KCTCS Enhancing Programs for IT Certification (EPIC)

Independent Evaluation contracted by
the Kentucky Community and Technical College System

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Executive Summary

TAACCCT Program/Intervention Description and Activities

The U.S. Department of Labor's Employment and Training Administration established the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grants program in order to increase the capacity of community colleges to provide education and training programs for high-wage, high-skill occupations. A consortium of six Kentucky community colleges was awarded a four-year, $10 million grant in October 2014 to support Enhancing Programs for IT Certification (EPIC). EPIC was to expand the colleges' online, competency-based curriculum—called Learn on Demand (LoD)—to create more opportunities for students to earn credentials in the computer information technology (CIT) and medical information technology (MIT) fields.

More specifically, the goal of the grant was to develop five new LoD degree programs, 14 stackable certificates in CIT, and two degrees and six certificates in MIT. Some credentials, such as a certificate for health care specialist, were newly developed for EPIC, while others already existed in face-to-face and/or online formats. For both the new and existing programs, the project would enable students to earn these credentials entirely via online competency-based learning. The targeted student population was broad, including not only trade-affected and displaced workers but also adults seeking new skills, credentials, and jobs.

Postsecondary competency-based education typically includes these components: definition of relevant and measurable competencies that are tied to specific fields or jobs and are precisely defined and measurable, demonstration of competency through valid assessment before students can advance, potential acceleration since students move through the material at their own pace, and high-quality materials and timely support. EPIC generally followed this model; in addition, the new LoD courses and programs included academic support services, student success coaching, workplace readiness preparation, and work-based learning, among other components.

Evaluation Design Summary

CCRC's evaluation of EPIC focused on both implementation and outcomes. The implementation analysis examined the multiple elements of the program that constitute the EPIC Pathways Model as well as the effectiveness of the model according to staff and students. Key research questions for the implementation analysis were: What is the EPIC program's administrative structure? How were EPIC LoD programs and courses developed using grant funds? What support or other services are offered? How have students been recruited into EPIC? What is the role of faculty in developing and delivering EPIC courses? What challenges have program administrators faced in the implementation of the EPIC program? How satisfied are students with EPIC courses and associated services? What steps are being taken to ensure the long-term sustainability of the EPIC program?

Qualitative data were collected from multiple sources: interviews with program administrators, faculty, students, and program partners (primarily by telephone); participation in the project's quarterly Workforce and Employer Leadership Council (WELC) meetings (in person and online); and written materials on the program, including information from websites. Interviews were conducted in two rounds over the course of the grant period.

The goals of the quantitative study were to examine whether participation in EPIC significantly improved students' academic outcomes, reduced the time to completion, and enhanced labor market outcomes. Original research questions included: Do students trained using the LoD model have stronger academic outcomes than similar students trained through conventional classroom and other non-LoD delivery methods? Are students able to complete training through LoD more quickly? What are the employment outcomes (employment rate, quarterly earnings, industry of employment) of students in EPIC programs? How do the employment outcomes for LoD IT program students compare with those who pursue IT training through conventional (classroom and regular online) modalities? Is the LoD approach to career-technical training as cost-effective as traditional on-campus classroom models?

Administrative data were provided by KCTCS, but due to data limitations, our analyses diverged from the original plan. The dataset includes all of the students who took a course that was offered as an EPIC LoD course over the period spring 2015 through spring 2017 (including summer terms). Thus, the dataset includes students who took EPIC LoD courses as well as those

who did not but who took those courses in other formats, even if the EPIC LoD version was not offered in the semester in which they took an alternate version.

In our analyses, we were able to describe the EPIC options that are now available and the patterns of course enrollments. We modeled selection into EPIC courses to see which students are choosing them and how intensively they are enrolling in online coursework. We examined how grades, course completion, and credit accumulation differ across modes of instruction. We also compared completion of certificates across the different modes.

Implementation Findings

Implementation findings include:

- The grant provided significant professional development, training, and technical assistance to relevant staff. Topics included competency-based education, best practices in online courses, contextualized remediation, student supports, employer engagement, sustainability, and teaching in the LoD mode. Participants also experienced cross-college collaboration and learning.
- The courses were designed through a backwards-mapping process that started with identifying the competencies that students would master through the course, then determining how each competency would be measured, and then creating assignments that mapped to the assessments and the competencies. Course content was informed by national organizations that sponsor certifications, as well as by education publishers and open educational resources. A statewide marketing campaign promoted the new programs.
- The EPIC program was implemented mostly as planned, following the original EPIC Pathways Model. Due to staff turnover and other challenges, the initiative got off to a somewhat slow start. But, by the end of the grant period, the project had produced more courses and credentials than originally proposed, overall enrollment goals were met, and support by the consortium partners was such that five of the six colleges planned to continue.
- This report describes challenges that EPIC administrators, staff, and faculty faced in implementing the EPIC program, such as the absence of a project roadmap, inconsistent policies and procedures across the colleges, some lack of buy-in to the LoD enrollment and

funding model, and weak participation in WELC and slow development of work-based learning.

- Outreach and placement specialists worked internally and in their communities to raise awareness of the new EPIC programs and of the LoD format in general as an option. Student supports, provided by success coaches, were also a strength of the program. However, given that these positions were grant-funded, it is unclear if these roles and their contributions will be sustained.

Participant Impacts and Outcomes

Descriptive findings include:

- EPIC enrollees are more likely to be eligible for Pell and they have lower levels of college readiness. Notably, they are 2–5 years older than the other students.

- Over the period 2015–2017, there were 1,182 students in EPIC courses. However, most of these students took few EPIC courses: 78 percent took only one EPIC course and 15 percent took two EPIC courses. In total, only 74 students took more than two EPIC courses. And, most of the EPIC enrollees were clustered in a few specific courses.

Based on fixed effects estimates:

- Regarding course grades, the impact varied significantly, depending on the comparison group. No mode of instruction emerges as clearly superior to others. Comparing EPIC courses with LoD non-EPIC courses, grades in EPIC courses were significantly higher; this result holds in a direct single comparison and across all program students. Also, grades in EPIC courses were higher than grades for courses in the learn-by-term mode (again across enrollments in the same four subjects) but significantly below grades for students in the hybrid mode. Compared with the broad class of students in KCTCS, EPIC students did not underperform.

- Regarding course completion, the results show a modestly stronger effect of EPIC enrollment on course completion. Enrollees in non-EPIC LOD courses were much less likely to complete their courses than EPIC students. As well, enrollees in EPIC courses were much more likely to complete courses in the relevant program fields;

EPIC enrollees even completed at higher rates than enrollees in face-to-face courses. Overall, completion in EPIC courses appears modestly higher than for enrollments in other modes.

- Due to the limited time frame of our study and the fact that most of the students in our dataset had taken only one EPIC course, it was not possible to evaluate completion rates for "EPIC awards." Thus, we examined the rates of completion of any certificate by students who took at least two EPIC courses, compared with students who took fewer than two EPIC courses. EPIC students were much more likely to complete a certificate compared to non-EPIC LoD students, all program students, and all students who have taken CIT 105 (the most commonly-taken EPIC course). When we restricted the samples to only students with at least six credits, the results were equivalent. However, we cannot be sure that the students in our samples all had the intention of earning a certificate; our data do not show which particular programs students are in. Many students may not have earned a certificate because they are aiming to earn an associate degree. We do exclude students who transferred, as transfer would indicate that they are seeking a bachelor's degree.

- To further try to understand whether EPIC students progress toward a credential more quickly than other students, we examined total credits accumulated. We find a strong positive effect for EPIC students who have taken CIT 105 versus non-EPIC students who took CIT 105 in other formats. Students who have taken at least two EPIC courses, including CIT 105, have accumulated more total credits than other students.

We cannot draw any strong conclusions from these analyses. The limitations of our dataset, particularly the short time span and the small number of students who have taken two or more EPIC courses, prevent any estimation of the overall effect of the investment in the EPIC initiative on students. At the course level, there is some suggestive evidence that this particular form of online education that includes strong supports may be more effective than the other, less-supportive forms offered.

Conclusions

A key lesson from the evaluation is that new programs such as EPIC that are delivered in unfamiliar online formats need a human resources infrastructure that will be sustained after the end of the grant funding. In addition, consistent and clear policies and procedures, as well as a funding scheme that incentivizes enrollment in this format, are necessary for it to thrive.

Implications and questions for future research include:

- In general, students in the Kentucky Community and Technical College System appear to take courses in a mix of modalities. It is unknown whether there is a "best" mix of courses; this likely depends on the student. There does appear to be a certain segment of the population that can be successful in an LoD-type program; is this segment is large enough to cover initial and sustaining costs? Are so many modalities needed and sustainable?
- There were indications from some interviewees that enrollment in LoD was having an impact on enrollment in other modes. To what extent does the LoD format attract new students versus shift students from one format to another?
- Interviewees did not validate and hardly even mentioned the idea of acceleration. LoD potentially allows students to complete two courses sequentially within one semester. Researchers should examine whether any students are in fact accelerating their progress and how well they do.
- These analyses did not address the cost-effectiveness of EPIC courses. Can online competency-based courses and programs be delivered at a lower cost? If any savings can be passed on to students in terms of lower fees, then course loads and completion rates may increase.
- Finally, while these analyses were unable to track students into the labor market, it is important to understand the value of the skills acquired and credentials earned. Qualitative research is also needed to understand credential completers' job search processes.

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1. Introduction

The U.S. Department of Labor's Employment and Training Administration established the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grants program in order to increase the capacity of community colleges to provide education and training programs for high-wage, high-skill occupations. The TAACCCT program disbursed almost $2 billion over four rounds of grants from 2011 to 2014. Recipients were to use the funds to prepare workers eligible for Trade Adjustment Assistance (TAA) and other adults to enter growth industry sectors with credentials that match employers' needs (Mikelson, Eyster, Durham, & Cohen, 2017).

As part of the fourth and final round of the program, a consortium of six Kentucky community colleges was awarded a four-year, $10 million grant in October 2014 to support a project called Enhancing Programs for IT Certification (EPIC). The goal of EPIC was to expand the colleges' online, competency-based curriculum—called Learn on Demand (LoD)—to create more opportunities for students to earn credentials in the computer information technology (CIT) and medical information technology (MIT) fields. EPIC would build upon the Kentucky Community and Technical College System's (KCTCS) decade-long efforts to establish online, modularized, competency-based programs in high-demand, high-wage fields.

Rounds two through four of the program required grantees to contract with a third-party evaluator to assess the implementation and outcomes of the grant-funded activities. The Community College Research Center (CCRC) served as evaluator for the EPIC initiative, and this report presents qualitative and quantitative analyses of the consortium's efforts over the course of the grant. In addition, a national evaluation of the TAACCCT grant program is being completed by the Urban Institute, Abt Associates, and other partners.

1.1 Why Support Online Competency-Based Education?

The EPIC degree programs and courses and KCTCS's LoD curricula are competency-based and offered solely online. Neither of these formats are new to higher education, but there is not yet a great deal of evidence on the effectiveness of either approach in improving student outcomes. While competency-based and online programs may provide greater access to postsecondary education opportunities to more students, in recent years policymakers and

researchers have become more concerned with the problem of low completion rates associated with such programs, particularly for community college students.

Many students find college to be a challenge, in part due to personal and economic obstacles, as well as academic barriers for those who are not college-ready (Goldrick-Rab, 2016). Community college enrollees tend to be independent, work more hours, and are older than the typical university student; 30 percent have children of their own (Fishman, 2015). Online courses have the potential to help students who are working and have difficulty getting to a college campus to finish credentials that will enable them to advance in the labor market. Many educational institutions now offer students greater flexibility in how they earn their credentials with the goal of improving completion rates. Certainly, distance learning has expanded rapidly. In fall 2015, almost 30 percent of students enrolled in higher education were taking at least one online course and just under half of those were enrolled exclusively in online coursework (Allen & Seaman, 2017). In 2002, this figure was less than 10 percent of total enrollments.

Competency-based education (CBE) is growing more slowly, as it involves not only a different delivery mode but also a restructuring of curricula and assessments. In CBE, students work independently and at their own pace through the course materials, and progress toward a credential is determined by their showing mastery of the learning outcomes, or competencies. More than 500 colleges across 23 states now offer some competency-based courses, which are typically taught online or in a hybrid format (Girardi & Crew, 2016). The U.S. Department of Education is encouraging exploration of CBE through its Experimental Sites Initiative, which allows participating institutions to waive some financial aid disbursement regulations in cases where CBE does not align with the traditional semester schedule.

There is great variety in CBE design, but the Western Governors University's (WGU) model is a well-known one that is being replicated. For example, a previous TAACCCT grant supported the development of competency-based programs at Austin Community College, Broward College, and Sinclair Community College, and they shared some common attributes derived from WGU's model (Person, Thomas, & Bruch, 2016). These features include:

- Definition of relevant and measurable competencies: Learning outcomes, or competencies, are tied to specific fields or jobs, and are precisely defined and measurable.

