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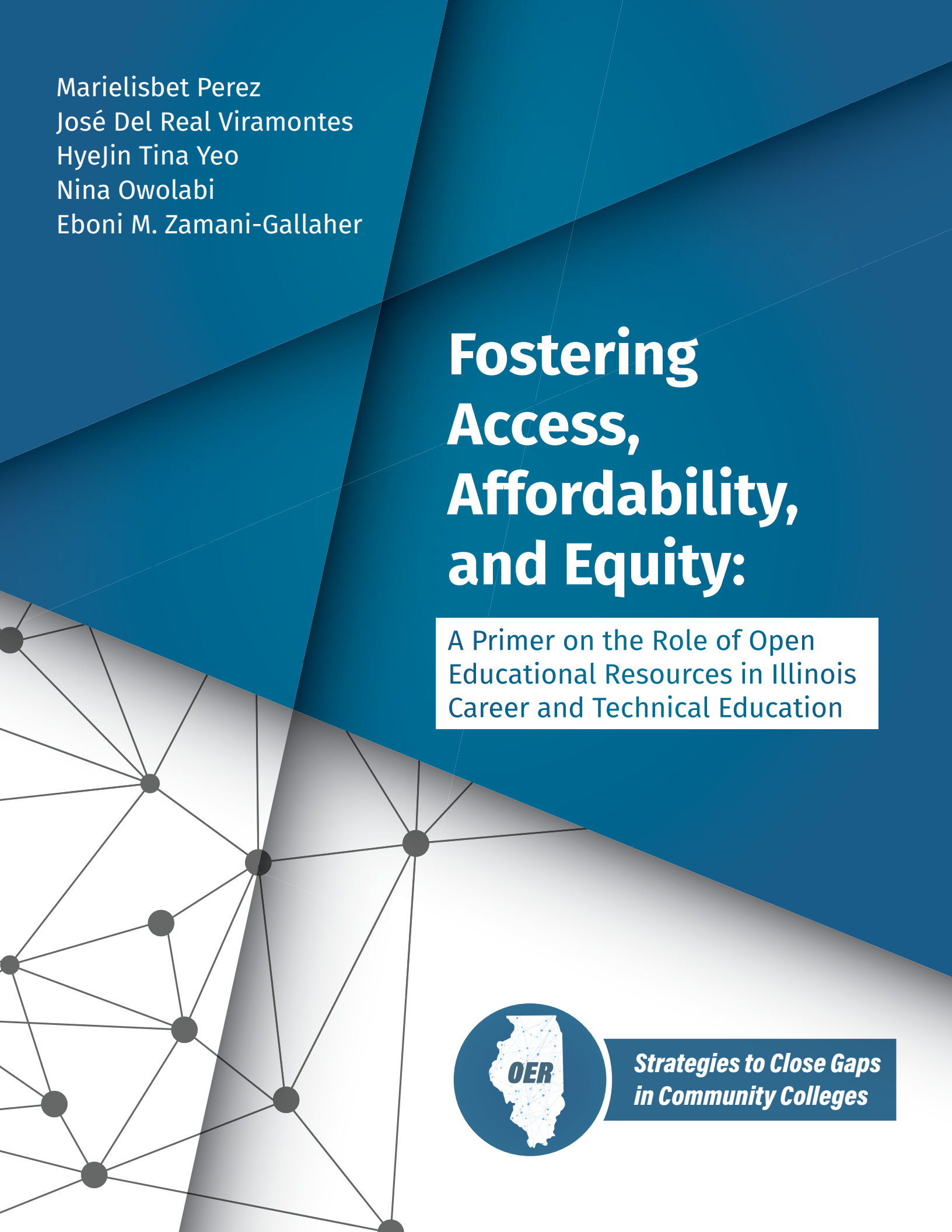
Fostering Access, Affordability, and Equity:

A Primer on the Role of Open Educational Resources in Illinois Career and Technical Education



Strategies to Close Gaps in Community Colleges

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STARBUC

BACKGROUND AND VALUE OF OPEN EDUCATIONAL RESOURCES

The William and Flora Hewlett Foundation is a partner in the development of open educational resources (OER). Without going too deep into the history of the movement of OER, Bliss and Smith (2017), both of whom represent the Hewlett Foundation, reported how the open access of textbooks and course materials was inspired by the Massachusetts Institute of Technology (MIT) faculty and administrators. The goal of MIT OCW (OpenCourseWare) was to provide anyone access to MIT's course materials. MIT faculty and administrators were the first to commit to openly sharing the content of their courses with the world through the development of the MIT OCW, which was inspired from:

> The MIT Council on Education Technology in 1999, which was charged with determining how MIT should position itself in the distance learning/e-learning environment, provide a new model for the dissemination of knowledge and collaboration among scholars around the world, and contribute to the 'shared intellectual commons' in academia, which fosters collaboration across MIT and among other scholars (Bliss & Smith, 2017, p. 10-11).

Thereafter, in early 2002, Hewlett Foundation became a significant funder of MIT efforts and in the development of 50 OpenCourseWare (OCW) products. By 2002, the Hewlett Foundation was on a mission to discover alternative ways of strategically investing in educational technology and open courseware accessibility (Bliss & Smith, 2017). According to Bliss and Smith (2017), the Hewlett Foundation has supported OER efforts for the last 15 years.

During the last 15 years, the Hewlett Foundation and other organizations have seen the value of open access and use of more effective curriculum and practices to enhance student learning and educational opportunities. Students with access to well-designed, customized, openly licensed materials will be more engaged without having to worry about finances. Educators and students, educational policymakers and leaders, and the field of OER are the primary sources and stakeholders being targeted for funding (Open Educational Resources, "Priorities," 2020). Seventy-five percent of the Hewlett Foundation grants go toward these primary sources and stakeholders.

ENDORSEMENT OF OER AT COMMUNITY COLLEGES

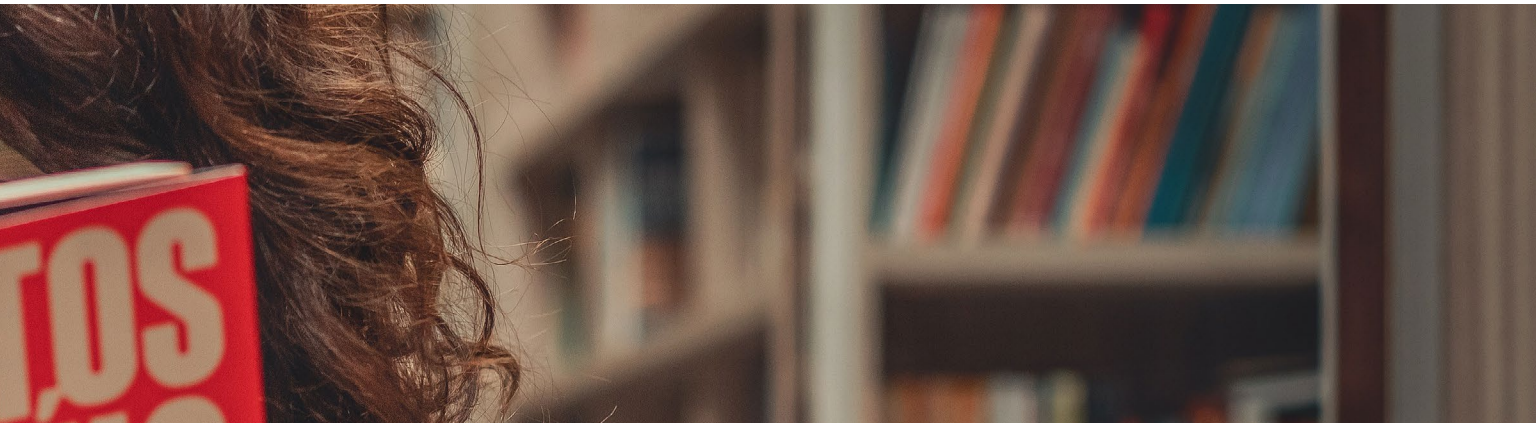
In our analysis, we noticed that OER is more than cost-efficient. Community colleges reported utilizing OER as a way of increasing financial and academic support for students. OER efforts serve the needs of community college students, especially students who are managing financial hardship and economic difficulty.

