the National Science Foundation Advanced Technological Education program (NSF Award# 1902019). The research project explores how technical education faculty can use student-level data to cultivate data-informed processes that lead to improved programs and pathways. Implemented across three years, the study's comparative case study design focuses on distinct Advanced Technological Education (ATE) programs at three community colleges in Washington state. We implemented multiple strands of qualitative inquiry to inform and potentially triangulate our findings. These qualitative strands included document review (Bowen, 2009), use of the expert panel method (Galliers & Huang, 2012, Lopez et. al, 2014), and semi-structured interviews (Adams, 2010). Meza et al. (2021) provides a detailed overview of the qualitative research methods and data collection that were undertaken to inform this analysis.

Findings

We find that faculty efforts typically fall in three areas of entrepreneurial inquiry: demographics and equity gaps, program diagnostics, and survey data. We found use of entrepreneurial efforts at two of the three colleges involved in our case studies and evidence of many more efforts around the state. The development of entrepreneurial efforts varies by college and by program and in many cases rely on the technical acumen of the faculty involved.

Demographics and equity gaps

Entrepreneurial efforts that faculty implement to analyze demographics generate descriptive insights into program characteristics. Faculty may develop relatively simple dashboards (Figure 1) to query basic characteristics of program participants along such demographic factors as race or socioeconomic factors such as self-reported family income. This type of demographic inquiry draws from institutional or state-level data but is contingent on the faculty member themselves accessing the data from the college. This sort of snapshot may reveal to the faculty member demographic insights about the program, but do not necessarily present actionable findings on which a faculty member could base program improvement. By "improve" we mean making programmatic, curricular, extracurricular, or organizational modifications to the status quo to increase the probability that a student successfully moves through technical education pathways and programs into living-wage technical employment that matches their training.

Data for Decision Making (D4DM) is a three-year research project (2019-2022), funded by the Advanced Technological Education (ATE) program within the National Science Foundation's Division of Undergraduate Education

Partners

> Seattle Central College

> Renton Technical College

> Green River College

> University of Washington

Figure 1

Example of simple dashboards to monitor student demographics

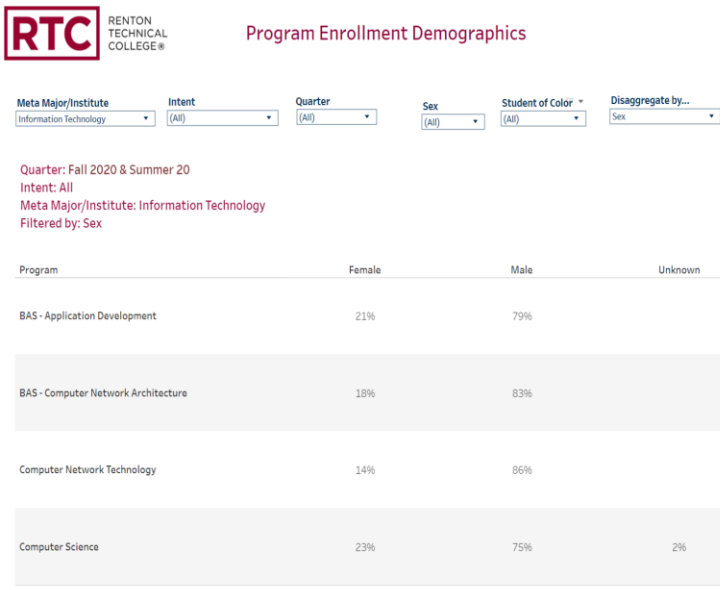
Race by Type of Student

	Professional Technical
	Number of Students
A) Student of Color	20
B) White Only	9
C) Other Race	1
D) Prefer Not to Answer	3