- Demonstration of competency through valid assessment: Mastery of each competency must be demonstrated through assessment before students can advance.
- Potential acceleration through the educational program: Students move through the material at their own pace, allowing for acceleration.
- Need for high-quality materials and timely support: Because students learn independently, they must have access to just-in-time support.

1.2 Research Evidence on Online and Competency-Based Education

Thus far, the research on the efficacy of online classes is far from promising. A study using data from two large community college systems found that students performed more poorly in online courses than they did in face-to-face courses; failure and withdrawal rates were significantly higher in the former than in the latter. The same study found that students who took a higher proportion of their credits online were less likely to complete a degree or transfer. In addition, performance gaps among some student subgroups were worse in online courses (Jaggars, Edgecombe, & Stacey, 2013b). Another study found similar results as to students' worse performance in online courses versus in-person courses (Bettinger, Fox, Loeb, & Taylor, 2017). Qualitative research has found that some students believe it is harder to learn material in online courses versus in the face-to-face classroom and that when they have a choice they prefer to take courses perceived as "interesting" in the face-to-face format. They would also rather not take all of their courses online (Jaggars, Edgecombe, & Stacey, 2013a).

However, a recent study of three public universities and three community colleges found that with a "strategic approach to digital learning"—developing a portfolio of digital delivery models tailored to different student populations—institutions were improving access, shortening credential completion times, and saving money for both the students and the colleges (Bailey, Vaduganathan, Henry, Laverdiere, & Pugilese, 2018, p. 6). Outcomes presented in the study, though, seem based solely on descriptive data.

There is little recent evidence on the effectiveness of CBE, particularly at the postsecondary level. The evaluation of the aforementioned TAACCCT project in three community colleges found that the programs had mixed results (Person et al., 2016). Descriptive findings show that 47 percent of the students who enrolled between fall 2013 and fall 2014 had

completed a program (defined as completing an industry certification preparatory course, a certificate, or an associate degree) by spring 2016. There was no measurable increase in the subsequent employment rate for the completers, but the authors point out that employment rates started out high as participants were more likely to be incumbent workers than the average for community college students nationwide. Wages of employed program participants increased by 13 percent from initial program enrollment to the end of the study. A comparison of program participants with similar, non-participants showed that gatekeeper course completion rates—required introductory computer courses—were slightly lower for participants than for comparison students. Other outcomes, most importantly credential completion rates, varied significantly among the three colleges in the consortium and by the analytic model used. The authors concluded that these differences likely reflect unobserved differences between participants and non-participants, and point out that the programs' intensive intake and placement processes purposefully targeted students with particular characteristics such as maturity and motivation.

A recent series of reports from Jobs for the Future on postsecondary CBE highlights the potential of the approach—its flexibility, personalization, accessibility, and affordability—but points out that underprepared learners may not be successful. The final report discusses four major concerns with CBE: (1) the flexible pacing may actually stall progress for underprepared learners; (2) reliance on online delivery, as discussed above, has been shown to have weak outcomes for such learners; (3) the importance of frequent assessment to the model creates a high-stakes learning environment that can be stressful for underprepared students; and (4) the focus on competencies "can disadvantage underprepared learners if they do not directly align to future education or employment" (Hilliard, Bushway, Krauss, & Anderson, 2018, p. 2). The authors propose solutions to each of these concerns, such as coaches working with students to create personalized pace charts with "minimum speed limits" that could potentially encourage and better support underprepared learners in CBE.

2. Learn on Demand at KCTCS

2.1 Background

The EPIC program was not KCTCS's first foray into online CBE; it was built on an existing KCTCS effort that began in 2006 as the Virtual Learning Initiative (VLI). According to Cook's (2014) historical account of LoD, at that time KCTCS was seeking a strategy to strengthen recruitment of adult students for programs such as business administration and information technology. Understanding that prospective adult students tend to have preexisting job and family responsibilities that impede college enrollment, KCTCS envisioned online courses that would have multiple possible start dates and be available online at all times, so that students could proceed at their own pace when convenient to them. Admission, registration, and student support services would also be available online. Furthermore, students could choose to take assessments to potentially receive credit for prior learning. Through a combination of convenient access, flexibility, and affordability, KCTCS aimed to increase enrollment and completion, provide value for students, and increase revenue for the colleges.

The VLI proceeded to be implemented in a structured way. KCTCS developed a business plan and an Online Central Services Team was established to oversee the initiative. Interest-free loans were made available through the Kentucky Council on Postsecondary Education's Virtual University Revolving Loan Fund to support the individual colleges in developing courses, which went through rigorous quality assurance. Programs began to be launched in 2009, and the name was changed to KCTCS Online Learn on Demand. Courses were modularized, and initially, students could enroll in single modules that would earn a portion of course credit and even take time off between modules. Existing general education courses were later modified for the LoD format so that students could earn entire degrees through the LoD format.

According to Cook (2014), enrollment in LoD was initially below expectations, and this was due to several reasons: inadequate outreach and marketing, confusion about LoD versus regular online courses (called Learn by Term), and a lack of internal advocacy at the colleges. Based on these findings, components were subsequently added to help students understand the unique format of LoD courses and how to be successful in them. A student contract was added to the enrollment process to help ensure that students understood how LoD differed from learn-by-term courses. In 2012, Blackboard was selected as the platform for all of KCTCS's online

courses, and a standard syllabus template and format were adopted for the LoD courses so that once students took one LoD course, additional ones would look and feel familiar. A grant from Complete College America funded a new online orientation to help students understand the Blackboard platform and LoD expectations. To speed student progress, college readiness math modules were developed so that remediation could be embedded into the courses.

Virtual student success coaches dedicated to LoD students were added in 2012. The six LoD-dedicated student success coaches were envisioned to be "high-touch"—hands-on in guiding and mentoring LoD students. In 2012, KCTCS added a service called BrainFuse, through which students can access live tutoring online, and in 2014 implemented the Starfish student retention system across the community college system. Even with these enhancements, an LoD Enrollment Management Project was initiated in 2013 to try to increase enrollment through better external and internal communication, a strengthened understanding and ownership of LoD, and better understanding of and outreach to the target population. Discussions were also held on whether to change the financial structure for LoD in which the home college, no matter whether the course is provided from that college, receives the FTE or headcount, while the college that delivers the course receives the tuition. This is still the current practice.

2.1 Enhancing Programs for IT Certification (EPIC)

The EPIC Consortium received the TAACCT grant in October 2014. The goal of the grant was to develop five new LoD degree programs, 14 new stackable certificates in CIT, and two degrees and six certificates in MIT. Some of the credentials, such as the Health Care Specialist certificate, were newly developed for EPIC, while others already existed in face-to-face and/or online formats. For both the new and existing programs, the aim was for students to be able to earn these credentials entirely via online competency-based learning. The targeted student population was broad, including not only trade-affected and displaced workers but also adults seeking new skills, credentials, and jobs.

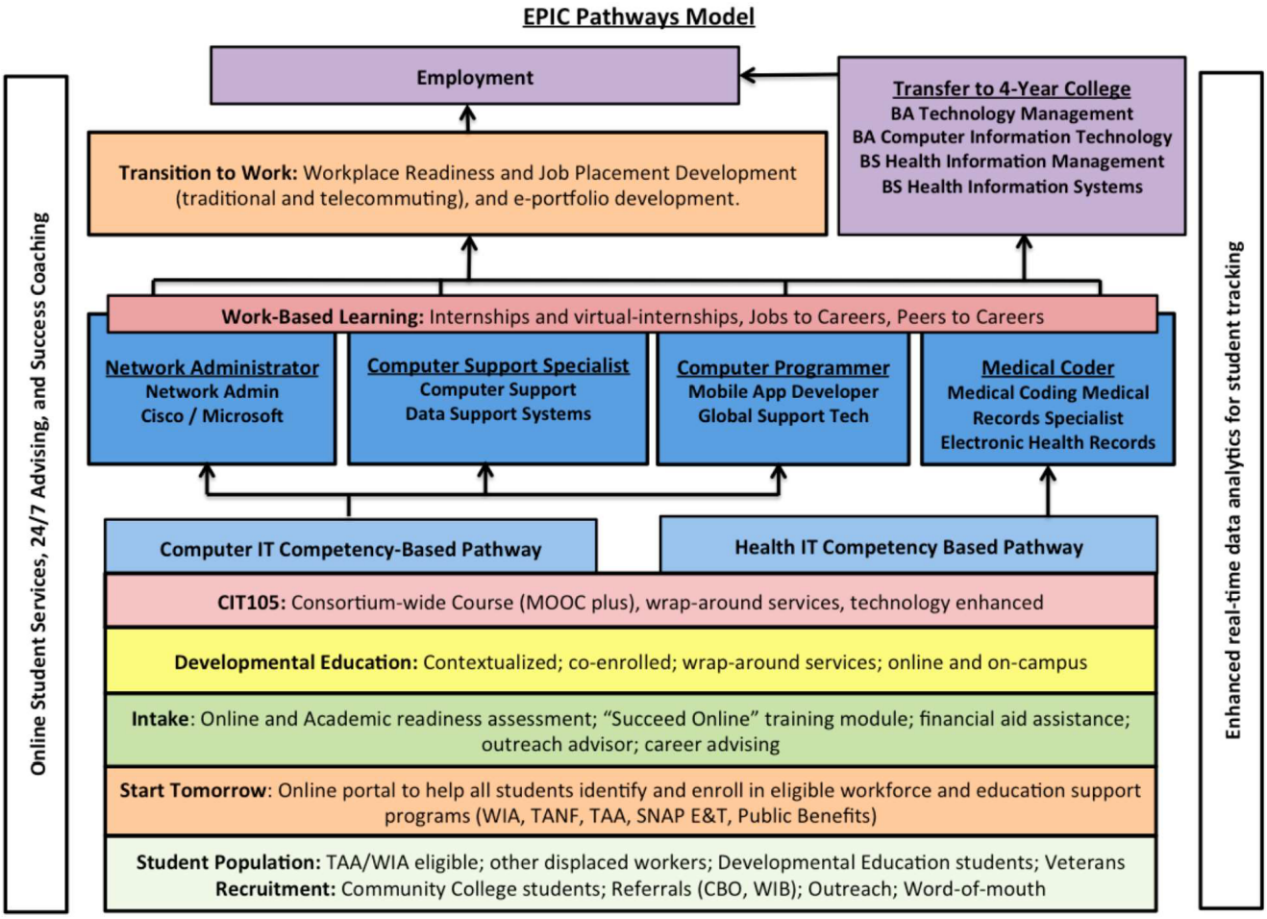
The degrees were as follows (see Appendix A for the full list of courses):

- Computer Information Technology (CIT)
    - Network Administration—either CISCO Specialization or Microsoft Specialization
    - Computer Support

    - Computer Programming—Information System Specialization or Software Development Specialization
- Medical Information Technology (MIT)
    - Medical Coding
    - Electronic Medical Records

In addition to new LoD courses and programs, the EPIC initiative was also meant to provide academic support services to participating students, as well as workplace readiness preparation and work-based learning. The EPIC Pathways Model (Figure 1) illustrates the various components of EPIC and how each should relate to the others. According to the EPIC statement of work, the model was based on an evidence-based pathways design that incorporates enhanced, innovative features. The model shows how students would progress through an EPIC program, starting with recruitment and enrollment (toward the bottom of Figure 1), moving through developmental education if needed, then through CIT 105 (an introductory course), and followed by the selected CIT or MIT pathway. Toward the top of the model, students are placed in internships and then finally transition into employment or a four-year institution. Throughout their time in the program, students receive various services, including advising, student success coaching, and other online student services.

Figure 1.



3. The Research Approach

CCRC's evaluation of EPIC focuses both on implementation and outcomes. The implementation analysis examines the multiple elements of the program that constitute the EPIC Pathways Model (Figure 1) as well as the effectiveness of the model according to staff and students. Key research questions for the implementation analysis are:

- What is the EPIC program's administrative structure?
- How have EPIC LoD programs and courses been developed using grant funds?
- What support or other services are offered?
- How have students been recruited into EPIC?

- What is the role of faculty in developing and delivering EPIC courses?
- What challenges have program administrators faced in the implementation of the EPIC program?
- How satisfied are students with EPIC courses and associated services?
- What steps are being taken to ensure the long-term sustainability of the EPIC program?

The impact evaluation was initially intended to measure the cost-effectiveness of the approach in terms of improving completion and reducing time to completion, as well as measure the impact on labor market outcomes. Due to data limitations, our analyses diverged from the original plan. The evaluation used the following data sources (see Appendix B for more details on data limitations and data sources):

- Online survey of LoD students
- Telephone interviews with LoD students
- Telephone interviews with LoD instructors and administrators
- Interviews with project partners and stakeholders, including employers
- In-person participation in KCTCS meetings and employer advisory group meetings
- KCTCS website and documents
- Administrative data provided by KCTCS

4. Qualitative Findings

4.1 EPIC Administrative Structure

Six colleges formed the EPIC consortium, with Hazard Community and Technical College as the lead. (Some descriptive data for the participating colleges are provided in Appendix C.) Hazard's Dean of Online Learning served as EPIC's Principal Investigator (PI).