When it comes to assessing the savings of OER relative to the academic goals of students, Ikahihifo, Spring, Rosecrans, and Watson (2017) reported that students at a Virginia community college who took courses that used OER found materials to be better than traditional textbooks in both quality and engagement, and were able to save money by not having to purchase course textbooks. Students in the study used their financial savings to help pay for their tuition, take additional courses and purchase other course materials, cover daily living expenses, and save funds for future necessities (Ikahihifo, Spring, Rosecrans, & Watson, 2017).

In a larger-scale study surveying 21,822 students on the impact of OER adoption in eight courses, results showed an improvement in the end of course grades and a decrease in D, F, and W (withdraw) letter grades for all students (Colvard, Watson, & Park, 2018). This improvement was primarily found among Pell recipients, part-time students, and populations historically underserved by institutions of higher education (Colvard, Watson, & Park, 2018). According to Colvard, Watson, and Park's (2018) findings, OER addresses "affordability, completion, attainment gap concerns, and learning. These findings contribute to a broadening perception of the value of OERs and their relevance to the great challenges facing higher education today" (p. 262).

Other studies did not conclude as great of an effect. Although Winitzky-Stephens and Pickavance (2017) did not find significant differences in student success among classes that used OER versus traditional textbooks, the authors noticed some evidence that OER could benefit new students.

Ultimately, having access to OER courses and materials at the community college level can help students, especially underrepresented populations, complete their credentials and transfer to a four-year university to advance their educational attainment. The adoption of OER at community colleges has been found to have an impact in a variety of fields such as anthropology, art, biology, business, economics, education, history, math, psychology, sociology, and more.



OER DEFINITION AND INITIATIVES

The definition of OER is broad and references any educational materials if it is free to access and open. Creative Commons (CC), "a nonprofit organization dedicated to building a globally-accessible public commons of knowledge and culture" (Creative Commons, "What We Do." 2020, p.1), makes it easier for educators to share creativity and academic work as well as to build more creativity and knowledge. Through its efforts, the organization aims to contribute and develop a more equitable, accessible, and innovative world. The CC definition of OER is similar to other sites and literature analyzed, which is:

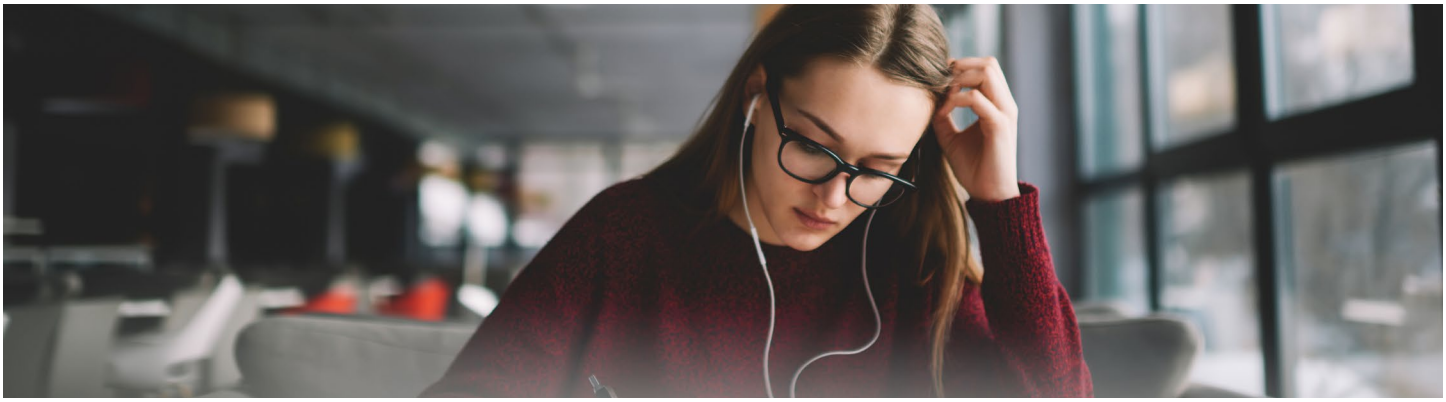
> Teaching, learning, and research materials that are either (a) in the public domain or (b) licensed in a manner that provides everyone with free and perpetual permission to engage in the 5R activities:
>
> **Retain** – make, own, and control a copy of the resource
>
> **Reuse** – use your original, revised, or remixed copy of the resource publicly
>
> **Revise** – edit, adapt, and modify your copy of the resource
>
> **Remix** – combine your original or revised copy of the resource with other existing material to create something new
>
> **Redistribute** – share copies of your original, revised, or remixed copy of the resource with others (Creative Commons, 2020a)

OER initiatives have the flexibility to offer students high-quality educational experiences that encompass a myriad of teaching practices, varied learning resources, and innovative educational policies (Creative Commons, 2020a, 2020b; Open Education Resources, 2020a, 2020b, 2020c).

Long-term funders such as the Hewlett Foundation and the Scholarly Publishing and Academic Resources Coalition (SPARC) search for ways to enhance diverse learning, advance the access and availability of technology tools and resources, and reduce the cost of textbooks at U.S. colleges and universities by endorsing the Affordable College Textbook Act, which "expands the use of open textbooks to achieve savings for students and improve textbook price information" (Durbin, 2019, p. 1).

ADOPTION OF OPENLY LICESNED MATERIALS

According to Senack (2014b), there are three barriers faculty struggle when adopting and using available open textbooks. Senack (2014a) says faculty have a "lack of knowledge that an open textbook exists for their course, lack of training on how to actually engage with the material and use it in their class, and lack of ancillary materials to accompany the textbook" (p. 11). To work through these barriers, Senack (2015) and other OER endorsers (Braddlee & VanScoy, 2019; Fischer, Hilton III, Robinson, & Wiley, 2015; Hilton III, Fischer, Wiley, & Williams, 2016; Vitez, 2018) explain how open textbook policies need to include training (workshops and seminars) that will educate faculty about OER, provide information about current material that are openly and freely



available to faculty, and assist faculty in developing materials fitting to OER guidelines. Additionally, it is critical to engage experts in the field of OER to help educate, guide, and mentor faculty and students about openly accessible materials and OER initiatives.

Openly Licensed Materials

Resources and materials that are not freely accessible and openly licensed to everyone are not considered to be a part of the open-movement guidelines. Due to the misunderstanding of "openly licensed," Elder (2019) gives a visual of the differences between "openly licensed," "freely available," and "modified" within the guidelines and components of OER (See Table 1). As previously stated, educators and students are not aware of OER and the materials available.

Table 1. Components of OER

Material Type	Openly Licensed	Freely Available	Modified
Open educational resources	Yes	Yes	Yes
Free online resources under all rights reserved copyright	No	Yes	No
Materials available through the University Library	No	Yes	No
Open access articles and monographs	Yes	Yes	Maybe

Figure 1 Source: Elder, 2019, p. 4

Although there are efforts happening in developing primary resources and products that align with the U.S. educational system that includes both K-12 curricula and higher education courses and materials, to be considered OER, all materials and content must be freely accessible and openly licensed to everyone to be considered part of the open movement, not just accessible per institution, location, and region but across the U.S. and by all ethnically racial and socioeconomic populations.