CTE faculty, however, may move from demographic analysis to zero in on equity questions related to program enrollment, progress, and completion. Acknowledging differences in technical education program enrollment by gender, for instance, a technical faculty member to disaggregated data both by gender and by program concentration (Figure 2). Even in circumstances where program enrollments are modest (e.g. fewer than 30 students) such disaggregation reveals important patterns, such as a consistent underrepresentation of women in a particular technical education program. While facult

Figure 2

Example of dashboard to monitor program-specific demographics



Program diagnostics

Entrepreneurial data analysis efforts by technical faculty also demonstrate a willingness to directly engage student-level data to query more granular data that can support analysis, intervention, and improvement. When technical faculty have the capability to write simple programs to access data (e.g. SQL queries) they are, in turn, able to tailor their inquiries to potential program improvement. Figure 3, for instance, illustrates how a faculty member begins this process by generating a default view to show every student in a technical education program and the student's completion status and grade for every required core course in the program. A faculty member can then create a subsequent inquiry to filter students by a particular criterion related to the student's progress in a program, grade earned in a gateway course, or other factor related to completion. In the example portrayed in Figure 4, a query has been implemented to identify program students who have not yet taken IT 378, and information technology course required for the completion of a baccalaureate degree in software development. A faculty member can use this information to email these students missing IT 378 and offer a reminder to enroll in the course when offered next so to not delay graduation. Efforts like a targeted message to students may seem like a modest intervention but education research is increasingly focused on the behavioral impact of such "nudges" (Jabbar, 2011; Lavecchia, Liu, & Oreopoulos, 2016), which may hold particular promise for community college students (Scott-Clayton, 2011).

Figure 3

Example of default view for SQL inquiry monitoring completion/grades

Name	Prog	SID	C011	C012	IT 301	IT 305	IT 328	IT 333	IT 334	IT 355	IT 372	IT 378
Search Name	Searc	Searc	Search	Search	Searc	Searc	Searc	Searc	Searc	Searc	Searc	
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	
[redacted]	5BD	[redacted]	N	Y	-	-	-	-	-	-	-	
[redacted]	5BD	[redacted]	N	Y	-	4.0	4.0	4.0	3.5	-	-	
[redacted]	5BD	[redacted]	Y	N	-	2.0	1.8	2.8	0.0	-	-	
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	
[redacted]	5BD	[redacted]	N	Y	-	4.0	4.0	4.0	4.0	-	-	
[redacted]	5BD	[redacted]	N	Y	-	-	-	-	-	-	-	
[redacted]	5BD	[redacted]	N	N	3.8	4.0	3.1	4.0	-	-	-	
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	

Figure 4

Example of filtered view for SQL inquiry to diagnose pathway progress

GRC Student Tracker

(Students have taken a program class in the last year)

Select a Program: BAS Software Dev (5BD)

Copy | Excel | CSV | Search:

Name	Prog	SID	C011	C012	IT 301	IT 305	IT 328	IT 333	IT 334	IT 355	IT 372	IT 378	IT 485	IT 486	MATH	ENGL	CMST
Search Name	Searc	Searc	Search	Search	Searc	Searc	Searc	Searc	Searc	Searc	Searc	Searc	Searc	Searc	Search M	Search ENGI	Search C
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	-	-	-			
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	0.0	-	-	142	101, 126, 335	210, 238
[redacted]	5BD	[redacted]	N	Y	-	-	-	-	-	-	-	-	-	-		101	210
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	0.0	-	-	107	100, 101, 335	230
[redacted]	5BD	[redacted]	N	Y	-	4.0	4.0	4.0	3.5	-	-	-	-	-	141	101, 128	210
[redacted]	5BD	[redacted]	Y	N	-	2.0	1.8	2.8	0.0	-	-	-	-	-	142	101, 128	210
[redacted]	5BD	[redacted]	N	Y	-	4.0	4.0	4.0	3.2	-	-	0.0	-	-	141	101, 126	210, 230
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	-	-	-		101, 128	210
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	-	-	-	147	097, 101, 117, 126	210, 238
[redacted]	5BD	[redacted]	N	N	3.6	2.6	2.1	4.0	2.5	4.0	-	0.0	-	-	153	101, 115, 335	
[redacted]	5BD	[redacted]	N	Y	-	4.0	4.0	4.0	4.0	-	-	-	-	-	151	101, 128	230
[redacted]	5BD	[redacted]	N	Y	-	-	-	-	-	-	-	-	-	-	147	101, 127	210, 230
[redacted]	5BD	[redacted]	N	N	3.8	4.0	3.1	4.0	-	-	-	-	-	-		335	
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	-	-	-	141	110, 160, 227	210, 220
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	-	-	-	141	101, 128, 335	220, 230
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	0.0	-	-		128	
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	0.0	-	-		101, 335	238
[redacted]	5BD	[redacted]	N	N	4.0	4.0	4.0	4.0	4.0	4.0	-	0.0	-	-	147	101, 128, 335	210
[redacted]	5BD	[redacted]	N	N	-	-	-	-	-	-	-	0.0	-	-	147	110, 111, 247, 335	212