Also based at Hazard was the consortium lead, whose role it was to lead and coordinate all project activities across the six colleges, as well as to manage project tasks for Hazard. Each of the other five colleges had a full-time EPIC project team lead; some were existing college faculty or program coordinators who took on the EPIC role. All six colleges had full-time outreach and placement specialists. In addition, two success coaches were hired to be solely dedicated to EPIC students, and an instructional designer was engaged to support the curriculum development process. With the exception of the PI, these positions were all funded full-time by the grant. Some additional administrative support was provided by the grant to Hazard.

The PI oversaw the project director and instructional designer. The project director was responsible for overall project administration and organization, including tasks such as planning and holding regular consortium-wide meetings, providing professional development, and ensuring communication among the consortium colleges. The individual college leads oversaw their own college's EPIC activities, such as recruiting faculty and overseeing the outreach and placement specialists. They also submitted quarterly reports to the consortium lead, which included information on course development, contacts with partners such as employers, student recruitment, and so on.

As one of them described his broad role,

> My job then is to manage the project, take care of the budget, also work with employers and see what kind of internship or employment opportunities exist there, advise students, and work with students on their career goals, and then also oversee the development of all the EPIC courses that we develop for the college.

Another described himself as serving "as a liaison between the college and the community for the EPIC program."

Jobs for the Future (JFF), a national non-profit that focuses on education and workforce development, was a partner in EPIC from the project's inception. Included in the grant were funds to support JFF staff in providing ongoing technical assistance to the consortium project director. Thus, over the period of the grant JFF provided professional learning opportunities on apprenticeships, contextualized remediation, and student supports, which were delivered via webinars to the project staff. JFF also organized periodic retreats for project staff on topics such as employer engagement and program sustainability. They also provided individualized coaching

calls to some college-based project staff. One of JFF's main ongoing roles was to plan and host the meetings of the Workforce and Employer Leadership Council (WELC), an advisory body to the project.

There was general agreement that the project did not get off to a smooth start. The grant was awarded in October 2014. The initial project director started in January 2015 and was characterized as having a "hands-off" style when what was needed was a detailed course of direction and procedures. He left in August of that year. The project then had no director until a new one was put in place in November; she left in August 2017. The next and final director was a staff member who was already working on the project at the time of appointment.

Many interviewees spoke of the lack of effective project management from the beginning of the grant period. One team lead said, "I really think more policies and procedures in place up front, then change instead of develop as you go, which is kind of what we've done. … I'll be honest, it has made for some headache to develop a lot of things as we went." Another team lead noted challenges due to geographic distance:

> Due to the fact that we're spread all over Kentucky … I would just say that due to the fact that logistics, and not having enough time to meet in person, and make definite decisions when we met, maybe stagnated progress that could have been made earlier. … Sometimes people's opinions and ideas cannot be correctly conveyed over a Skype call or conference call. … There's the issue of, when can everybody meet? But I think what also would have been very helpful is if there had been some type of maybe, some kind of manual in place, some kind of definitive outline. … I like blueprints. I wish there had been a blueprint for us.

Another interviewee echoed this, saying that what was needed was clear communication of tasks, milestones, and deadlines.

In addition to turnover in project leadership, there were also significant changes in KCTCS and college leadership over the grant period. KCTCS saw a new president and chancellor; individual colleges inaugurated new presidents. There was also turnover in the distance learning department of the system office, along with staff shortages in the office responsible for course and program approvals. In addition, in the last year of the grant, in anticipation that their grant-funded roles would soon end, several key college-based staff persons left for new positions.

4.2 Course and Program Development

The initial undertaking for the grant was to develop the courses that would comprise the new certificates and degrees. But first, decisions had to be made regarding which colleges would develop and offer which courses and credentials. Once the grant was awarded, the colleges were asked by the project leads to select the courses they wanted, but the leads ultimately determined the distribution of the courses among the colleges. As one lead said, "We made the decision of what made sense. … For example, giving one college all the Cisco-related courses, which is actually four courses. Even though another college requested one of the Cisco courses, it made sense to keep them all together under one college." Another factor considered was whether a college already offered the necessary prerequisites for particular courses.

All of the general education courses necessary to the credentials were already available in all delivery formats, including LoD. Some of the program-specific courses existed in the other delivery modes—face-to-face and/or learn-by-term—and just needed to be modified for the LoD format. Yet other courses had to be newly created. The courses were designed through a backwards-mapping process that started with identifying the competencies that students would master through the course, then determining how each competency would be measured, and then creating assignments that mapped to the assessments and the competencies. Across KCTCS, all course competences are developed and approved through curriculum committees. If a course can lead to a certification, any competencies needed for the certification would also be included. This process is visualized in Appendix D and was explained by one EPIC program administrator as follows:

> When you look at each competency ... I don't know if you want to call them objectives, because I know everybody uses different terminology, but we look at, "Well, what would it take for a student to meet that competency?" Then we actually design assignments that map to that competency. This is all to be done before you even look at any book content. That's how you're going to assess them, what would be a good assignment, how are you going to make sure they're able to master what that competency is.

Course developers and instructional designers were necessary to this process. Course developers were those with expertise in the course subject matter—essentially faculty members—who may or may not have had any technical proficiency with the Blackboard platform. They were paid $1,000 per credit hour from the grant for their work in course

development. A centrally hired full-time instructional designer, also funded by the grant, supported the course developers across all the participating colleges. Faculty could access a Blackboard video on building online courses, but needed more information on the LoD format. The instructional designer provided extensive in-person as well as online training to the faculty course developers that included monthly sessions, Q&A opportunities, and just-in-time mini-lessons such as at the end of the semester to show new faculty how to post students' grades. As courses were continually being added across the life of the grant, new faculty regularly came on board, so all of the training needed to be regularly repeated.

As the instructional designer explained:

> The faculty are the developers, yes. We've hired faculty from all over the system to develop these courses. The faculty have varying levels of skills in course design, particularly online course design, which is what we're doing. One of the faculty that was hired had never used Blackboard before so I've been helping her step-by-step on how to develop a course in Blackboard. Most of them have experience developing courses online but there [are] varying levels of technical skills and course design skills. I've provided them a template that we had from our system office, a template on the course design for Learn on Demand courses that we just updated and modified a little bit. … I helped them follow that template and fill it in with content.

Course content was obtained from a number of sources. Faculty who were already teaching a course but in a different format had the content but needed help from the instructional designer to acquire it or modify it for the digital format. Some digital content came from publishers of education materials such as Pearson and Cengage. Another source for some EPIC courses was industry itself—for example, Cisco Systems, Inc. sponsors a "Networking Academy" that provides a curriculum in information technology that is—in the words of one instructor— "fairly prescribed." Courses required for the healthcare specialists' certificates were to a great extent informed by content needed to acquire national certifications sponsored by the American Health Information Management Association (AHIMA).

In addition, a requirement of the grant was that courses should use open educational resources (OER) as much as possible. OER are openly licensed and free-to-use instructional materials that can be sourced from various websites such as OER Commons. The instructional designer provided some training to course developers on how to search for OER and alerted

course developers to various OER resources. The LoD version of CIT 105, an introductory course that is required of all students, uses only OER. In most cases, EPIC courses do not require physical textbooks (an exception is medical coding, for which students have to buy coding manuals that they need for the certification examinations); they include only e-resources that are integrated into the Blackboard platform. Students are thus charged an e-resource fee for most EPIC courses, but not in the case of the all-OER CIT 105.

In addition to the development in the LoD platform of the program-specific courses, the EPIC pathways model proposed to incorporate contextualized developmental education into the core class that all students begin with, CIT 105. Similar to many community colleges, all new KCTCS credential-seeking students take a basic skills assessment unless they enter with scores from a nationally recognized examination that show college readiness. Typically, many students are deemed by the assessment to be not college-ready and are placed in developmental (also called basic skills, or remedial) courses. Currently, across U.S. community colleges, changes are being made to such courses to try to speed up student progress through them. Thus, students who enrolled in CIT 105 who were assessed as needing developmental English were allowed to waive it; if they chose to take the developmental course anyway, they were allowed to take it concurrently with CIT 105, rather than having to take the courses in sequence. Within the LoD CIT 105 course, assignments were linked to academic tutorials from external websites, such as NROC.org, a foundation-funded source of content, professional development, and technical assistance to help underprepared students.

The instructional designer also oversaw quality assurance for the courses. She used resources from Quality Matters, a research-based initiative that promotes high standards for online course design. Quality Matters offers a rubric for building quality online courses, and she incorporated this information in course development trainings. She also provided course developers with a basic checklist to ensure that all web links worked, that the content was complete and supported the competencies, and so on, before then submitting the course to the EPIC team lead at the particular campus for an additional review. She then forwarded the course to the system office, where new courses are reviewed by a three-person quality assurance team. The KCTCS office charges a $150 fee for review and approval of new courses; grant funds were used for these fees.

By all accounts, this was a great deal of work for one instructional designer, and other campus-based individuals with expertise in instructional design were recruited when possible to assist with some of the courses. But overall, course development proceeded behind schedule. There were a "lot of missed deadlines," according to one informant. For the faculty, course development was

> not part of their regular duties, it's something they volunteer to do for extra money. That's the big challenge with meeting the deadlines for faculty. There's really nothing we can do. … We can let them go, terminate their contract and hire someone else, but it doesn't really help our case. We have to start all over again with someone else.

Some faculty were completely unfamiliar with the LoD format. In addition, some of the campus team leads had not been involved in course development previously and did not have knowledge of or experience with the review process. In addition, staff shortages caused a bottleneck in the quality assurance process at the system level.

Consequently, interviewees stated that more human resources were needed to support the course development process; specifically, that each college should have had its own instructional designer. As one interviewee said,

> That way, subject matter experts can really spend their time on their subject, rather than on trying to learn technologies that they will only need while they're building this course this one time. Just more online course building support would be helpful, very helpful, especially in meeting the timelines because we struggled to meet the timelines for course development.

Echoing other interviewees' wishes to have had more set procedures to guide the project, one individual said that "It might have been better having something written. … Having like a booklet, welcoming the faculty member who developed curriculum for this EPIC grant. Here are some of the steps that you need to know about."

Still, by the end of the grant period, 90 courses (see Appendix A for full course list) were either entirely newly developed or modified from other formats into the LoD mode. Interviewees believe that they are strong courses, citing the rigorous process described above, and also see the OER content as a boon to students.

4.3 Course Structure

As described above, with the LoD delivery mode KCTCS aimed to provide learners with a new way of accessing, moving through, and completing courses. As one college administrator described it, "Our ultimate goal would be to provide instruction in as many different formats as we can for people with different life circumstances. I think that it's helping us broaden what we can offer to students and the multiple ways we can offer it to them." Students can enroll in LoD courses any Monday up to 10 weeks into the semester, access the course content and assignments day and night, and proceed at their own pace. The only due date is the last day of the semester, when the course must be completed.

Overall, interviewees emphasized what they saw as the many positive aspects of the LoD approach. In addition to "competency-based," respondents used terms such as "mastery-based" and "learner-driven" to describe the courses. They also extolled the authentic nature of the assessments students complete at the end of each module of a course and the ability to receive credit for prior learning.

As one instructor described,

> It's based on mastery learning. You will get to your chapter, you work your way through your chapter, you have an assignment for the chapter or a couple of assignments for the chapter, in the end you have a chapter assessment. Only if you pass the chapter assessment can you go on to the next chapter. Then after the three or four chapters when you are done with the module, then you have an authentic assessment in the module, because then we are saying, okay, this is nice that you did well on your quizzes, but now we want to see how you apply what you've learned. ... You are going from an objective assessment then to an authentic assessment where it has to be applied.

Others described the courses as "learner-driven," saying that "truly a learner cannot fail at these courses" because if a student does not pass an end-of-chapter quiz, he can review the chapter materials and try again. And, the materials include multiple ways to learn and practice the content, such as readings, videos, and flash cards. Seventy percent or above on a chapter quiz is required to pass to the next chapter; 90 percent or above is required to complete a module and move onto the next one. If a student wishes to try for credit for prior learning, she can take a pre-assessment; if she scores 90 percent or above, she moves on to the post-test, and if she scores above 90 percent again, she can receive full credit for the course. The post-tests typically include

an authentic assessment such as having to build a computer program. One college administrator expressed her excitement for this opportunity in particular, saying that at her college credit for prior learning is currently only offered for the LoD courses.