OER CORE AUDIENCE AND STUDENT CHALLENGES

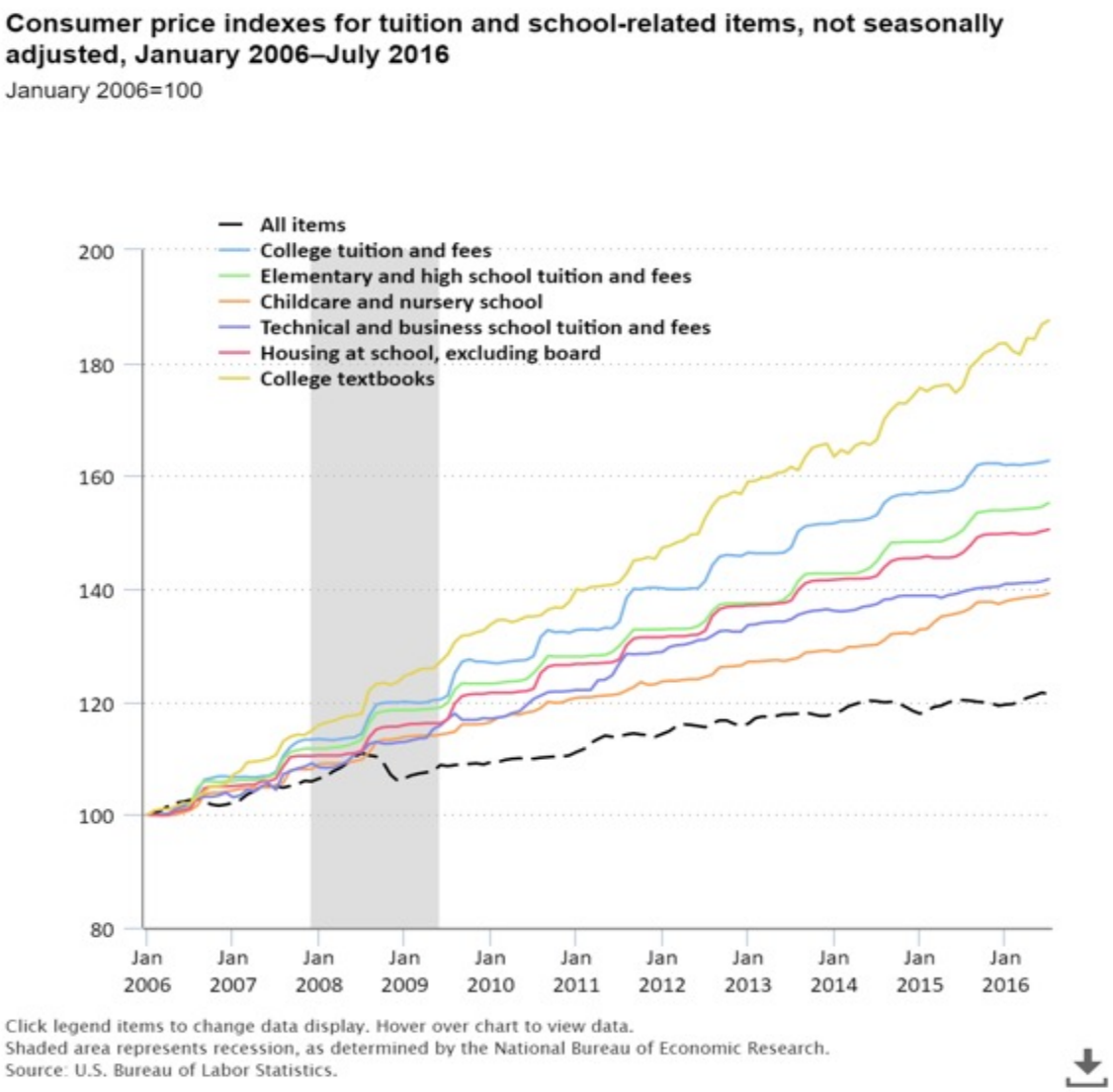
The core audience that OER is reported to benefit is college students. In the literature we analyzed for this report, we did not find specific racial or ethnic groups benefiting from OER. Instead, studies mention specific fields and courses we discuss in the next section. In this section, we discuss core audience and challenges of OER from a broader perspective because that is what we found in our research. More research needs to be conducted on specific groups around the benefits and values of OER, especially when it comes to serving the needs of underrepresented student populations that are more at risk of accessing and attaining an education and completing credentials.

Student Challenges

The increased cost of college textbooks continues to impact students and their ability to complete higher-education degrees. Before the COVID-19 pandemic, many students already could not afford to buy their course textbooks and materials (Durbin, 2019; Seaman & Seaman, 2018; Senack & Donoghue, 2016). Issues with financial aid distribution also place students at a disadvantage. Not getting financial aid funds before the semester starts is not always a result of students not submitting required financial aid forms by deadlines, but rather a limitation of state and federal funding or the process of paperwork at the institutional and/or funders' level.

For example, Figure 1 shows how the cost of college textbooks continues to rise, expanding alongside college tuition and housing. Bliss and Smith (2017) say organizations, such as the Hewlett Foundation, see OER as helping solve educational problems by strengthening the infrastructure of the U.S. educational system and its practices by improving the access of educational materials. Furthermore, Bliss and Smith express how OER alone cannot solve all inequity issues in education. However, they believe OER can help lessen some educational challenges by implementing sustainable attention and careful planning of learning resources, teaching practices, and educational policies that will give students the flexibility and access to high-quality educational courses and materials without the burden of affordability.

Figure 1. Consumer Price Indexes for Tuition and School-Related Items January 2006 to July 2016



Source: Bureau of Labor Statistics, U.S. Department of Labor, 2020, July

ACCESS, COST, AND BENEFITS OF OPEN EDUCATIONAL RESOURCES

In our analysis of access, cost, and benefits of OER at community colleges in Illinois, the terminology "access" and "open" are not clearly defined. Information was not easily accessible during our research and analysis of community colleges in Illinois utilizing OER materials. In general, what we noticed from our search is that learning about OER courses and materials is complex, and not every institution's site is easy to navigate. Based on the publicly shared information from college websites out of the 50 community colleges in Illinois, only five of these institutions have courses and course materials using OER. These community colleges include City Colleges Chicago, College of Lake County, Illinois Central College, Joliet Junior College, and Lincoln Land Community College. Of these five institutions, only College of Lake County had two career and technical education programs utilizing OERs (Teaching of English as a Foreign Language and Horticulture). Additionally, five Illinois community colleges provide OER information and resources within their library guide system, including Black Hawk College, Elgin Community College, Harper College, Heartland Community College, and John Wood Community College. Finally, at least one community college, Carl Sandburg College, showed evidence of participating in its institution's OER initiatives (see APPENDIX A). It is also important to mention that there may be other community colleges in Illinois using OERs. Still, we were not able to find existing evidence of other programs or courses utilizing OERs at the time of this report

> "...out of the 50 community colleges in Illinois, only five of these institutions have courses and course materials using OER."

ACCESS AND EQUITY RELATIVE TO SPECIAL POPULATIONS

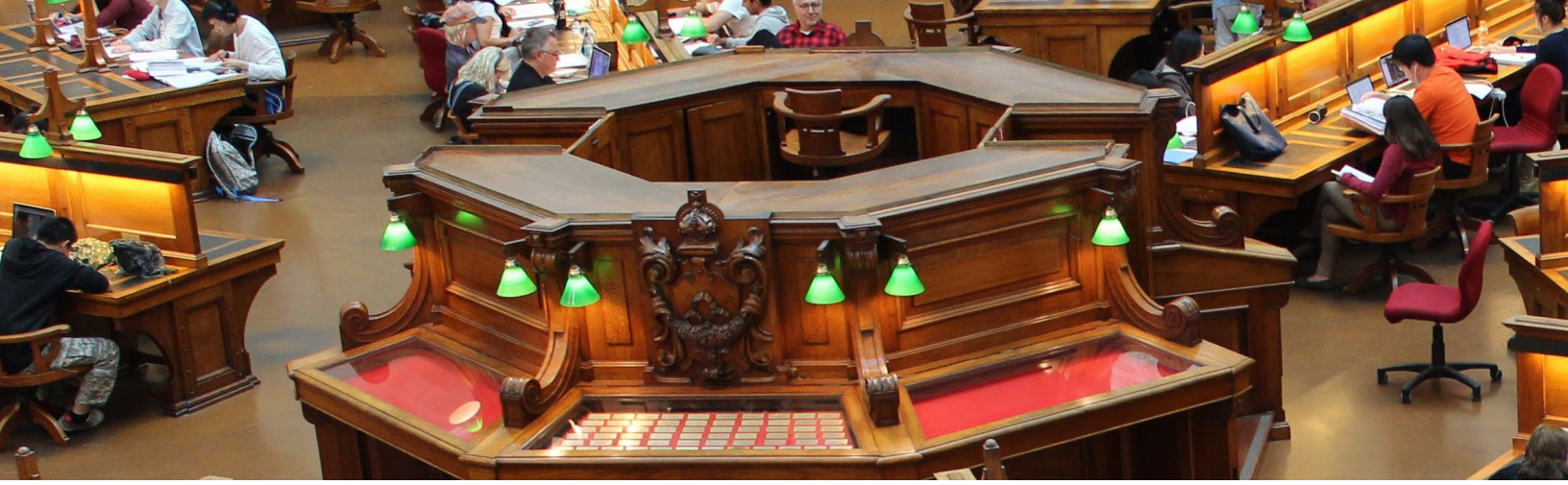
Accessibility is not defined only by cost and availability to students. In considering OER's quality and potential, accessibility must also attend to the needs and representation of students with disabilities and other historically marginalized students. There may be opportunities to draw on the flexibility of OER to better serve underrepresented and racially minoritized groups on campus to work toward creating more equitable classrooms. Without proper scrutiny, OER may only replicate the same inequities currently evident in some curriculum (Veletsianos, 2020).