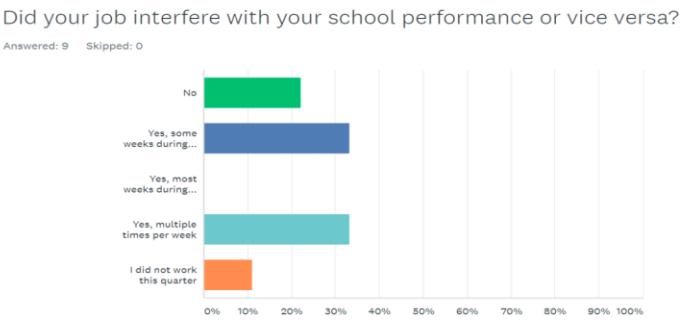
Survey data

Survey data, often comprising qualitative responses, is the final type of data-related entrepreneurship we find among technical education faculty. This type of data collection is logical considering that faculty may have limited access to institutional data at a college and even when data are available, it may be of limited value given the question of interest to the faculty member. Figure 5 illustrates a question embedded in a broader post-program survey sent to students in an ATE program. The finding of this question – that work and school interfered with each other in some way for two-thirds of the students who responded – may not lend itself to an immediate intervention for program improvement but does provide valuable insight for two-thirds of the students who responded provides valuable insight for how a faculty member may restructure a course, assignment, or exam to enhance flexibility for working students.

In interviews we found one faculty member who is engaging the use of an external survey designed by survey design and analysis experts at the Data Buddies Project to better understand students'

backgrounds and their sense of belonging with the goal of designing interventions to help close equity gaps.

Figure 5
Example of survey responses



ANSWER CHOICES	RESPONSES
No	22.22%
Yes, some weeks during the quarter	33.33%
Yes, most weeks during the quarter	0.00%
Yes, multiple times per week	33.33%
I did not work this quarter	11.11%
TOTAL	

The missing metric: Employment outcomes

A major barrier to using student-level data to improve technical education programs and pathways is the difficulty colleges and technical faculty face in accessing reliable employment outcomes for students who complete technical education programs and pathways (Blume, Meza & Rubin, 2021). Faculty-led data analysis of CTE programs anchored to employment outcomes provides a uniform measure of performance among programmatically diverse technical education programs and pathways. Technical education programs and pathways are designed to connect students with living-wage jobs that match their technical training; this makes employment, and not necessarily credential attainment, the most salient outcome for research and evaluation (Hollenbeck, 2011; Imperatore & Hyslop, 2017). Statewide data systems have made important advances in the past decade as states attempt to make workforce and unemployment insurance (UI) data more accessible to researchers but substantial barriers remain in the actual implementation of such initiatives (Blume, Meza, & Bragg, 2019; Bragg, 2017).