"Learner-driven" implies a minimal faculty role, and it is the case that in the LoD mode, faculty do not directly teach content but instead guide the learning process. Indeed, some interviewees used the term "facilitators" rather than "instructors" to refer to EPIC faculty members. But, interviewees disputed any notion that students in LoD courses are very much on their own. KCTCS mandates that faculty members who are going to teach in the LoD mode take an online facilitator training course. Through the platform, faculty are able to introduce themselves, and can ask students to do the same via a discussion board. Instructors provide their contact information and availability, post announcements, respond to students' questions (by email, phone, or Skype), monitor students' progress, and grade submitted work. One instructor said,

> I think there is a lot of upfront telling the students exactly what is expected, how this course works. All of that is very much put in the center. For example, we have syllabus exams; they cannot pass on until they've really read their syllabus and had a quiz over the syllabus so they really understood it. Where a lot of times in regular classes they get their syllabus and they might or might not read it.

Another faculty member described the information provided to students initially.

> I let them know straight off how many modules are in the class, this is how it works. We have a suggested pathway, that you complete this class by so and so date. We have a checklist in the course that has every assignment that the student needs to complete for the semester. … There are not due dates, but suggested. You know if you work this one, it'll take you 45 minutes. If you work this one, it will take you an hour. We kind of break it down for them.

Still, while abundant procedural guidance is available through the platform, and instructors can closely monitor students' progress, it seems that faculty and EPIC students do not tend to get to know one another. As one long-time full-time faculty member said:

> There's not a lot of discussion or interaction between the student and the instructor. The classes are all meant to be run at your own pace, so that means we don't really have set meeting times and

> such. Unless the student makes some effort to get to know me, we usually don't have much to talk about. …I like getting to know the students, but it doesn't happen very often.

Given the lack of interaction, some instructors characterized teaching LoD as "less demanding" than teaching learn-by-term or in-person courses, yet one instructor described it as "more challenging" because of the difficulty of understanding a student's learning needs without any face-to-face contact. Several faculty members said that they prefer to teach in-person courses but that those sections do not always now meet minimum enrollment requirements to run.

Interviewees had different views as to whether students find LoD courses easier or more difficult than in-person courses. Students may perceive online courses to be easier, "But then they find out, it's not so easy because they have to do so much more than just coming and sitting in the class and having the information lectured to them." Faculty members consistently emphasized the importance of self-motivation to success in LoD courses, and stressed the necessity of careful student advising and placement.

4.4 Student Outreach, Recruitment, and Enrollment

As described above, the grant funded a full-time Outreach and Placement Specialist (OPS) position at each of the six colleges. These individuals, along with the college EPIC team lead, received training in order to market the program to the community and to recruit, advise, and enroll students. The programs were marketed broadly, supported by centrally developed campaign materials. Yet, student enrollment proceeded slowly. This was partly because of the delay in course development already discussed, and partly because of staff being thoughtful in recommending the LoD mode only to students likely to be successful in it. There may have also been reluctance in some cases to enroll students in LoD courses delivered by other colleges.

The EPIC leads wanted to ensure a consistent message about EPIC and about the benefits to students; training emphasized these points. As one administrator explained,

> In this grant you've got six colleges. They do things six different ways. When we were doing the advisor training, one said, "Well, this is how we do advising at our college," and then another one's like, "Well, this is how we do it at our college." I'm kind of like, "Throw that out the window." If you're a grant across six colleges then you need to be consistent in how you convey your message to your student.

Working with the individual college's marketing departments was also challenging. As one individual explained,

> It was hard to get, at first, each of the colleges to understand, you're not marketing your college, you're marketing the EPIC program. … So, trying to get them to rethink about how they were marketing … because they kept wanting to tag their individual school logo onto everything they were doing.

Multiple individuals complained that the marketing materials took too long to be developed and shared, but others pointed out the conundrum that the courses were still being developed at the same time that they were supposed to be recruiting students.

A new EPIC website was created (epicworkforce.net) and EPIC advertisements were developed for radio, billboards, and social media. One EPIC lead described it as "full-scale marketing across the state of Kentucky." The OPS staff regularly visited Kentucky Career Centers, where state unemployment offices are located, to share information on the program with staff and job-seekers. The flexible course start dates were emphasized: "Let's say our regular classes started August 1 and you got laid off in September, you didn't have to wait until January to get started, you could go ahead and come in." OPS staff also spoke at community events and at high schools with the goal of getting the EPIC information to students' parents.

From the EPIC website, students could send a request for information, which would be forwarded to the outreach person in the student's geographic region. At that point the staff person would advise the potential student, explaining the LoD format and recommending the online learning readiness assessment developed specifically for EPIC with grant funds. The assessment is not a gatekeeper but produces a score indicating whether the student would be a good candidate for online coursework. College staff also consider the student's readiness for college, with some interviewees expressing a reluctance to enroll students needing significant academic remediation in online coursework. Other interviewees expressed that they tended to enroll first-time students in only one LoD course so that "they can figure out if they actually like the format."

Internal communication was also very important to enrollment in EPIC. The EPIC outreach staff made efforts to ensure that their college's other outreach and advising staff were aware of the EPIC programs and courses and that they would encourage enrollment, regardless of which KCTCS college offered them. While the KCTCS colleges have their own geographic

service areas for in-person courses, advisors can enroll students in online courses at other colleges. In addition, the way in which the EPIC programs and courses were distributed among the six consortium colleges ensured that the targeted students would not necessarily restrict their course and program choices to the nearest physical college.

However, interviewees said that there were some challenges to their colleagues' understanding and acceptance of the EPIC offerings. As one project lead said,

> We want the students to take classes with the home college, but we have several students that have taken the Learn on Demand format, and they like the Learn on Demand format, so we put them in whatever classes they need, no matter whichever college owns the courses. We expected the other colleges to do the same thing. Even though it was hard for them to get around that mentality of, "This is my student, and they're going to take our classes." And we still struggled with that early on, the first year or two, and we still had some problems. ... To me, it's student choice. It's whatever the student wants.

Others expressed that tight budgets were driving a reluctance to enroll students in other colleges' courses. As one said, "It just feels like, internally, people tend to forget about Learn on Demand. And, in the budget climate that we're in, I totally understand we want to put people in the college courses that we're going to get tuition revenue from." Some administrators felt that the LoD funding model needed an in-depth revisiting as it was not incentivizing LoD enrollment.

4.5 Student Supports

The EPIC model envisioned wrap-around student supports from several sources—online supports embedded in the Blackboard LoD platform; instructors who would be immediately available over email or telephone; OPS staff who would provide continuous advising; online and in-person tutoring; and dedicated student success coaches. As described above in the brief history of LoD, there are six student success coaches who support LoD students across KCTCS. The TAACCCT grant funded two additional coaches who were assigned to EPIC students only. In addition, KCTCS has adopted the Starfish student retention system, which provides a means for instructors to log concerns about students that are shared with support services staff for follow-up.

Interviewees reported that it took some time to establish an ideal division of labor among the OPS and success coach staff, but that these individuals eventually landed on ways to serve

the students' multiple needs. Faculty support was more uneven, as will be elaborated upon below. The primary roles of the OPS staff were to recruit and enroll students; the next step was to have a "soft hand-off to the success coaches who continue to do that mentoring and check-ins during the semester," according to one of the project leads. Because the coaches were supporting students in two specific program areas, CIT and MIT, rather than all LoD students, they were able to address students' needs in their program plans and career paths.

The coaches had access to enrollment data and kept spreadsheets of EPIC students, sending out welcome and introductory messages at the beginning of every semester and tracking their progress and outreach to them. The coaches were provided with new, grant-funded cell phones to facilitate their accessibility to the EPIC students. Initially, the two success coaches divided up the students geographically and each took half, but over time they decided to divide their roles by their own content expertise, with one focusing on academic support and the other specializing in students' career preparation and placement.

The two coaches collaborated in building up a library of resources within the LoD Blackboard shell. On the site is an "SOS Shell"—Success for Online Students. There, they posted academic and career preparation resources specific to the CIT and MIT fields, as well as general resources such as resume templates and tips for interviews. They continuously add new resources. There is a "Healthy Minds" tab with links to resources for students who might be seeking a local therapist or who might need help with learning challenges.

The academic support coach helps students to identify tutoring options and provides other resources, such as practice tests for certification examinations, in addition to being a "sounding board" and performing general troubleshooting. The coach described how she uses the Starfish system:

> I get an email every time a student either gets a flag or a kudo in a class, so that prompts me to focus on certain students. I have a spreadsheet that I kind of keep track of who's been flagged or kudoed, so that helps me sort of really hone in on who I need to be talking to regularly.

Online tutoring is available through Brainfuse (an outside vendor), which is offered by KCTCS for free to all LoD students. However, Brainfuse provides tutoring primarily in general education subjects. The coach explained that, "Usually when the students come to us, they're having issues with their higher-level computer courses or their more tricky coding courses for medical coding.

And for that, we have to find people in the field who know what they're talking about. Brainfuse can't cover those content areas." This is challenging since many students are not within easy access of a campus.

The career-focused coach provided a range of resources and opportunities, including assistance with resume preparation, mock interviews on the telephone or via Skype, job search assistance, and help building soft skills. She developed videos on soft skills and career paths. She described her job search assistance as follows:

> I've got two spreadsheets of students, one of students who are currently enrolled in an EPIC course, and then a separate spreadsheet for those who have completed an EPIC program. ... And for my students who have not completed yet, I try to make sure that their jobs are more, I call them survival jobs, where they are good jobs for while they are still in school or really good entry-level jobs, things like medical front desk receptionist for my billing students so that they get used to patient flow. ... And then for my completers, things that would be appropriate for somebody who's got the degree already, maybe has a few months of experience if they've already been out for a little while and maybe looking for something new, and occasionally work-from-home positions.

Project and campus leads were very positive about the two coaches. They described them as "high-touch" and contrasted their proactive approach with the other six LoD coaches whom they perceived as being more reactive. As one said,

> Our EPIC success coaches are actually going to be checking in with students on a regular basis. They're going to be monitoring their progress in the courses, so if a student hasn't logged in for two weeks, for example, they will be contacting the student and saying, "We notice that you haven't logged in. What's going on? How can I help?"

In contrast, multiple informants expressed that support from faculty was more uneven, with only some faculty being accessible and responsive to students and using the Starfish system consistently. Both coaches described being frustrated by the lack of collaboration from faculty. One said:

> We have some instructors who are on the ball the third week of classes. If the student hasn't gotten a good start, an instructor will flag and say, "You know, you need to step it up." Then you get your 11th-hour flaggers who in the last two weeks of the semester

> will be like, "This student is going to fail." And it will be the first and only flag they've had that entire time, at which point there is little that we can do.

In addition, the coaches described receiving pushback from some instructors when they tried to intervene on behalf of students, with the attitude of "It's my class; it's my business." Some EPIC campus leads expressed having had similar negative experiences with faculty, but said that they could do little about it because of staff reporting lines. This experience was not uniform to all faculty, however, and other interviewees, including four of the students interviewed (see section 4.7), described instances of instructors as being very helpful.

Many respondents expressed understanding that LoD is new to most students and that they therefore had to make a special effort to help students, especially those who turn out to not be a good fit for the format. The monitoring tools within the platform, along with Starfish, provide the means to help ensure that students complete their courses, if they are used. In addition, the coaches used technological tools such as Skype to try to connect personally with the students. Both coaches and some faculty talked about how they try to "make online personal" as best as they can. As one MIT faculty member said

> When you're in a class every day and you're looking at somebody, you sort of get to know that person. But if you're behind a screen, that can be a little bit intimidating because you don't know who or what you're talking to. … We want the students to know that even though they're not looking at me face to face, that I'm available to them.

4.6 Employer Partners and Work-Based Learning

Another important component of the EPIC model was work-based learning. As with the courses, development of work-based learning opportunities proceeded later than planned. KCTCS had applied for a U.S. Department of Labor American Apprenticeship Initiative grant that would have supported staff to develop apprenticeships; the system office hoped to coordinate this with EPIC work-based learning efforts and so told the EPIC leadership to hold off until the awards were made in 2015. But, unfortunately, KCTCS was not awarded that grant. Interviewees did say that colleges in the past had designated work-based learning administrators, but that the positions had been eliminated and so the role fell to the different program

coordinators. The EPIC leads said that they wished they had written a full-time staff person solely devoted to work-based learning into their TAACCCT grant.

The EPIC team did engage with employers from the start of the initiative. The Workforce and Employer Leadership Council (WELC) was formed to gain employer feedback on the programs and curricula, validate competencies, and advise on skills needed in the work place, including technical and soft skills. The membership was envisioned to include business and industry professionals, who would be identified and invited through the individual participating colleges, university representatives, faculty, a Workforce Investment Board representative, and staff from the consortium colleges and system office.

JFF took a lead role in planning the quarterly meetings. JFF staff also often provided content for the meetings, such as labor market data. Early meetings focused on EPIC's objectives, promoting understanding of CBE, and descriptions of the courses and programs. Later meetings described the career development aspects of EPIC, focusing on the career coach's services to students at the end stages of their programs. Employers were asked to provide their perspectives on the skillsets needed for hiring. A participating representative from a regional hospital, for example, said that,

> I've tried to make them understand the thing that's difficult for health information management is it's becoming so computerized now. We need people who not only understand from a health information management standpoint those concepts, we also need them to be computer tech savvy ... somebody who's able to bridge the gap between both of those is very valuable.