Students with Disabilities and Universal Design for Learning

Disability is formally defined as physical or mental conditions, also known as impairments, that significantly restrict major life activities (Centers for Disease Control, n.d.; The United States Department of Justice, n.d.). In their work, Evans, Broido, Brown and Wilkes (2017) note that impairment "refers to the ways in which people's bodies or minds differ from what society deems 'normal' or 'typical'" (p. 4). Protections under the American Disabilities Act are for people who have a record of this condition or are "perceived by others to have such an impairment" (The United States Department of Justice, n.d.). Like most aspects of identity, disability is socially constructed—as definitions, paradigms, and terminology evolve over time (Annamma et al., 2013; Erevelles & Minear, 2010; Evans et al., 2017). However, this aspect of disability does not negate tangible implications for those who identify with the label (Shakespeare, 1997; Sommo & Chaskes, 2013).

It is estimated that between 11% to 15% of college-going students have a disability (Kimball et al., 2016; National Council on Disability, 2017). Research also highlights how students with disabilities tend to be concentrated at the community college (Newman et al., 2016). Legislation such as Section 504 and 508 of the Rehabilitation Act requires institutions to provide appropriate accommodations and access to technology for students with a documented disability. As institutions move toward an increased use of digitized materials, it remains crucial for them to ensure their accessibility, OER included. Accessibility refers to the usability of materials for students with sensory, physical, learning, and cognitive disabilities (Hashey & Stahl, 2014).

A 2011 study of 60 open textbooks found that most did not account for issues of access, particularly those in PDF format (De Winter et al., 2011). Since that time, multiple repositories now feature accessibility search functions, though not all (Center on Inclusive Software for Learning, 2020; Navarrete et al., 2019). Accessibility is a key aspect of quality and remains a concern (Hashey & Stahl, 2014; Moreno et al., 2018; Rodríguez et al., 2017; Zhang et al., 2020). In their review of research related to OER and accessibility, Zhang et al. (2020) found limited discussion on



authoring tools that can support the creation of accessible content. This finding may partially explain why there is limited premade OER content available to support students with diverse abilities (Zhang et al., 2020). Retrofitting OER is a difficult and costly task that most institutions are not able to support (Center for Applied Special Technology, n.d.; Center on Inclusive Software for Learning, 2020).

The estimated number of students with disabilities is not inclusive of students who do not formally disclose their disability. Using data from the National Longitudinal Transition Study (NLTS2), Newman et al. (2011) found that "almost two-thirds (63 percent) of postsecondary students who were identified by their secondary school as having a disability did not consider themselves to have a disability by the time they had transitioned to postsecondary schooling. An additional 9 percent reported considering themselves to have a disability but chose not to disclose it to their postsecondary schools" (p. 31). The disclosure process is complex and often influenced by the stigma associated with disability as well as "the perceived and actual risks associated with disclosure in a particular environment" (Evans et al., 2017, p. 147). While the choice of students to not disclose their disabilities should not be attributed to developmental flaws, lack of disclosure can present potential barriers to learning (Evans et al., 2017). Further, an acknowledgement of socially constructed labels like disability does not mean students will receive the suitable accommodations and support needed from their institutions (Brown & Coomes, 2016). There is a high likelihood that instructors may not know who will have a disability in their classroom.

Hashey and Stahl (2014) observe the temptation of content creators to adhere to a checklist of items delineating particular steps to make OER accessible, but the authors emphasize that "this approach simplifies the purposeful creation of resources that are designed with learner variation in mind" (p. 12). For this reason, considering Universal Design for Learning (UDL) practices while developing OER could be a key function for ensuring quality (Tacoma Community College Library, 2019). UDL is an educational framework that "reflects an awareness of the unique nature of each learner and the need to accommodate differences, creating learning experiences that suit the learner and maximize his or her ability to progress" (Rose & Meyer, 2002, p. 70). This framework encompasses three guiding principles providing multiple means of representation (how instructors convey learning materials), expression (how students demonstrate learning), and engagement (how the class collaborates to deepen learning) (Lieberman, 2018a, 2018b). According to the Center for Applied Special Technology (CAST), UDL draws on universal design, an architectural "approach to product or activity creation that addresses these needs from the outset, to avoid, to the greatest extent possible, the need for ad hoc retrofitting" (UDL On Campus: Accessibility and Open Educational Resources, n.d.). The flexible nature of OER, hypothetically, lends itself to UDL because of its ability to be adapted to "diverse students' varied needs in a variety of instructional contexts" (Rose & Meyer, 2002, p. 62). UDL does not necessarily remove the need for accommodations, but it embeds options within the curriculum that allows a broader array of students to access and engage course materials. As faculty explore and create OER, considerations for accessibility will be critical. This includes ensuring that readings, images, interactive games, and other resources provide auditory and visual accessibility and have educational efficacy, particularly for students with disabilities (Hashey & Stahl, 2014). Zhang et al. (2020) emphasizes how current research has not yet investigated the effectiveness of OER as a tool in "providing accessible learning experiences and enhancing disabled students learning achievement" (p. 16).

Culturally Sustaining Pedagogy

The presence of UDL practices embedded in OER does not ensure other issues of bias and representation are not present. Scholars in recent years have acknowledged the limitation of OER adoption to be a beacon of justice and accessibility, if not critically examined and questioned (Crissinger, 2015; Hodgkinson-Williams & Trotter, 2018; Veletsianos, 2020). Proponents of OER and open practices are beginning to interrogate who is at the helm of generating OER, as they witness an underrepresentation of content created by and featuring Black, Indigenous and other People of Color (BIPOC) (Veletsianos, 2020). Without these perspectives and images represented, the opportunity for the exclusion and misrepresentation of minoritized voices increases. Faculty and librarians who are new to OER creation may lean on pre-created content that already lacks diverse stories in the areas of race, ethnicity, socioeconomic status, gender, sexuality, and ability. Hodgkinson-Williams and Trotter (2018b) warn that using OER without any alteration "can be problematic if it ends up propagating hegemonic forms of knowledge and values, reinforcing the cultural power and prestige of the knowledge domain in which the OER was created rather than that in which it is used" (p. 213). Incorporating justice-focused and asset-based pedagogies could combat OER as a tool for inequity reproduction.