Given that faculty do not often have access to institutional or statewide data reporting labor market outcomes for their students they may use resources like internship information or LinkedIn to track students as they enter the labor market. In one two cases we found forms students fill out around receiving internship credit revealed valuable information for faculty members. For example, students who complete an internship can request credit for an internship prep class (rather than take the actual class) via a "credit for prior learning" request. As part of this request, the faculty asks where the student completed their internship, the particular knowledge and skills they learned in the program that they could apply to their internship, and additional knowledge and skills they had to learn on the fly and were expected to do but were not covered in their CTE program. As a result of this data the faculty were able to target program outreach to companies who hire students to strengthen employer relationships and improve internship placements. In addition, they discussed the skills used and skills missing in department meetings to modify curriculum and triangulate what skills students identified with what skills employers identified. For example, the faculty member said "if we see a lot of students going down the technical management track, for example, we may choose to incorporate some more management concepts/skills in some of our project based learning classes."

We also found faculty who developed a program exit form that students can fill out on a voluntary basis where they provide a non-college email address, for a chance to follow up in the future, their employer, if they are employed, and job title and a connection on LinkedIn. Faculty may follow up with students to learn more about their job titles and employment trajectory in the absence of other data.

Conclusions and Implications

The entrepreneurial efforts demonstrated by technical education faculty members, which are diverse in their implementation and vary in their value for decision-making, demonstrate an important observation worth noting: technical faculty broadly acknowledge the value of analyzing student-level data even if they do not have easy access to such data. Observing in a college that technical faculty are not systematically analyzing student-level data should not be interpreted as evidence that faculty do not have an interest in using data for decision making around

program improvement, change or innovation. Indeed, our analysis as described here reveals technical faculty are entrepreneurial and innovative in transforming their ideas about student-level data into tangible data-informed analysis. Despite that we broadly found that faculty are interested in developing entrepreneurial efforts to access data they often don't have the research background or technical expertise to design a survey or query a database but use what skills and resources they have to develop local, program-level knowledge.

Whereas faculty may have access to a number of dashboards or other data sources, much of the data they see may not be actionable for them. When data is developed by a committee or administrators, they may not consider how it could be used in CTE programs. An overlooked asset to improving student outcomes are the CTE faculty who know their programs best and are best equipped to make changes for program improvement but may be reluctant to engage in college data processes and sometimes employ entrepreneurial efforts to drive program improvement. These educators and workforce experts represent an important opportunity to bring data into the hands of those who can implement meaningful improvement to technical education programs and pathways.

Acknowledgements

This paper is part of a broader research project conducted with funding from the National Science Foundation (Award #1902019). The authors gratefully acknowledge National Science Foundation's support for this research. William Zumeta and Zachary Rubin also assisted in the production of this report. All opinions and views expressed in this manuscript are those solely of the authors.

References

Adams, W. (2010). Conducting semi-structured interviews. In J. Wholey, H. Hatry, and K. Newcomer (eds.), *Handbook of practical program evaluation* (pp. 365-377). San Francisco: Jossey-Bass.

Attaran, M., Stark, J., & Stotler, D. (2018). Opportunities and challenges for big data analytics in US higher education: A conceptual model for implementation. *Industry and Higher Education*, *32*(3), 169–182.

Belfield, C. R., Jenkins, D., & Fink, J. (2019). Early Momentum Metrics: Leading Indicators for Community College Improvement. CCRC Research Brief. New York: Columbia University, Community College Research Center.

Blume, G., Meza, E., & Mast, G. (2021). Where change happens: A faculty-centric, data-driven approach to improving community college CTE program outcomes. Working Paper. Seattle: University of Washington, Evans School of Public Policy and Governance.

Blume, G., Meza, E., & Rubin, Z. (2021). Employment outcomes as the missing metric in community college career and technical education. Research brief 1 in the series Data for Decision Making in Career and Technical Education. Seattle: University of Washington.