There were mixed views among interviewees in terms of the value of the WELC. The meetings were generally not well-attended, although both in-person and online formats were attempted. Some pointed out the long distances between the colleges and said that WELC members should not be asked to travel so far to a meeting. Others said that programs already have employer advisory committees that meet regularly; these efforts should have been strengthened and not duplicated. There are even some existing regional partnerships, such as the Louisville Tech Alliance, which Jefferson College participates in. One respondent had the idea that the project leads travel to other colleges' employer advisory meetings and learn and share that way, rather than asking employers to travel.

One partner was Teleworks USA, a unit of the East Kentucky Concentrate Employment Program, under the workforce investment board. Teleworks' mission is to connect employers with potential telework employees. Telework provides free services to Workforce Innovation and Opportunity Act–eligible adults such as digital literacy and customer service skills, as well as resumé and interview preparation. EPIC and Teleworks staff collaborated in referring students to each other, as the offerings seemed complementary. EPIC staff also learned from Teleworks' close relationships with employers some of the important things employers look for when hiring, such as prior experience in customer service and certifications.

Several interviewees said that a major realization from their interactions with employers was the importance of industry certifications for IT positions, for both the CIT and MIT fields. As one EPIC lead said, "This is really something that I've learned about during this process—the importance of those industry certifications versus just having a college degree or a college certificate." One of the regional workforce boards shared with EPIC staff that they do not connect job-seekers without certifications to employers. And, faculty could see that students who earned certain certifications, such as the Cisco Certified Network Associate, would readily be employed. Those wishing to enter the medical coding field must have the national certifications. Unfortunately, as was noted by several people, grant funds could not be used to cover the cost of students' industry certification examinations, and that cost can be a barrier.

In terms of work-based learning placements, EPIC staff were developing these opportunities, and were quite creative in doing so, but they had not become widespread. Work-based learning was delivered through a practicum MIT course and through virtual projects and internships. The MIT degrees require the practicum course; it is the last course students take in their program. The software provides a virtual practicum experience; for example:

> You would have lab reports come back for a patient. ... The student has to go and find the lab results, go into the software to query for that patient, find the patient by the record number, enter in the lab results, and actually send it through protocol for where the physician obtains the lab results.

In some cases, students' existing jobs would serve as practicums. When students were already working in the field, such as in dental or doctors' offices, the faculty member or program coordinator would count those work experiences toward the practicum requirement.

EPIC was also piloting virtual internships, connecting with employers who had short-term project work that could be done remotely. Interviewees pointed out that MIT positions such as medical coding are now often done remotely. Student could meet with their supervisors and receive assignments and feedback via Skype or conference call. One student interviewee was participating in such an internship (see section 4.7). The Director for Health Information Management (HIM) Services at a regional hospital described a virtual project that she was developing for MIT students:

> I wanted them to come up with a little PowerPoint presentation for orientations that I do on privacy and security. You know, that would be a good project for students to put together and then eventually come and present it to the hospital, maybe to the IT department, to [the] HIM department. … What I really wanted to do ultimately was use it for my orientation that I do every month on privacy and security.

To support staff efforts to identify work-based learning and permanent job placements, JFF provided regular labor market information reports for the individual participating colleges. Data came from employer postings, national data, and Burning Glass, a software company that provides real-time information on job growth and labor market trends. The data looked specifically at positions in the CIT and MIT fields, and at demand for the EPIC credentials and skills.

4.7 Student Views

In this section, we report on student views of their EPIC programs and courses. Data for these findings come primarily from two sources: an online survey administered to EPIC enrollees and telephone interviews with a small number of students. Faculty and staff respondents also often provided their perspectives on students' experiences in the courses.

Student survey. The survey was administered to students in fall 2017. It was developed by CCRC but emailed directly by KCTCS to 1,132 students who were identified as being or having been enrolled in EPIC LoD courses. The response rate was very low (see Appendix B for more details) and we report on data from only 67 students, so we caution against generalizing these findings to the full EPIC student population. The survey sought to understand EPIC students' demographic characteristics, their course-taking patterns, and their experiences and satisfaction with EPIC.

The main findings are as follows. (Due to the small sample size and lack of generalizability of the findings, the full results are not shown here, but were provided in a memo to KCTCS.) With regard to demographics, the student respondents represented a broad range of ages, and more than half were female. Half worked full-time. About four out of five were seeking a degree, with most interested in a bachelor's degree. Students learned about the EPIC program in a variety of ways, most commonly through a KCTCS advisor. Another significant percentage of respondents learned about the courses through the KCTCS LoD website.

Most students in the sample identified as being enrolled in either an MIT or CIT program, and more than half had taken the required CIT 105 (Introduction to Computers) course. Twenty-four students (36 percent) had enrolled in one or more MIT courses and 40 students (60 percent) had enrolled in one or more CIT courses. Twenty respondents received credits by passing a credit for prior learning (CPL) assessment before starting/reviewing any course content in an LoD course. Twenty-six students indicated that they had enrolled in other online courses.

The majority of respondents (52 percent) stated that they logged into their LoD course websites almost every day or several times a day. Survey respondents reported using services such as online and in-person advising and tutoring. Similar numbers of students used in-person advising and tutoring versus the online versions of these services.

Students indicated high levels of satisfaction with their introductory course, the instruction, the course technology, and the affordability of LoD courses. Students also overwhelmingly found the Blackboard course management software easy to use. Respondents seemed to be satisfied with the competency-based nature of their LoD courses: 83 percent of respondents were either somewhat or strongly satisfied with the self-paced nature and design of Learn on Demand courses, while only 4 percent were either somewhat dissatisfied or strongly dissatisfied. More than 90 percent of respondents somewhat or strongly agreed with the statement that they were "able to progress through the online Learn on Demand courses at their own pace," and the statement that the course design allowed for "flexibility" in their schedules. Interestingly, most respondents said that LoD, compared with non-LoD online and in-person delivery formats, was their preferred method of course delivery.

Most students who responded to the survey were satisfied with their experiences in EPIC LoD courses. More than 80 percent of the students who responded indicated that they were either somewhat or strongly satisfied with their overall experience, with the majority of those

respondents (64 percent) replying that they were strongly satisfied. Only about 5 percent of respondents indicated they were either strongly or somewhat dissatisfied with their overall experience with LoD, while the remaining 4 percent were neither satisfied nor dissatisfied. Additionally, 82 percent of the respondents either strongly or somewhat agreed that their LoD courses met or exceeded their expectations; only 9 percent either strongly or somewhat disagreed with that statement, and the remaining 8 percent neither agreed nor disagreed. Finally, 91 percent of respondents agreed that they would recommend LoD courses to others seeking training in computing and medical information technology, while 4 percent disagreed.

Overall, these results present a promising picture of the LoD delivery method. It attracts working students of all ages who are seeking a degree. Students supplement their courses with online and in-person supports and are satisfied with the course content and overall delivery of the program. However, again, we caution readers that the sample size is small, so one cannot generalize these findings to all EPIC LoD participants.

Student interviews. Five students were interviewed by telephone. The students ranged in age from late twenties to late forties; there were three men and two women; three (two of them men) were in the CIT program, and two were in MIT. All were enrolled because of their need for employment or higher-paying employment. Two had never been to college and had worked in low-paying retail positions since graduating from high school; they expressed wanting "something different" and needing to earn more. Two others had some college experience (but no degrees) and long-time positions in the labor market that they had recently lost. The fifth interviewee had a degree but a low-paying position and saw more opportunities for a higher salary in the CIT field. Thus, for the most part, these seemed the types of students that EPIC aims to reach.

The interviewees came to EPIC in different ways. One, in seeking better opportunities, found the courses on the website and simply started signing up. Another student explained that

> I actually, when I lost my job and went and signed up for unemployment benefits, in that same office was the government agency that they help they sign up for your unemployment, they said, "If you are interested in going to back to school to learn a new profession, then we can give you some assistance with it." So, that's actually where I learned about it.

Similarly, another student described her experience after being laid off:

> I worked here in the area at one of the local hospitals and I was laid off. They had a mass layoff. ... I worked as a medical transcriptionist. I went through one of the local community action agencies. … They were helping assisting all the laid off workers, and I went to see them as instructed by my employer when they gave us our packet, when they laid us off. I went and spoke to one of the counselors there at the community action agency and she just instructed me on about filing for unemployment and different things and she also told me that there was several programs that they worked within our area, the KCTCS colleges. She asked me was that something that I was interested in and I was absolutely for it. Explained to her that I had worked as a medical transcriptionist for 25 years at least and that with the new technology that was coming out, that I just felt like with voice recognition technology and things that were already available in that field of work, that my job was just not very stable and that I felt like I needed to get into something else. She set me up with several counselors through the college and I went in and talked to them, kind of gave them my goals that I wanted to do and what I was actually looking for when I went back to school and we kind of just talked and decided that I would go into the medical coding direction.

Only one of the students we interviewed took all of his courses in the LoD mode. Two combined LoD and learn-by-term online courses and two took courses in all the modalities, including face-to-face. One student lives near campus and went there for face-to-face meetings with an advisor, but chose to take all his courses online. Another student turned to an in-person math course after failing it online; he said that "I don't think math is something that translates well to online courses." One student explained his course selection process by saying, "Stuff that I actually feel like I need, you know, help with a tutor, like a real teacher in person, I usually take those in person. But if I feel like I can learn it myself, I take it online."

Four of the five students were very positive about the support they received from their LoD instructors and from EPIC staff generally; the fifth student was less enthusiastic. One said that "They always answer emails within a day. Most of them give you a phone number, and you can call them during school hours and they'll answer." As an example, the student said that "I had one course that the online ebook wouldn't open, so I emailed the teacher on that. I emailed her kind of late, I think it was like 10:30, and she replied at like 7:00 AM the next morning." Other students mentioned that the student success coaches and advisors had reached out to them.

Some students did use the online LoD and Blackboard support features to solve technical problems.

One student mentioned the support he received through interaction with other students in his courses. The variable start dates of LoD courses would seem to preclude student group work, but this student said that

> There's usually a couple of assignments where we post on discussion boards and stuff. And they usually recommend you install Blackboard Instant Messenger and you can have groups of students and stuff to talk to. … My computer classes, mostly, they have discussion boards broken up into like 4 or 5 different modules for the course and stuff. People can discuss problems and everything.

In terms of career preparation and work-based learning, the students had mixed experiences. One student complained that being an online student is a disadvantage, because if a faculty member does not know you personally he or she may be less likely to inform you about or recommend you for internships. This point was validated by some instructors, who said they hesitated to provide internship or employment references for students they did not know – meaning, in-person. However, another student had done a virtual group internship and expressed great enthusiasm about it. He said,

> Right now we're helping this entrepreneur start her new company. It's like an alternative health company. We're building their website and managing her contacts, and researching information for her and stuff. … This is the first kind of professional setting I've done. So, I'm learning how to manage team meetings and the structure of a business and stuff.

The students were in different stages of their programs; one was quite new while two others were well on their way to earning associate degrees. One had earned a certificate and was about to take an industry certification examination. At least one had aspirations to transfer and earn a bachelor's degree.

In terms of their satisfaction with EPIC and LoD courses, only one student said that she would never take any LoD again. From talking to other students, she gained the impression that the amount of work in LoD is greater than in the same courses in other formats: "There are extra assignments in Learn on Demand that there may not be in a regular course." We could not

independently confirm this, but it is the case that while the underlying course competencies are common across different delivery formats, in all but the LoD courses instructors determine their own requirements and so may teach the competencies differently.

In contrast, the other four students had virtually no negative feedback. One said:

> It's only been helpful for me. To be able to take most of my classes online, it's been so helpful for my schedule and everything. Like if I had to take all my classes on campus, I doubt I would have been able to keep a job for the first couple of years, and take up both internships. And I actually like learning, self-paced learning, because I can take longer on stuff that I really need time to understand more.

Another stated:

> Yes, yes. I'm very satisfied. It's made it very easy for me to be back in college under the circumstances that I've been put in with being unemployed. It's just made the experience so much better. It's really exceeded my expectations actually. … I love the way it's set up and the accessibility and with me being laid off and not having to travel from where we're at in a rural area. … I love how college is so much different now compared to then with all these online classes and Blackboard. This has just made such a difference in my college experience and I wish that this stuff would've been available when I first was going to college because I think I would've done so much better.

4.8 Sustainability

Planning for the continuation of EPIC was begun in April of 2017, almost a full 18 months before the end of the grant period, with a consortium-wide training on sustainability. As data collection for this report was ending in the early spring of 2018, the consortium colleges were holding individual meetings to plan for sustainability. And, staff in grant-funded roles were looking for new positions.