Culturally sustaining pedagogy is one such framework that critically engages students' cultural and linguistic practices, centering them as bearers, creators, challengers, and contributors of knowledge in the educational space (Ladson-Billings, 2014; Paris, 2012; Waitoller & King Thorius, 2016). Further, it has been a powerful tool for educators to encourage student engagement and activism with sociopolitical issues impacting their communities and contexts. A baseline aspect of culturally sustaining pedagogy is using texts and materials relevant to students' experiences for the purpose of questioning and critiquing systems. Inherent to OER's character is its malleability, which opens space for users to uncover, problematize, and deconstruct biased material. For instance, OER could be particularly supportive of LGBTQ+ inclusion as "understanding of queer identities and the language we have to describe them is constantly evolving" (Prescott, 2019, p. 13) and not easily captured by printed textbooks. Still, it takes extensive effort and energy to create high-quality OER like this; that effort is not always honored by institutions, but it should be for OER to take hold (Crissinger, 2015). Veletsianos (2020) presents guiding questions in helping equity-minded practitioners and researchers work to dismantle the inequities present in OER (p. 4):

- Who creates OER?
- Who is and who is not represented in OER? Are individuals' representations in OER appropriate and empowering?
- Who is cited in OER? Which forms of knowledge are reproduced in OER?

Another critical aspect to consider is the range given to students to participate in OER creation, to critically challenge invisible labor and facilitate the knowledge-creation work rather than a banking method of information (Crissinger, 2015).

BRINGING THE METHODOLOGIES TOGETHER

Simply adopting OER does not facilitate or ensure that innovative teaching practices or critical engagement of the material is happening in the classroom (Crissinger, 2015; Wiley, 2015). However, engaging UDL and culturally sustaining practices simultaneously creates a more equitable space that challenges master narratives and harmful norms, allowing students to be seen and take action to dismantle oppressive systems. With community colleges serving large proportions of BIPOC (Iloh & Toldson, 2013; Ma & Baum, 2016) and disabled students (Kimball et al., 2016; L. A. Newman et al., 2016), the use of OER to facilitate meaningful representation and engagement of diverse identities is tantamount. Scholarship acknowledges historical linkages between racism and ableism (Annamma et al., 2013; Waitoller & King Thorius, 2016) that still manifests in the institutional context (Ramirez-Stapleton et al., 2020). As institutions seek to rightly incorporate OER into broader curriculum and CTE pathways, it is imperative to consider how they might be used. Emphasis in universal design for learning and instruction, as well as culturally sustaining pedagogy's connection to OER, is lacking in current scholarship and also apparent in the training and support of faculty developing OER.

Currently, of the 11 Illinois community colleges that provide resources for OER development or offer OER-specific courses, only five guides include information specific to accessibility. Only two explicitly speak to issues of diversity and inclusion beyond disability. One resource addresses universal design for instruction and learning by providing access to a webinar. It is possible these institutions and others may have updated their documents and websites since the publication of this report. However, it is clear that more work needs to be done and empirical research completed to examine how community colleges in Illinois engage multiple pedagogies to ensure the efficacy and equity of OER beyond cost.

Management and Maintenance

With growing interest among higher education faculty and administration in adopting OER, several nationwide and statewide OER initiatives, launched by educational organizations such as SkillsCommons, the Community College Consortium for Open Educational Resources (CCCOER), Midwestern Higher Education Compact and Consortium of Academic and Research Libraries in Illinois (CARLI), are attempting to increase the awareness and encourage the implementation of OER. In addition, numerous foundations, such as Rebus Community and the William and Flora Hewlett Foundation, have supported the development and adoption of OER. In the exploration of OER resources for career and technical education in Illinois community colleges, our research team conducted the literature review, text analysis through college websites, and secondary data analysis. Because the policy, research, and practice of OER are burgeoning, a lot of attention in this area goes toward increasing awareness of OER and its impacts and adopting and creating OER on campus. For example, exhaustive literature research showed the positive financial and learning impacts on students when faculty adopt OER (Hilton III, Fischer, Wiley, & Williams, 2016; Hilton III, Gaudet, Clark, Robinson, & Wiley, 2013; Wiley, Williams, DeMarte, & Hilton, 2016).

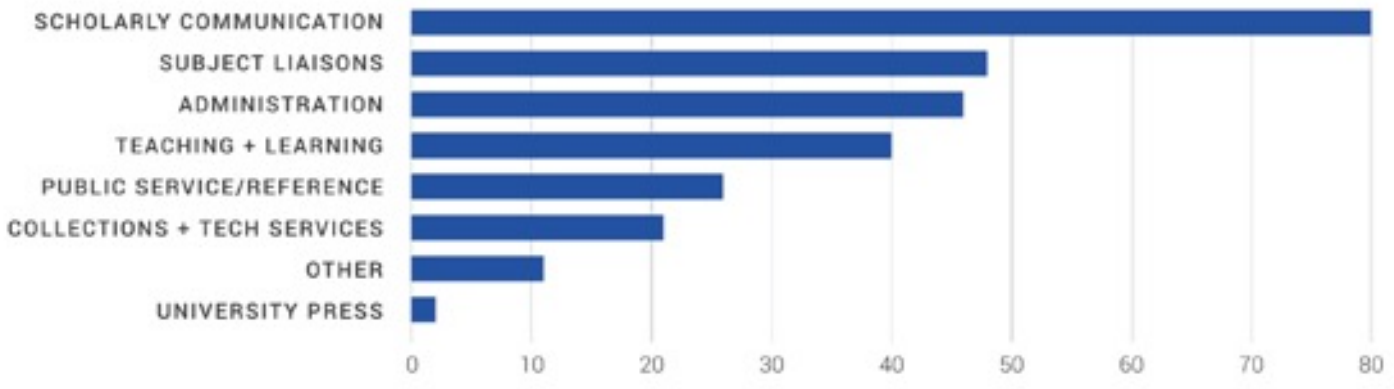
As described in the previous section, we found learning about OER courses and materials in CTE difficult to navigate and not all that accessible. Furthermore, we barely found specific information about how OER resources are managed and maintained and who had such accountability in its management. However, we found colleges' libraries and librarians are leading efforts to manage OER alongside creating it.

Libraries Leading OER Efforts

Libraries at higher-education institutions are actively engaged in the management and maintenance of OER

across disciplines. The Scholarly Publishing and Academic Resources Coalition (SPARC) team collected data from 132 participating institutions to provide a snapshot of the state of OER activities as of the end of the 2018-2019 academic year. According to the report Connect OER (Nyamweya, 2019), OER efforts by libraries have been made through scholarly communication, subject liaisons, administration, teaching and learning, public service, collections and tech services, and the university press (Figure 2).

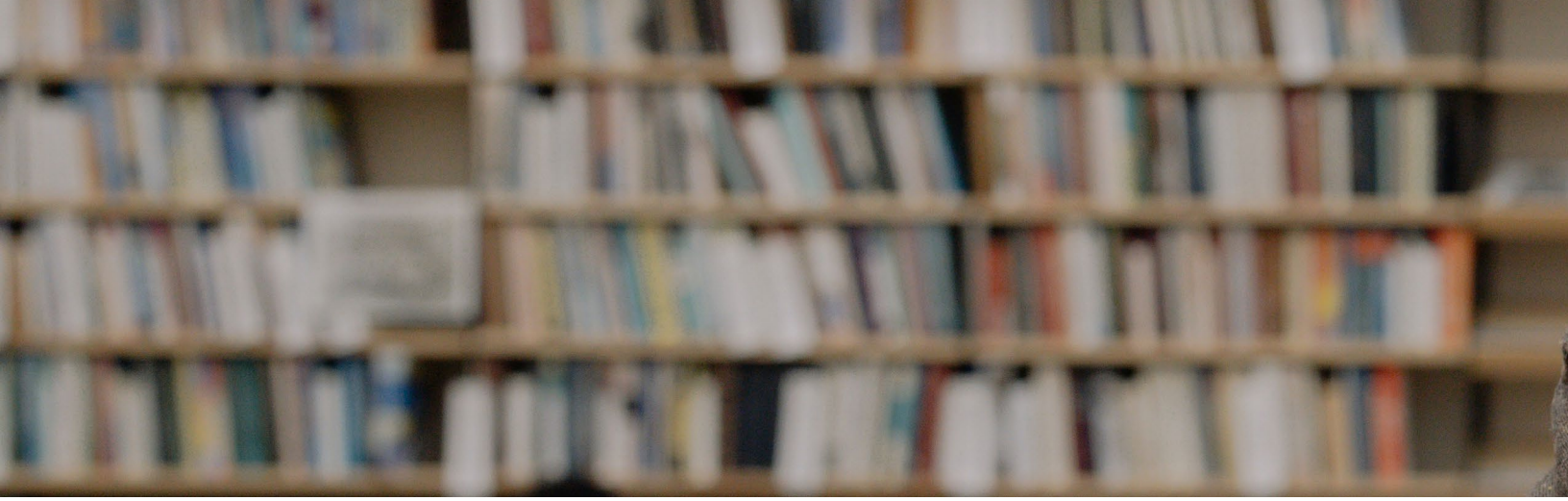
Figure 2. Library Departments Leading OER Efforts



Note. Number of Institutions = 128

Our research to identify OER in CTE in Illinois community colleges was conducted mainly through communication with these institutions' libraries. The majority of OER information is uploaded on the library website. For example, the library website of the College of Lake County provides general information about OER, including the clear institutional definition of OER and the OER textbook. It also provides a list of courses utilizing OER and the list of faculty members championing OER for adopting, adapting, and creating OER.