Calcagno, J. C., Crosta, P. M., Bailey, T., & Jenkins, D. (2007). Stepping stones to a degree: The impact of enrollment pathways and milestones on community college student outcomes. *Research in Higher Education*, 48(7), 775-801.

Ekowo, M., & Palmer, I. (2017). Predictive analytics in higher education: Five Guiding Practices for Ethical Use. *New America*. Retrieved from https://naproduction.s3.amazonaws.com/documents/Predictive-Analytics-GuidingPractices.pdf

Fletcher Jr, E. C., Djajalaksana, Y., & Eison, J. (2012). Instructional strategy use of faculty in career and technical education. *Journal of Career and Technical Education, 27*(2), 69-83.

Fletcher Jr, E. C. (2018). Characteristics of Career and Technical Education Faculty across Institutions of Higher Education in the United States. *International Journal of Adult Vocational Education and Technology* (IJAVET), 9(1), 42-58.

Galliers, R. D. and Huang, J. C. (2012) The teaching of qualitative research methods in information systems: an explorative study utilizing learning theory, *European Journal of Information Systems, 21*, 119–134

Hollenbeck, K. M. (2011). *Conducting Return on Investment Analyses for Secondary and Postsecondary CTE: A Framework*. National Research Center for Career and Technical Education.

Imperatore, C., & Hyslop, A. (2017). CTE policy past, present, and future: Driving forces behind the evolution of federal priorities. *Peabody Journal of Education, 92*(2), 275-289.

Jabbar, H. (2011). The behavioral economics of education: New directions for research. *Educational Researcher, 40*(9), 446-453.

Kerna, K. D. (2012). Help wanted: Professional development and training for career and technical education faculty. *International Journal of Vocational and Technical Education, 4*(3), 38-45.

Lavecchia, A. M., Liu, H., & Oreopoulos, P. (2016). Behavioral economics of education: Progress and possibilities. In E. Hanushek, S. Machin, & L. Woessman (Eds.), *Handbook of the Economics of Education* (Vol. 5, pp. 1-74). New York, NY: Elsevier.

López Martín, I., Blanco Fernández, A., Pagán Marín, R. A., Gazapo Andrade, B., De Arana del Valle, J. M., Pizarro Juanas, D. A., Martínez Pascual, B. (2014). Qualitative study of college tutoring through the expert panel method. *Higher Learning Research Communications, 4*(1), 73-90.

Mack, W. R., Green, D., & Vedlitz, A. (2008). Innovation and implementation in the public sector: An examination of public entrepreneurship. *Review of Policy Research, 25*(3), 233-252.

Marshall, J. (2016). Online course selection: using course dashboards to inform student enrollment decisions. *Open Learning: The Journal of Open, Distance and E-Learning, 31*(3), 245-259.

Meza, E., Blume, G., Balhan, K., Hang, K., Rubin, Z., Bragg, D., & Zumeta, W. (2021). *The Landscape of Faculty Data Use for Decision-Making and Program Improvement in National Science Foundation - Advanced Technical Education Programs in Washington State.* Career and Technical Education Research.

Prince, D., (2019). *Guiding students to and through professional-technical workforce pathways.* Washington State Board for Community and Technical Colleges: Olympia, WA.

Roberts, L. D., Howell, J. A., & Seaman, K. (2017). Give me a customizable dashboard: Personalized learning analytics dashboards in higher education. *Technology, Knowledge and Learning, 22*(3), 317-333.

Scott-Clayton, J. (2011). The structure of student decision-making at community colleges. *CCRC Research Brief, No. 49*. New York: Columbia University, Teachers College, Community College Research Center.

Windrum, P. (2008). Innovation and entrepreneurship in public services. In P. Windrum and P. Koch (Eds.), *Innovation in public sector services: Entrepreneurship, creativity, and management* (pp. 3-20). Northampton, MA: Edward Elgar Publishing.