Of the six colleges in the consortium, one had decided to not continue offering the EPIC courses. The primary cause given was the difficulty in finding qualified and available faculty as the CIT courses were quite specialized. However, one interviewee at a different college said his perception was that "they never bought into the Learn on Demand model and they only did it because of the grant and they do not support how it's set up." Across the other five colleges, interviewees expressed continuing support for EPIC, with plans to do only some reshuffling of

the offerings amongst them—some wanted to take on additional courses; some wished to release courses, citing low enrollment, but add other ones. A project lead said that

> We'll look at … what makes sense and what makes the best fit as far as what they're already doing and hopefully that's how they're going to be thinking about it too when they request courses instead of just saying, 'All of them. I want them all.' They have to have some rationale as to why they would want a particular course and how it fits in with what they're doing.

While it appears that the programs and courses will continue to be available, the EPIC-funded positions likely will not. Some of the staff, such as OPS staff, were already leaving for new, more permanent positions elsewhere. There was disagreement among the respondents about the effects that this would have. Some interviewees expressed that the tasks of the EPIC staff would be easily and efficiently parceled out to existing college outreach and advising personnel, given that the programs and courses are now fully developed and available. Others strongly disagreed, citing budget cuts over the last several years that have resulted in overworked staff. Several interviewees particularly bemoaned the end of the dedicated student support that was funded by the grant; for example:

> The students like the extra support. That's one of the things that I hate, is once this is gone, of course the Blackboard shell and some of the different tools that we've created are going to be around, that's part of the sustainability, but I hate that the extra support the students are getting may not be there.

The EPIC success coaches were already identifying other advisors for their students under the assumption that their positions would not be continuing.

Several interviewees mentioned that toward the beginning of the grant period, high-level KCTCS administrators began a review of distance learning, with the aim of developing a new strategic plan. However, because of changes in leadership, this initiative was halted. Still, the general sense among interviewees was that the system continues to support LoD and sees value in expanding it. Some respondents also see EPIC and LoD as in line with broader interest nationally in CBE, accelerated learning, and credit for prior learning as alternative ways of making curriculum and credits available that would continue.

5. Quantitative Analysis

The quantitative analysis uses transcript data from KCTCS administrative records. Below, we describe the EPIC options that are now available at KCTCS and patterns of courses and enrollments. Next, we model selection into EPIC classes to see which students are choosing them and how intensively they are enrolling in online coursework. We look at how grades and course completion differ across modes of instruction. We also compare completion of certificates across the different modes.

The dataset includes all of the students who took a course that was offered as an EPIC LoD course from spring 2015 through spring 2017 (including summer terms). Thus, the dataset includes students who took EPIC LoD courses as well as those who did not but took those courses in other formats, even if the EPIC LoD version was not offered in the semester in which they took an alternate version. For example, a student may have taken MIT103 in non-EPIC mode in fall 2016; that student is included in the dataset if MIT103 was offered in EPIC mode in spring 2017. As students from any of the KCTCS colleges may enroll in EPIC LoD courses, no distinction is made regarding the colleges in the analyses.

We create two comparison groups against which to compare EPIC enrollees. The first includes all of the students who took an LoD course that was not part of the EPIC initiative, so that we can compare EPIC and non-EPIC LoD courses. The second group is composed of the other students at these colleges who took a course that was offered in EPIC format. However, as we show below, EPIC courses are clustered in specific subjects. Therefore, we restrict this second sample to only enrollees in the same subjects as EPIC students. Importantly, we are estimating EPIC impacts at the student-course level: as students take many courses across different modes, we are able to adjust for within-student effects on course outcomes.

Only KCTCS students who took a course that was offered in EPIC LoD format are included in the dataset. This inclusion criterion has two implications. First, as fewer than 50 EPIC LoD courses were offered during this period (see below), we estimate that the dataset includes approximately one third of all KCTCS students. Second, as EPIC courses were weighted toward particular subjects (or student groups), the student sample is also weighted toward students who majored in those subjects (or students in those groups). These implications need to be accounted for when interpreting the descriptive frequencies.

Nevertheless, this exclusion criterion does not affect our identification of the impacts of taking EPIC courses. As we discuss below, it is valid to compare students who did take EPIC courses with students who are observationally similar but did not take EPIC courses. With different comparison groups we are able to investigate different selection effects.

5.1 Descriptive Statistics

Sections by mode. Students may be able to choose whether to enroll in EPIC course modes or other course modes. For each course in a given year, there may be sections offered in multiple modes. So, CIT 105 may be offered as a hybrid course, an LoD course, or an EPIC course.

Table 1 presents a summary of course provision across the EPIC format and the other modes: LoD (non-EPIC), hybrid, face-to-face, and learn-by-term. Over the period 2015–2017, 48 unique EPIC courses were offered; 544 sections of these courses were delivered with 1,619 enrollments in these sections. EPIC served 1,182 unique students. In comparison, there were 127 LoD courses with 11,000 enrollments (i.e., courses not on the EPIC list). The other three modes are even more common, with 410,000 enrollments in face-to-face mode and 287,000 enrollments in learn-by-term mode.

Table 1.
Enrollments by Mode

	EPIC	LoD non-EPIC	Hybrid	Face to Face	Learn by Term
Unique Courses	48	127	664	1,843	991
Total Sections	544	2,724	4,802	45,160	19,250
Unique students	1,182	6,295	21,664	73,903	69,888
Total Enrollments	1,619	11,067	38,526	409,540	286,798

Note. All students were enrolled from 2015–2017.

EPIC enrollments: Subjects studied. EPIC courses are weighted toward four specific subjects. The subject mix of EPIC enrollments are listed in column 1 of Table 2. Two-thirds of EPIC enrollments were in computer and information sciences; one-quarter were in allied health; and one-in-eight in STEM; the remainder were in business and marketing. This subject mix differs substantially from that for courses delivered by LoD non-EPIC mode: half of these

courses were in STEM but otherwise there was a broad mix of offerings. Similarly, enrollments in other modes were spread across subjects, with one-fifth in arts and humanities.

Table 2.
Enrollments by Subject by Mode

Subject	EPIC	LoD Non-EPIC	Hybrid	Face to Face	Learn by Term
Computer & information sciences	59	< 1	16	3	8
Allied health	23	4	13	15	5
Mathematics & science (STEM)	12	51	13	37	25
Business and marketing	6	14	6	2	9
Art, humanities, and English	0	18	22	20	22
Other	0	12	30	23	31
N enrollments in sections	*1,619*	*11,067*	*38,526*	*409,540*	*286,798*

Note. Subjects based on CIP code classifications.

Most of the EPIC enrollees were clustered in a few specific courses. As shown in Table 3, the most popular EPIC course was “Introduction to Computers” (CIT 105) and the second was “Basic Anatomy & Physiology” (BIO 135). These two courses represented almost half of all EPIC enrollments. Most of the EPIC courses enrolled fewer than 10 students. (Formally, there are 90 EPIC courses: however, there are no recorded enrollments in 42 courses over the period up to spring 2017).

Table 3.
Enrollments by Course in EPIC Mode

Subject	Course ID	EPIC Enrollments (%)
Introduction to Computers	CIT 105	35
Basic Anatomy & Physiology	BIO 135	12
Medical Terminology	AHS 115	9
Document Formatting	OST 110	5
Productivity Suite	CIT 130	4
Medical Office Terminology	MIT 103	4
Medical Insurance	MIT 104	4
Remaining 41 EPIC courses	--	27
N Enrollments in Sections		*1,619*

Table 4.
Characteristics of Enrollees by Mode

	EPIC	LoD Non-EPIC	Hybrid	Face to Face	Learn by Term
Female	65	73	60	61	71
Eligible for Pell	81	79	71	81	79
Dual enrollment	18	17	24	18	24
Race:					
White	86	81	81	79	85
Black	7	10	9	10	7
Other/unknown	7	9	10	11	8
Hispanic	2	3	4	5	3
College ready in:					
English	47	51	53	54	54
Reading	46	46	47	47	47
Math	18	20	25	26	22
High School GPA	2.9	2.9	2.9	3.0	3.0
	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)
Age at entry	27.5	25.8	22.6	22.2	23.9
	(10.5)	(9.6)	(8.7)	(8.3)	(9.1)
N Enrollments	*1,619*	*11,067*	*38,526*	*409,540*	*286,798*

Note. Standard deviations in parentheses.

LOD enrollments: Student characteristics. The characteristics of the enrollees for each mode group are given in Table 4. Relative to other students, EPIC enrollees are more likely to be eligible for Pell Grants, are less likely to be dual enrolled (such students were not a target population for EPIC), and have lower levels of college readiness. Notably, they were 2–5 years older than the other students.

LOD students: Course enrollment intensity. Over the period 2015–2017, there were 1,182 students enrolled in EPIC courses. However, most of these students took few EPIC courses: 78 percent took only one EPIC course; and 15 percent took two EPIC courses. In total, only 74 students took more than two EPIC courses.

Academic performance by mode. Table 5 shows enrollees' academic performance across each mode. Broadly, these frequencies show that EPIC students performed well relative to LoD enrollees and learn-by-term enrollees. But EPIC students post GPAs and C-grade pass rates that are below those of students in hybrid and face-to-face modes. Looking at whether a student earned credits or not from the course, EPIC enrollees report the highest rates (at 91 percent). Notably, performance is worst in LoD non-EPIC courses.

Table 5.
Academic Performance by Mode

	EPIC	LoD Non-EPIC	Hybrid	Face to Face	Learn by Term
GPA	2.61	2.22	2.71	2.71	2.51
	[1.7]	[1.7]	[1.4]	[1.4]	[1.5]
At least C grade	65	55	72	72	66
Earned credits for course	91	86	91	89	89
N Enrollments	*1,619*	*11,067*	*38,526*	*409,540*	*286,798*

Note. Standard deviations in brackets.

5.2 Modelling Enrollment and Academic Performance Outcomes

Determinants of EPIC choice. We estimate a logistic equation to identify the factors associated with choice of EPIC. Per enrollee, we estimate:

(1) $\text{Prob.}(EPIC_{ikt} = 1) = f(X_i, A_i, R_{i,t=1}, P_{i,t=1}, C_{it}, \alpha_i \mid YEAR)$

Equation (1) states that the probability of student *i* enrolling in any EPIC mode section *k* in semester *t* depends on the following vectors of student attributes: personal characteristics X_i; pre-college ability A_i; college readiness $R_{i,t=1}$ and performance in the first semester $P_{i,t=1}$; and same-semester course load C_{it}. Equation (1) also includes a student fixed effect α_i to capture unobserved student attributes. We also control for calendar year.

The counterfactual groups are students who took LoD non-EPIC courses and all "program enrollees." In light of the narrow subject mix of EPIC courses, we restrict the other group to only enrollees in courses in the same four subjects (as per Table 3). We refer to these as program enrollees. Importantly, the choice is modeled as enrollment in an EPIC mode section versus enrollment in another mode section. As noted above, the other modes may not be equivalent choices for students. (At this stage we do not investigate more detailed multinomial log choices across modes).

Table 6 shows the student characteristics associated with choosing to enroll in EPIC sections. The patterns of results are similar across both counterfactual groups. Students' characteristics matter. Women and students of color were much less likely to enroll in EPIC courses. Age was an important factor. Finally, students who are doing less well in college tend to enroll in EPIC courses: their GPAs in all their courses in their first semester are lower and they are taking fewer courses.

Academic performance in LOD sections. We now estimate students' academic performance in EPIC sections, controlling for observable student attributes. As shown in Table 7, EPIC students appear to perform as well as other students. To estimate the effects of EPIC mode on course performance we apply a fixed effects specification:

$$(2) \qquad GPA_{ikt} = f(X_i, A_i, R_{i,t=1}, C_{it}, MODE_{ikt}, \alpha_i \mid YEAR)$$

Measured GPA in section *k* by student in calendar semester *t* is estimated to depend on student characteristics, pre-college ability, college readiness, and course load in semester *t*. Student fixed effects α_i are included along with year, college, and field of study controls. Of key interest are the coefficients on $MODE_{ikt}$, an indicator for the mode of instruction for that section. In the specifications below the EPIC mode is compared against various alternative modes.

Table 6.
Choice of LoD Mode in Semester *t* by Enrollees

	EPIC v. LoD Non-EPIC Enrollees	EPIC v. All Program Enrollees [a]
Female	-0.429***	-0.272***
	[0.062]	[0.057]
Race: Black	-0.502***	-0.515***
	[0.113]	[0.107]
Race: Other	-0.308**	-0.321**
	[0.135]	[0.128]
Hispanic	-0.290	-0.425*
	[0.238]	[0.227]
Pell	0.194**	0.421***
	[0.079]	[0.074]
Dual enrollee	0.225***	-0.033
	[0.080]	[0.075]
Age at entry	0.013***	0.029***
	[0.003]	[0.003]
HS GPA	0.077	-0.069
	[0.061]	[0.058]
Coll. ready: Engl.	-0.182**	-0.204***
	[0.071]	[0.065]
Coll. ready: Read	0.072	0.040
	[0.070]	[0.064]
Coll. ready: Math	-0.098	-0.051
	[0.085]	[0.079]
Semester 1 GPA	-0.019	-0.188***
	[0.034]	[0.033]
Course load	-0.077***	-0.331***
	[0.019]	[0.016]
Student-sections	*11,550*	*350,997*

Note. Logit model applied with student fixed effects. Dependent variable is enrolled in EPIC LoD section. Year identifiers from 2015–2016.