Conversely, there are a substantial number of community colleges in Illinois that do not have a customized web page about OER. This lack of OER information could be due to several factors. Our research shows that higher-education institutions actively engaged in OER have OER task forces or committees, provide grant programs or incentives for supporting OER, and inform which course use OER (Nyamweya, 2019). Such transparent actions in OER (e.g., OER course marking) at the institutional level are particularly important to empower students to make informed decisions about the cost of courses they select. In addition, community colleges using OER are more likely located in states with higher-education OER policies or state-funded initiatives (Allen, 2018, 2020). According to the State Policy Playbook (Allen, 2020), Illinois was not listed as a state launching or having OER policy or state-funded initiatives, but several bill activities related to OER are acknowledged such as HB 2509, SB 2290, HB 4924, and HB 4992 in 2020.



OER in CTE

To identify OER in CTE in Illinois community colleges, our research team conducted a crosswalk between the Classification of Instructional Programs (CIP) focusing on the CTE field of study to Standard Occupational Classification (SOC). For this exercise, we used the Perkins IV table, Instructional Programs by Career Clusters/Career Pathways, which assigned instructional programs and their corresponding CIP codes into each of the Career Clusters and Career Pathways. This is based on the 2000 CIP code. Thus, we updated the CIP code with the 2020 CIP code and conducted crosswalks with the 2018 SOC code. Then we attempted to analyze the CTE courses using OER in Illinois community colleges with the crosswalk data to navigate which CTE fields or programs are currently utilized in OER in Illinois. The crosswalk data file, CIP-SOC-CTE in IL Crosswalk, is attached in Appendix C.

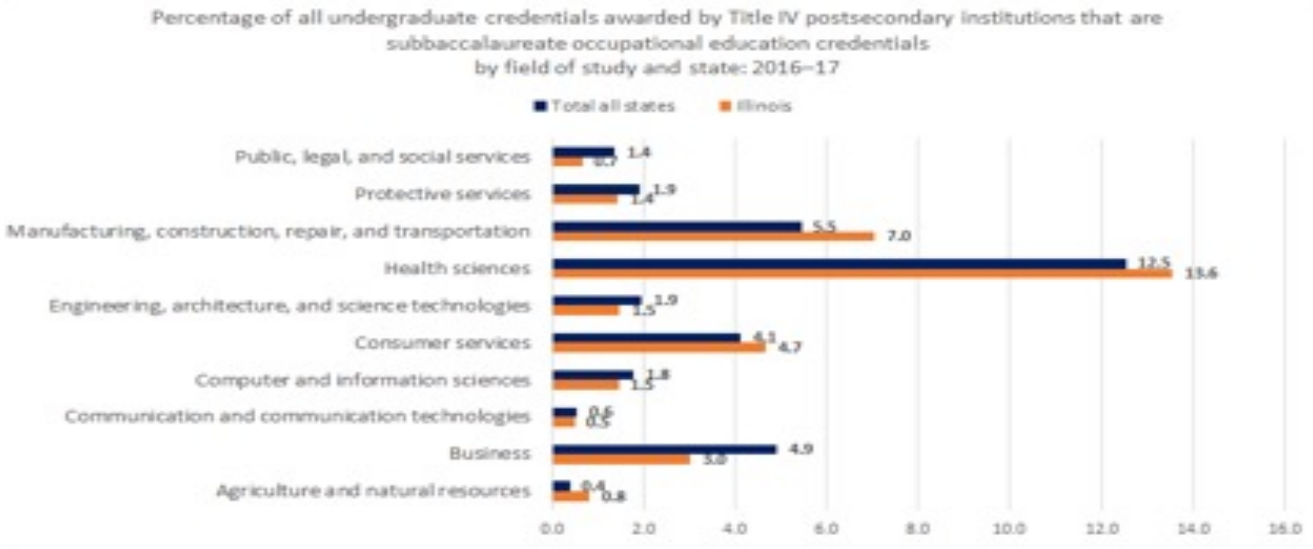
The CIP-SOC-CTE in IL Crosswalk data indicate that instructional programs of CTE in community colleges in the CIP category provide knowledge and skills to directly prepare individuals for performance in jobs classified in the SOC category (NCES, 2020). It also provides information and guidance to students in making decisions about cost and careers, as well as education, training choices, or conducting a job search via the crosswalk to help answer questions such as "Which college, CTE program, or courses in Illinois utilize OER?" and "To get a job in this occupation, what type of programs should I take?"

The CIP-SOC-CTE in IL Crosswalk provides data for users as a comprehensive list and resource for OER relating to CIP and SOC. Potential uses for the CIP-SOC-CTE in IL Crosswalk include, but are not limited to, the following:

1. Presenting data on and analyzing the relationship of postsecondary education and training programs of CTE to the labor market and the trends of OER in CTE fields;
2. Analyzing labor market supply and demand conditions and trends in CTE instructional programs;
3. Providing information on the labor market for use in making CTE-related postsecondary education and training program funding decisions, including adoption, adaptation, and creation of OER; and
4. Offering information on tasks and other characteristics of occupations related to CTE programs for use in developing and maintaining postsecondary education and training curriculum with OER.

The CIP codes of CTE instructional programs are assigned to 17 career clusters and pathways (Appendix B). Among them, the field of health sciences is the most common one of study with 27.17% of CTE concentrators enrolled in that area nationally. Illinois had a rate of 37.39% enrollment in the health sciences field in 2017-2018, followed by business, management, and administration.

Figure 3. 2017-2018 CTE Concentrators in Illinois by Career Cluster



As the previous section described, there are not many CTE courses or programs listed in the CIP-SOC-CTE in IL Crosswalk. Our research shows a majority of courses using OER are non-credit ones or prerequisite classes for transfer-to-credit programs. We could list the two CTE programs using OER directly related to the CIP-SOC-CTE in IL Crosswalk (Teaching of English as a Foreign Language and Horticulture) at College of Lake County (Appendix C). However, this does not mean there is a severe lack of CTE courses using OER in Illinois community colleges. We should note that the collected data are based on publicly shared information from college websites and informal interviews with librarians. Also of note is that a majority of prerequisite courses in math, English, or history can be a foundational course in a different SOC category. For example, mathematics-related courses fall into several SOC categories: Data Scientists (SOC Code: 15-2051), Mathematical Science Occupations (15-2099), Middle School Teachers (25-2022), Natural Sciences Managers (11-9121), and so on. Thus, we concluded that more efforts are required to adopt, adapt, and create OER in CTE programs in Illinois.

Community colleges have been promoting the adoption of high-quality OER. Its positive impacts on students have relied on the availability of OER in the varied subject areas. Considering the high enrollment and cost in the health science field, we would suggest developing OER-related institutional policy or supportive programs in the health science area. The information of OER should easily and effectively be accessible to students and faculty. The CIP-SOC-CTE in IL Crosswalk can provide resources for decision-making in policy and program development with OER.