[a] Program students in computer and information sciences; allied health; STEM; and business/marketing. Standard deviations in brackets.

*** $p < .01$. ** $p < .05$. * $p < .1$.

Table 7.
Same-Semester GPA: Effect of EPIC Enrollment

	EPIC v. LoD Non-EPIC Students	EPIC v. All Program Students [a]	EPIC CIT 105 v. All CIT 105 Students	EPIC BIO 135 v. All BIO 135 Students
Female	0.025	0.107***	0.167***	0.102
	[0.048]	[0.010]	[0.020]	[0.083]
Race: Black	-0.366***	-0.404***	-0.246***	-0.252**
	[0.079]	[0.017]	[0.034]	[0.118]
Race: Other	0.119	-0.004	0.072*	0.211
	[0.093]	[0.020]	[0.039]	[0.148]
Hispanic	0.096	0.033	0.117*	-0.120
	[0.150]	[0.031]	[0.060]	[0.231]
Pell-eligible	-0.422***	-0.249***	-0.220***	-0.241***
	[0.057]	[0.011]	[0.022]	[0.086]
Dual Enrollee	-0.120**	0.167***	0.081***	-0.078
	[0.059]	[0.012]	[0.024]	[0.077]
Age at entry	0.011***	0.021***	0.022***	0.018***
	[0.003]	[0.001]	[0.001]	[0.004]
HS GPA	0.475***	0.551***	0.633***	0.340***
	[0.046]	[0.010]	[0.020]	[0.067]
College ready: Engl.	0.131**	0.151***	0.169***	0.121*
	[0.053]	[0.011]	[0.023]	[0.072]
College ready: Read	0.001	0.085***	0.103***	0.116
	[0.052]	[0.011]	[0.022]	[0.071]
College ready: Math	0.085	0.125***	0.097***	0.140
	[0.060]	[0.012]	[0.025]	[0.090]
Load per semester	-0.008	-0.015***	-0.009	-0.000
	[0.012]	[0.002]	[0.006]	[0.018]
LoD	-0.372***	-0.200***		
	[0.049]	[0.040]		
Learn-by-term		-0.145***	0.040	0.165
		[0.036]	[0.070]	[0.167]
Hybrid		0.136***	0.076	0.156
		[0.037]	[0.072]	[0.189]
Face-to-face		0.009	0.383***	-0.053
		[0.036]	[0.071]	[0.169]
Enrollments	*8,831*	*256,458*	*26,549*	*2,046*
Students	*5,532*	*73,225*	*25,207*	*1,975*

Note. Regression model applied with student fixed effects. Dependent variable is student-level GPA in course. Year identifiers from 2015-16.

[a] Program students in computer and information sciences; allied health; STEM; and business/marketing. Standard deviations in brackets.

*** $p < .01$. ** $p < .05$. * $p < .1$.

This student-level fixed effects estimation follows that of Xu and Jaggars (2011, 2014). This approach controls for differences in student characteristics that are unobservable to the researcher. The regression coefficient for each mode represents the within-student difference in performance across modes. However, the fixed effects estimation does not control for time-varying or course-varying factors that motivate selection of modes (though we do control for year in equation 2). Alternative approaches are to use instrumental variables and propensity score matching.

Academic performance results. The determinants of course grades based on the fixed effects estimates are reported in Table 7. The results for student characteristics accord with prior literature. Female students post higher GPAs; minority and Pell-eligible students post lower GPAs. Dual enrollees and younger students have lower GPAs. Unsurprisingly, students with higher high school GPAs and those who were initially college-ready have higher college GPAs.

The shaded row in Table 7 shows the impact on course GPA relative to if that course was an EPIC course. (Negative signs indicate that GPAs from this mode were lower than EPIC GPAs). The impact varies significantly, depending on the comparison group. No mode of instruction emerges as clearly superior to others. Comparing EPIC courses to LoD non-EPIC courses, grades in EPIC courses are significantly higher; this result holds in a direct single comparison and across all program students (columns 1 and 2). Also, grades in EPIC courses are higher than grades for courses in the learn-by-term mode (again across enrollments in the same four subjects) but significantly below grades for students in the hybrid mode. Compared to the broad class of students in KCTCS, EPIC students do not underperform.

The small group of EPIC enrollees are clustered in specific subjects and 100-level courses. Specifically, as shown in Table 3, half of all EPIC enrollees are in two courses: CIT 105 and BIO 135. Therefore, we re-estimate equation (2) restricted only to enrollees in those two courses. The results are shown in columns 3 and 4 of Table 7. Compared to students in other modes, students in these two courses post lower grades if they are in the EPIC mode, although the effect is only statistically significant for the face-to-face mode. These results suggest that there may be unobservable characteristics of courses that are important. For instance, CIT 105 may be a relatively basic course compared to the average KCTCS course (it is 100 level and may be easy for persons with prior experience of computers); but, the EPIC format (LoD mode) of CIT 105 may be pedagogically inferior than a face-to-face mode. This inconsistency of the gap

across comparison student groups suggests that selection effects into EPIC sections is an important explanation for students' performance in EPIC.

5.3 Course Completion Outcomes

The EPIC grant provided for significant support for students. Many interviewees described strong efforts in helping students complete their courses, which could result in higher course completion rates. To test this, we re-estimate the analysis shown in Table 7 using course completion as the outcome of interest.

Table 8 shows the association between course completion and EPIC enrollment. The results show a modestly stronger effect of EPIC enrollment on course completion. As shown in column 1, enrollees in non-EPIC LoD courses are much less likely to complete their courses than EPIC students. As well, column 2 shows that enrollees in EPIC courses are much more likely to complete courses in the relevant program fields; EPIC enrollees even complete at higher rates than enrollees in face-to-face courses. However, when we restrict the samples to specific courses—CIT 105 and BIO 135—we find no difference in course completion rates across any of the instruction modes. Overall, completion in EPIC courses appears modestly higher than for enrollments in other modes.

5.4 Credential Completion Rates

Most students entering college aim to earn a credential. For EPIC programs, the credential options are AAS degrees and certificates in Computer and Information Technologies and Medical Information Technology, and a Health Care Specialist Certificate. However, as noted above, very few students took sufficient EPIC courses to complete an award by only this mode of instruction. As such, it is not possible to evaluate completion rates for "EPIC awards." Nevertheless, we can look at completion rates for "students who took some EPIC courses." Taking EPIC courses may have helped these students progress to completion of a certificate, even when many of the students' courses were delivered by alternative modes of instruction. (We do not look at degree completion rates because the proportion of EPIC courses taken is too low).

Table 8.
Course Completion: Effect of EPIC Enrollment

	EPIC v. LoD Non-EPIC Students	EPIC v. All Program Students [a]	EPIC CIT 105 v. All CIT 105 Students	EPIC BIO 135 v. All BIO 135 Students
Female	-0.085	0.080***	0.026	-0.020
	[0.087]	[0.018]	[0.050]	[0.180]
Race: Black	-0.581***	-0.150***	-0.004	-0.638***
	[0.124]	[0.029]	[0.080]	[0.192]
Race: Other	-0.055	-0.060*	0.385***	0.074
	[0.165]	[0.035]	[0.110]	[0.335]
Hispanic	-0.076	0.068	-0.292*	-0.173
	[0.261]	[0.054]	[0.160]	[0.491]
Pell-eligible	-0.144	-0.106***	-0.164***	-0.264
	[0.104]	[0.020]	[0.059]	[0.202]
Dual Enrollee	-0.115	0.198***	-0.096	-0.139
	[0.105]	[0.021]	[0.059]	[0.161]
Age at entry	-0.005	0.003**	-0.002	0.006
	[0.004]	[0.001]	[0.003]	[0.008]
HS GPA	-0.024	0.355***	0.405***	0.109
	[0.081]	[0.017]	[0.048]	[0.138]
College ready: Engl.	-0.003	0.115***	0.168***	-0.147
	[0.094]	[0.020]	[0.057]	[0.149]
College ready: Read	0.105	0.092***	0.224***	0.284*
	[0.093]	[0.019]	[0.056]	[0.154]
College ready: Math	0.026	0.202***	0.089	0.254
	[0.109]	[0.022]	[0.067]	[0.208]
Load per semester	-0.048**	0.002	-0.102***	0.009
	[0.023]	[0.004]	[0.016]	[0.038]
LoD	-0.581***	-0.460***		
	[0.120]	[0.113]		
Learn-by-term		-0.371***	-0.068	0.346
		[0.105]	[0.175]	[0.285]
Hybrid		-0.303***	-0.020	0.553
		[0.109]	[0.181]	[0.346]
Face-to-face		-0.463***	0.097	0.466
		[0.105]	[0.178]	[0.285]
Enrollments	*11,550*	*350,997*	*29,005*	*4,502*
Students	*6,449*	*78,654*	*26,934*	*2,303*

Note. Logistic regression model applied with student fixed effects. Dependent variable is whether or not student completed the course. Year identifiers from 2015–16.

[a] Program students in computer and information sciences; allied health; STEM; and business/marketing. Standard deviations in brackets.

*** $p < .01$. ** $p < .05$. * $p < .1$.

Specifically, we examine the rates of completion of any certificate by students who took at least two EPIC courses. These students are compared to students who took fewer than two EPIC courses. We apply the sample restrictions as defined above: all students who took a non-EPIC LoD course; students who took courses in the same program fields; and students who took courses in either CIT 105 and BIO 135.

The results for certificate completion are shown in Table 9. EPIC students are much more likely to complete a certificate compared to non-EPIC LoD students, all program students, and all students who have taken CIT 105. No effect is found for students who have taken BIO 135. As sensitivity tests, we estimate completion rates for certificates and diplomas combined and for total credits accumulated; the results are similar to those reported in Table 9. Finally, we check to see if these associations are driven by credit accumulation per se. That is, EPIC students have at least six credits (two EPIC courses); other students in the samples may have fewer than six credits and so are less likely to complete a certificate. When we restrict the samples to only students who have at least six credits, the results are equivalent to those reported in Table 9. However, it remains possible that the effects are driven by the accumulation of two courses that are direct requirements for a certificate.

These results are suggestive of a positive effect of EPIC on completion of a certificate. However, we cannot be sure that the students in our samples all have the intention of earning a certificate; our data do not show which particular programs students are in. Many students may not have earned a certificate because they are aiming to earn an associate degree. We do exclude students who transferred, as transfer would indicate that they are seeking a bachelor's degree.

Thus, to further try to understand whether EPIC students progress towards a credential more quickly than other students, we examine total credits accumulated. We find a strong positive effect for EPIC students who have taken CIT 105 versus non-EPIC students who took CIT 105 in other formats (Table 10). Students who have taken at least two EPIC courses, including CIT 105, have accumulated more total credits than other students. However, we do not have similar findings for the BIO 135 students.

Table 9.
Certificate Completion Rates: Effect of EPIC Enrollment

	EPIC v. LoD Non-EPIC Students	EPIC v. All Program Students [a]	EPIC CIT 105 v. All CIT 105 Students	EPIC BIO 135 v. All BIO 135 Students
Female	0.477***	0.612***	0.741***	0.822***
	[0.142]	[0.035]	[0.048]	[0.184]
Race: Black	-0.548**	-0.320***	-0.222***	0.081
	[0.225]	[0.058]	[0.079]	[0.219]
Race: Other	-0.519*	-0.253***	-0.138	-0.424
	[0.268]	[0.069]	[0.093]	[0.302]
Hispanic	0.280	0.094	0.020	0.449
	[0.383]	[0.104]	[0.141]	[0.465]
Age at entry	0.008	0.026***	0.019***	0.020***
	[0.006]	[0.001]	[0.002]	[0.005]
HS GPA	0.191	0.187***	0.171***	-0.045
	[0.129]	[0.033]	[0.044]	[0.128]
College ready: Engl.	-0.032	-0.035	0.026	0.061
	[0.141]	[0.036]	[0.047]	[0.130]
College ready: Read	0.106	-0.045	-0.106**	-0.214
	[0.138]	[0.035]	[0.047]	[0.130]
College ready: Math	-0.250	-0.073*	-0.090	-0.464**
	[0.164]	[0.044]	[0.059]	[0.183]
EPIC student	1.146***	0.482**	0.587**	-0.642
(took 2+ EPIC courses)	[0.349]	[0.236]	[0.274]	[0.402]
Students	*3,173*	*58,911*	*32,354*	*1,923*

Note. Logistic regression model. Dependent variable is whether or not student completed certificate (any field). Students from years 2014–2017.

[a] Program students in computer and information sciences; allied health; STEM; and business/marketing. Standard deviations in brackets.