ASSESSMENT AND EVALUATION

The rapidly growing movement for OER spurred a need for measuring and evaluation. We noticed various OER initiatives have heterogeneous approaches to adopt, adapt, create, and manage OER. Since OER is still in the beginning stage in CTE, the discourse of it seems to be behind its evaluation. In this section, adapted from the OER 5R approach (Creative Commons, 2020) and our relevant literature review, we attempt to provide a set of indicators to evaluate OER in CTE. The OER 5R approach appears to underpin effectively in the development and permission of OER (Seaman & Seaman, 2018). In this regard, the OER 5R can be a good indicator in each element to evaluate OER. Table 2 describes the evaluation elements of OER in CTE within the 5R. This initial evaluation guideline will help OER adoption in CTE for the biggest impact on educational equity. More research is needed to validate this guideline, conduct the needs-assessment on awareness and adoption of OER in CTE, and develop the rigorous evaluation model for OER in CTE.

Table 2. OCCRL Evaluation Guidelines for OER in CTE

Elements for Evaluation	Description	"5 R" Approach
OER for CTE	• Develop policies, procedures, or guidelines for the adoption and support of OER at the state and institutional level • Consult OER stakeholders • Provide sustainable OER grant programs or funding model • Form OER task force • Conduct needs-assessment on CTE materials by users (faculty and students) and subjects • Develop an evaluation model for OER in CTE • Focus on investment in high-quality OER for the CTE classes that attract the large number of CTE concentrators • OER course-marking	Retain Reuse Revise Remix Redistribute
OER Repository (e.g., Illinois' Open Education Resource repository)	• Access and participation • Search in a structured way (e.g., keyword) • Retrieve and select content • Make content available for reuse or refinement	Retain Reuse Revise Remix Redistribute

	• Create new resources through adapting or translating • Save or share content • Collaborate with other members of the user community by commenting on, reviewing, promoting, and developing resources	
Quality	• Clear definition of OER • Peer review (available or used as policy) • Transparency of authorship/institution • The soundness of pedagogical methods • Allows for customization or refinement	Retain Reuse Redistribute
Access/Technical	• Accessibility to all students, including individuals identified as blind, visually impaired, or print-disabled • High technical quality (clear visuals, high production value) • Clear licensing declaration (Creative Commons License present, in the public domain, etc.) • License to remix or share again	Reuse Remix Redistribute
Cost	• License to use (institution) • Require membership with low or no cost (for students)	Reuse Redistribute
Appropriateness	• Accuracy of content is ensured • Reliability of sources (e.g., citation) • Alignment with a learning outcome or course objective • Appropriateness of students' level	Reuse

Conclusion: Summary, suggestions, and recommendations for practice

To conclude, we feel that the adoption of OER could improve equity goals for community colleges in Illinois, but more analysis is needed. This critiquing would include OER in career and technical education by field of study, student demographics, and mixed-method evaluation research. Assessment and evaluation tools should be developed for OER in CTE. Additionally, more research is needed on specific underrepresented minoritized students who are benefiting from OER, and there should be sustainable funding models for OER at the state and institutional level. Finally, institutions should work toward developing an easy way for students to navigate and identify CTE programs of study, courses, and course materials that use OERs.

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APPENDIX A

Available Listing of OER related courses/programs in Illinois Community Colleges

Black Hawk College

https://www.bhc.edu/academics/academic-resources/library/open-educational-resources/

Transfer Credit Courses

Math 140 College Algebra

- College Algebra with Modeling & Visualization, 5th edition, by Rockswold (ISBN-13: 9780321833105)
  Textbook Only
- MyMathLab: Student Access Kit (ISBN-13: 9780321199911)
  MML (online resource)

Math 141 Plane Trigonometry

- MathXL Standalone Access Card (6 Month) (ISBN-13: 9780321878359)
- Book Referenced: Trigonometry, 10th edition, by Lial (ISBN-13: 9780321671776)
  This is an online resource which does include an eBook)
- Trigonometry by Michael Corral http://mecmath.net/trig/trigbook.pdf
  This is a free textbook

Math 143 Pre-Calculus

- Precalculus, by Jay Abramson, Lippman, and Rasmussen (OER - Open Education Resource with free pdf. download) Free pdf textbook
- Precalculus, by Jay Abramson, Lippman, and Rasmussen https://openstax.org/details/precalculus (for purchase)
  Physical Textbook

MyOpenMath (*http://www.myopenmath.com*) Online resource

Math 204-1 Calculus For Business & Social Sciences

- MyMathLab: Student Access Kit (ISBN-13: 9780321199911)
  MML (online resource)
- Calculus for Business, Economics, Life Sciences and Social Sciences, 13th edition, by Barnett (ISBN-13: 9780321925718) Textbook only

Math 207 Calculus & Analytic Geometry

- Calculus 7E by Hughes-Hallett, Wiley-Plus Access Code Only with the E-textbook (ISBN: 9781119043133) Ebook and Wiley-Plus (online resource)
- Calculus 7E by Hughes-Hallett, Wiley-Plus Access Code with the E- textbook and Loose-leaf (ISBN-13: 9781119343998) Loose-leaf textbook, Ebook, and Wiley-Plus (online resource)

College of Lake County

Career & Technical Education Programs/Courses

Teaching of English as a Foreign Language
ENG: 272: Principles and Practices in Foreign Language Teaching

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ENG: 273: English Language: Structure and Use.

Horticulture

HRT 127: Perennials, Annuals, and Weeds.

Non-Credit Courses

Composition
ENG 108 Strategic Reading and Writing 1
Intersections: An Integrated Reading and Writing Textbook (PDF)

ENG 109 Strategic Reading and Writing II
Writing Spaces: Readings on Writing (Volume 1)
Writing Spaces: Readings on Writing (Volume 2)
https://www.clcillinois.edu/programs/eng/openeducation

English
ENG 108: Developmental Composition

English Language Instruction
ELI 102: Reading and Vocabulary
Reading and Vocabulary (PDF)
https://www.clcillinois.edu/programs-and-classes/degrees-and-certificates/academicesl/classes

Counseling
Instructor: Vicki Code
PDS 120: Becoming a Successful Student.

Transfer Credit Courses

Biology
BIO 127: Introduction to Evolution

Earth Sciences
ESC 140: Introduction to Astronomy
ESC 121: Physical Geology
ESC 124: Oceanography

History
HST 221: U.S. History to 1876
HST 221: U.S. History 1876 to Present

Math
MTH 244: Discrete Mathematics
MTH 141: Quantitative Literacy
A Course In Quantitative Literacy (PDF)
MTH 142: General Education Statistics
MTH 222: Elementary Statistics
Introductory Statistics (PDF)
https://www.clcillinois.edu/programs/mth/openeducation

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Political Science
PSC 121: Introduction to Political Science
American Government (PDF)
https://www.clcillinois.edu/programs/psc/openeducation

Psychology
PSY 220: Lifespan Development
Lifespan Development: A Psychological Perspective Textbook (PDF)
PSY 121: Introduction to Psychology
CLC Introduction to Psychology Textbook (PDF)
https://www.clcillinois.edu/programs/psy/openeducation

Sociology
SOC 121: Introduction to Sociology
https://cnx.org/contents/r-QzKsl_@17.1:_97x1rAv@8/Introduction-to-Sociology
SOC 222: Social Problems
https://www.clcillinois.edu/programs/soc/openeducation

- **Elgin Community College**
  Has a link within their library that provides information and resources about OER.
  https://ecclibrary.elgin.edu/OER

- **Harper College**
  https://ecclibrary.elgin.edu/OER

- **Heartland Community College**
  https://www.heartland.edu/textbooks/faculty/oer.html

- **Illinois Central College**

  Transfer Credit Courses

  Literature
  LIT 115 Introduction to Literature

  Math
  MATH 085 Corequisite for College Algebra
  https://mymobile.icc.edu/app/catalog/classsection/ICCOL/2206/2714?institution=ICCOL

  MATH 092 Pre-Algebra
  https://mymobile.icc.edu/app/catalog/classsection/ICCOL/2206/2307

  MATH 110 Concepts of Mathematics
  https://mymobile.icc.edu/app/catalog/classsection/ICCOL/2206/2341?institution=ICCOL

  MATH 111 General Education Statistics
  https://mymobile.icc.edu/app/catalog/classsection/ICCOL/2206/2353

  MATH 115 College Algebra
  https://mymobile.icc.edu/app/catalog/classsection/ICCOL/2206/1837

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John Wood Community College

https://guides.jwcc.edu/oer

Joliet Junior College

Transfer Credit Courses

Math
MATH 170 Calculus w/Analytic Geometry I.
Note: A template for the syllabus of this course shows the use of Web Assign, a provider of online instructional tools for faculty and students. WebAssign delivers secure online testing, customizable pre-coded questions from a wide range of math and science textbooks. WebAssign provides students with access to Calculus 8th Edition. However, the information does not confirm that instructors who teach this course are using this service or the cost of the material.

Lincoln Land Community College

Non-Transfer Courses

College Success Skills
CSS 100: College Success Skills (uses electronic textbook https://saylordotorg.github.io/text_college-success/index.html) and other materials such as note taking lesson created using SoftChalk (https://www.softchalkcloud.com/lesson/gqYju7GtMFn8V1) and a YouTube video on how to takes notes in class (https://www.youtube.com/watch?v=AffuwyJZTQQ).

Mathematics
MAT 088: Developmental Beginning Algebra I
MAT 092: Developmental Beginning Algebra II
MAT 094: Developmental Intermediate Algebra I
MAT 096: Developmental Intermediate Algebra II

Note: The instructor for these courses uses a collection of lectures that he created in SoftChalk that feature lots of examples (including videos) and practice problems. These are completely original materials that are provided at no cost to students.

Transfer Credit Courses

English
EGL 222: Shakespeare

For the texts of the plays and poems, students read http://www.folgerdigitaltexts.org/. This website allows for easy linking to line numbers so students can quote and share the text. Folger Digital Texts is also great for doing research, since each line will link to JSTOR articles that reference that particular line. For viewing the plays, students watch videos of the Alexander Street Press productions available through the LLCC library. The instructor also has an assignment in which the students must compare the original text to a paraphrase in the website "No Fear Shakespeare" (http://nfs.sparknotes.com/) and then reveal what is lost in the translation.

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Humanities
HUM 101: Introduction to the Humanities
the instructor uses SoftChalk Lesson (Example): *https://www.softchalkcloud.com/lesson/serve/Hy7RmtN5velg69/html*

Note: The cost of required course materials: Required Text: One literary novel -- $15-20 (on average).

Political Science
POS 101: Introduction to American Politics-All sections. Note: The textbook alternative used for this course is Open Stax American Government (FREE).
POS 201: State and Local Politics
Note: The textbook alternative used for this course is, State and Local Government, by Anthony DiMaggio and John Vinzant (FREE)

APPENDIX B

APPENDIX B
CIP code of CTE Instructional Program by Career Cluster and Pathway in Illinois

#	CIP Code	Career Cluster and Pathways in IL, and CIP Program Title
1.0000	Agriculture, Food, and Natural Resource Career Cluster	
	1.1000	Food Products and Processing Systems Pathway
	1.2000	Plant Systems Pathway
	1.3000	Animal Systems Pathway
	1.4000	Power Structure and Technical Systems Pathway
	1.5000	Natural Resources Systems Pathway
	1.6000	Environmental Service Systems Pathway
	1.7000	Agribusiness Systems Pathway
2.0000	Architecture and Construction Career Cluster	
	2.1000	Design/Pre-Construction Pathway
	2.2000	Construction Pathway
	2.3000	Maintenance/Operations Pathway
3.0000	Arts, Audio/Video Technology and Communications Career Cluster	
	3.1000	Audio and Video Technology and Film Pathway
	3.2000	Printing Technology Pathway
	3.3000	Visual Arts Pathway
	3.4000	Performing Arts Pathway
	3.5000	Journalism and Broadcasting Pathway
	3.6000	Telecommunications Pathway
4.0000	Business, Management and Administration Career Cluster	
	4.1000	Management Pathway
	4.2000	Business Financial Management and Accounting Pathway
	4.3000	Human Resources Pathway
	4.4000	Business Analysis Pathway
	4.5000	Marketing Pathway
	4.6000	Administrative and Information Support Pathway

#	CIP Code	Career Cluster and Pathways in IL, and CIP Program Title
5.0000	Education and Training Career Cluster	
	5.1000	Administration and Administrative Support Pathway
	5.2000	Professional Support Services Pathway
	5.3000	Teaching/Training Pathway
6.0000	Finance Career Cluster	
	6.1000	Financial and Investment Planning Pathway
	6.2000	Business Financial Management Pathway
	6.3000	Banking and Related Services Pathway
	6.4000	Insurance Services Pathway
7.0000	Government and Public Administration Career Clusterw	
	7.1000	Governance (Legislators and general government executives and staff) Pathway
	7.2000	National Security Pathway
	7.3000	Foreign Service Pathway
	7.4000	Planning Pathway
	7.5000	Revenue and Taxation Pathway
	7.6000	Regulation Career Pathway
	7.7000	Public Management and Administration Pathway
8.0000	Health Science Career Cluster	
	8.1000	Therapeutic Services Pathway
	8.2000	Diagnostics Services Pathway
	8.3000	Health Informatics Pathway
	8.4000	Support Services Pathway
	8.5000	Biotechnology Research and Development

APPENDIX B

APPENDIX B Continued
CIP code of CTE Instructional Program by Career Cluster and Pathway in Illinois

#	CIP Code	Career Cluster and Pathways in IL, and CIP Program Title
9.0000	Hospitality and Tourism Career Cluster	
	9.1000	Restaurants and Food/Beverage Services Pathway
	9.2000	Lodging Pathway
	9.3000	Travel and Tourism Pathway
	9.4000	Recreation, Amusements and Attractions Pathway
10.0000	Human Service Career Cluster	
	10.1000	Early Childhood Development and Services Pathway
	10.2000	Counseling and Mental Health Services Pathway
	10.3000	Family and Community Services Pathway
	10.4000	Personal Care Services Pathway
	10.5000	Consumer Services Career Pathway
11.0000	Information Technology Career Cluster	
	11.1000	Network Systems Pathway
	11.2000	Information Support Services Pathway
	11.3000	Interactive Media Pathway
	11.4000	Programming and Software Development Pathway
12.0000	Law, Public Safety, Corrections and Security Career Cluster	
	12.1000	Correction Services Pathway
	12.2000	Emergency and Fire Management Services Pathway
	12.3000	Security and Protective Services Pathway
	12.4000	Law Enforcement Services Pathway
	12.5000	Legal Services Pathway

#	CIP Code	Career Cluster and Pathways in IL, and CIP Program Title
13.0000	Manufacturing Career Cluster	
	13.1000	Production Pathway
	13.2000	Manufacturing Production Process Development
	13.3000	Maintenance, Installation and Repair Pathway
	13.4000	Quality Assurance Pathway
	13.5000	Logistics and Inventory Control Pathway
	13.6000	Health, Safety and Environmental Assurance Pathway
14.0000	Marketing Sales and Service Career Cluster	
	14.1000	Management and Entrepreneurship Pathway
	14.2000	Professional Sales and Marketing Pathway
	14.3000	Buying and Merchandising Pathway
	14.4000	Marketing Communication and Promotion Pathway
	14.5000	Marketing Information Management and Research Pathway
	14.6000	Distribution and Logistics Pathway
	14.7000	E-Marketing Pathway
15.0000	Science, Technology, Engineering and Mathematics Career Cluster	
	15.1000	Engineering and Technology Pathway
	15.2000	Science and Mathematics Pathway
16.0000	Transportation, Distribution, and Logistics Career Cluster	
	16.1000	Transportation Operations Pathway
	16.2000	Logistics Planning and Management Services Pathway
	16.3000	Warehousing and Distribution Center Operations Pathway
	16.4000	Facility and Mobile Equipment Maintenance Pathway
	16.5000	Transportation Systems/ Infrastructure Planning, Management, and Regulation Pathway
	16.6000	Health, Safety and Environmental Pathway
	16.7000	Sales and Service Pathway

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