*** $p < .01$. ** $p < .05$. * $p < .1$.

Table 10.
Credit Accumulation: Effect of EPIC Enrollment

	EPIC CIT 105 v. All CIT 105 Students	EPIC BIO 135 v. All BIO 135 Students
Female	2.681***	2.583*
	[0.248]	[1.510]
Race: Black	-2.076***	-0.042
	[0.430]	[2.272]
Race: Other	-0.978*	-7.568***
	[0.521]	[2.651]
Hispanic	0.896	9.202**
	[0.784]	[4.265]
Age at entry	-0.098***	-0.032
	[0.013]	[0.055]
HS GPA	5.675***	1.524
	[0.251]	[1.243]
College ready: Engl.	0.666**	-2.774**
	[0.284]	[1.282]
College ready: Read	-0.228	-3.202**
	[0.280]	[1.272]
College ready: Math	-0.519	-6.448***
	[0.337]	[1.626]
EPIC student	8.247***	-0.662
(took 2+ EPIC courses)	[2.128]	[3.465]
Students	*34,192*	*2,067*

Note. OLS regression model. Dependent variable is total college credits accumulated in KCTCS system (transfer students excluded). Students from years 2014–2017.

[a] Program students in computer and information sciences; allied health; STEM; and business/marketing. Standard deviations in brackets.

*** $p < .01$. ** $p < .05$. * $p < .1$.

5.5 Summary

Community college students who select into EPIC courses are only modestly different from the general population of community college students; they are older than other enrollees, but their academic aptitude on entry does not appear to be significantly lower (in cross-section). And, when compared to students enrolled in other modes, in some cases EPIC students post higher grades. Most of the EPIC enrollees are in only a few courses. When we compare across grades in these courses, we have mixed findings. EPIC students did not perform significantly worse. Students in non-EPIC LoD earned the lowest grades; students in learn-by-term also

earned lower grades than EPIC LoD students. For the CIT 105 course, students in the face-to-face format performed significantly better. In terms of course completion, EPIC courses were completed at higher rates than courses in other modes. Regarding certificate completion, students who had taken at least two EPIC courses were much more likely to complete a certificate compared with non-EPIC LoD students, all program students, and all students who have taken CIT 105; however, comparison students may have lower certificate completion rates because they are pursuing associate degrees. Finally, students who have taken at least two EPIC courses, including CIT 105, have accumulated more total credits.

Thus, we cannot draw any strong conclusions from these analyses. The limitations of our dataset, particularly the short time span and the small number of students who have taken two or more EPIC courses, prevent any estimation of the overall effect of the investment in the EPIC initiative on students. At the course level, there is some suggestive evidence that this particular form of online education that includes strong supports may be more effective than the other, less-supportive forms offered.

6. Conclusion

6.1 Summary

The EPIC program was implemented mostly as planned, following the original EPIC Pathways Model. Due to the staff turnover and other issues described above, the initiative got off to a somewhat slow start. By the end of the grant period, however, the project had produced more courses and credentials than originally proposed, overall enrollment goals were met, and support by the consortium partners was such that five of the six colleges planned to continue with the program.

This report has described challenges that EPIC administrators, staff, and faculty faced in implementing the EPIC program, such as the absence of a project roadmap, inconsistent policies and procedures across the colleges, some lack of buy-in to the LoD enrollment and funding model, and weak participation in the WELC and slow development of work-based learning.

At the same time, there were accomplishments. As stated, some degrees and other credentials are now available entirely in LoD format, and all indications are that these will be sustained. Interviewees spoke of faculty and staff capacity-building through the course

development process and extensive training that was offered through the grant. They also appreciated the opportunity for cross-college collaboration and learning. In addition, the marketing and outreach for the EPIC program helped to raise awareness and understanding of the LoD format in general as an option, which meant reaching new students. And, early quantitative analyses are promising in finding that students are completing EPIC courses and accumulating credits at higher rates than other students, a result likely due to the emphasis on strong supports for EPIC-enrolled students.

These findings lead to some important considerations for KCTCS and for the field of online competency-based education in general. Other studies have shown that students, particularly underprepared students who tend to enroll in community colleges, do less well in online courses than in face-to-face courses. In addition, while there is not yet much evidence on outcomes for competency-based education, such students may also tend to do less well working independently. The EPIC project leads aimed to address EPIC students' needs by providing additional support staff, including a variety of learning and support tools in the LoD platform, and making use of student success and retention efforts already underway in the system. Our data suggest that this had some effect.

However, it is unclear whether the grant-funded human resources will be sustained and institutionalized. Our dataset shows that between 2015 and 2017, there were almost 6,300 unique students enrolled in non-EPIC LoD who would have potentially been supported by six success coaches; this is almost twice the caseload of the two EPIC coaches who potentially provided support to about 1,200 students during the same period. We also learned about significant variation among instructors in terms of their use of the tools at their disposal to support students.

Student success in LoD also relies to some extent on selection, the idea that only the "right students" should be enrolled in this format. In the interviews, much was made of the role of outreach and placement specialists in terms of targeting and enrolling only students with certain characteristics—most importantly self-motivation—that would foster their success. The grant-funded EPIC OPS staff received specialized training on EPIC, and as they depart, it is unclear whether such professional development will be extended to advisors throughout the KCTCS colleges, some of whom likely do not understand the format or are skeptical of it. Regardless, there will always be students who avoid or discount advising and instead select courses by themselves.

LoD was first conceptualized over a decade ago, but our interview data show that it is still not universally championed or even understood. Some respondents seemed simply resigned to the fact of ever-increasing student demand for online courses. Surely EPIC provided some momentum, as the initiative touched multiple colleges and many personnel, and extensive professional development was provided. Moving forward, KCTCS and its colleges need to implement the human resources infrastructure and consistent and clear policies and procedures necessary to this course modality thriving. In particular, policies should mandate faculty adherence to student support and retention systems and encourage cross-college collaboration on behalf of students. Finally, the funding scheme should not disincentivize LoD enrollment.

6.1 Questions for Future Research

This study adds to the literature on online competency-based programs offered by community colleges, but additional research is clearly needed. The following are questions that should be addressed in future research.

In general, students at KCTCS appear to take courses in a mix of modalities. In our sample, no students took all their courses in LoD. It is unknown whether there is a "best" mix of courses; this likely depends on the student. There does appear to be a certain segment of the population that can be successful in LoD-type programs. One question is whether the segment is large enough to cover initial and sustaining costs. Are so many modalities needed and sustainable?

There were indications from some interviewees that enrollment in LoD was having an impact on enrollment in other modes. For example, enrollment in the LoD format of one course had increased; only a handful of students signed up for the in-person version of the course, so that was cancelled, and the students who preferred in-person were asked to choose one of the online formats. To what extent does the LoD format attract new students versus shift students from one format to another?

It is interesting that interviewees did not validate (or even mention) the idea of acceleration. LoD potentially allows students to complete two courses sequentially within one semester. Yet students spoke of the courses being convenient rather than as a way to earn credits or credentials more quickly. Researchers should examine whether any students are in fact accelerating their progress and how well they do. It would also be useful to see whether students

who begin courses on start dates later in the semester do as well as students who begin on the first day of the term.

These analyses did not address the cost-effectiveness of EPIC courses. If EPIC courses can be delivered at lower cost, and if the savings can be passed on to students in terms of lower fees, then course loads and completion rates may increase. Given the financial constraints many students now face, these economic considerations are important and merit further investigation.

Finally, while these analyses were unable to track students into the labor market, it is important to understand the value of the skills acquired and credentials earned, e.g., whether those who complete gain better-paying or more stable employment. Qualitative research is also needed to understand credential completers' job search processes.

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Appendix A: EPIC Courses

Table A1
Course List

Course	College	Existed in LoD prior to EPIC	Developed New to LoD	Developed New to KCTCS
ACT 101 Fundamentals of Accounting I	Big Sandy		X	
AHS 115 Medical Terminology	Hazard		X	
BIO 135 Basic Anatomy and Physiology with Laboratory	Hazard		X	
CIT 105 Introduction to Computers	Hazard	X		
CIT 111 Computer Hardware and Software	Hazard	X		
CIT 120 Computational Thinking	Hazard	X		
CIT 125 Intro to Digital Maps	Jefferson		X	
CIT 130 Productivity Suite	Hazard	X		
CIT 140 Javascript I	Hazard	X		
CIT 141 PHP I	Big Sandy		X	
CIT 142 C++ I	Hazard		X	
CIT 144 Python I	West Kentucky		X	
CIT 148 Visual Basic I	Hazard	X		
CIT 149 Java I	Somerset		X	
CIT 150 Internet Technologies	Hazard	X		
CIT 151 Social Media I	Southeast KY		X	
CIT 155 Web Page Development	Big Sandy		X	
CIT 157 Web site Design and Production	Big Sandy		X	
CIT 160 Intro to Networking Concepts	Hazard	X		
CIT 161 Intro to Networks	Jefferson		X	
CIT 167 Routing & Switching Essentials	Jefferson		X	
CIT 170 Database Design Fundamentals	Hazard	X		
CIT 171 SQL I	Hazard		X	
CIT 180 Security Fundamentals	Hazard	X		
CIT 182 Perimeter Defense	Hazard	X		
CIT 184 Attacks and Exploits	Hazard	X		
CIT 209 Scaling Networks	Jefferson		X	
CIT 212 Connecting Networks	Jefferson		X	
CIT 213 Microsoft Client Configuration	Hazard	X		
CIT 214 Microsoft Server Configuration LoD	Hazard	X		
CIT 215 Microsoft Server Administration	Hazard		X	
CIT 216 Microsoft Server Advanced Services	Hazard		X	
CIT 217 Unix/Linux Administration	Hazard	X		

Course	College	Existed in LoD prior to EPIC	Developed New to LoD	Developed New to KCTCS
CIT 218 Unix/Linux Net Infrastructure	Hazard		X	
CIT 225 GIS Data Analysis	Jefferson		X	
CIT 229 Selected Topics in GIS	Jefferson		X	
CIT 232 Help Desk Operations	West Kentucky		X	
CIT 234 Advanced Productivity Software	Southeast KY		X	
CIT 236 Advanced Data Organization Software	Southeast KY		X	
CIT 248 Visual Basic II	Hazard			
CIT 249 Java II	Southeast		X	
CIT 251 Social Media II Master Shell	Southeast KY		X	
CIT 253 Data Driven Web Pages	Hazard		X	
CIT 278 Visual Basic III	Hazard		X	
CIT 284 Computer Forensics	Hazard	X		
CIT 288 Network Security	Hazard	X		
CIT 290 Internship	Hazard		X	
CIT 291 CIT Capstone	Hazard		X	
CIT 293 CIT Capstone	Hazard		X	
CIT 299 Special Topics Geospatial	Jefferson		X	
HCS 100 Public Health Care in the US	Hazard		X	X
HCS 110 Culture of Healthcare	Hazard		X	X
HCS 125 History in Healthcare	Hazard		X	X
HCS 145 Health IT Terminology	Hazard		X	X
HCS 150 Health IT Analysis & Quality	Hazard		X	X
HCS 165 Health Management Systems	Hazard		X	X
HCS 180 Usability and Human Factors	Hazard		X	X
HCS 200 Health IT Computer Systems	Hazard		X	X
HCS 210 Implementing Health IT Systems	Hazard		X	X
HCS 220 Working with HIT Systems	Hazard		X	X
HCS 230 Vendor-Specific Systems	Hazard		X	X
HCS 260 Health IT Instructional Design	Hazard		X	X
HCS 280 Project Management & Teams	Hazard		X	X
HCS 281 Health IT Customer Service	Hazard		X	X
HCS 290 Leadership for Health IT	Hazard		X	X
HCS 295 Health IT Capstone	Hazard		X	X
HST 121 Pharmacology	Jefferson		X	
HST 122 Clinical Pathophysiology	Jefferson		X	
MAT 126 Technical Algebra and Trigonometry	Southeast		X	
MIT 103 Medical Office Terminology	West Kentucky		X	
MIT 104 Medical Insurance	West Kentucky		X	

Course	College	Existed in LoD prior to EPIC	Developed New to LoD	Developed New to KCTCS
MIT 106 Introduction to Medical Transcription	Hazard		X	
MIT 204 Medical Coding	Hazard		X	
MIT 205 Advanced Medical Coding	Hazard		X	
MIT 206 Medical Transcription	Hazard		X	
MIT 208 Inpatient Coding	Southeast KY		X	
MIT 212 Medications	Southeast KY		X	
MIT 217 Medical Office Procedures	Somerset		X	
MIT 219 Coding Exam Preparation	Southeast		X	
MIT 224 Medical Practice Management	Big Sandy		X	
MIT 228 Electronic Medical Records	Hazard		X	
MIT 230 Medical Information Management	West Kentucky		X	
MIT 295 Medical Info Tech Capstone	Hazard		X	
OST 110 Document Formatting & Intro to Word	Southeast KY		X	
OST 160 Records and Database Management	Somerset		X	
OST 210 Advanced Word Processing	Southeast KY		X	
OST 215 Office Procedures	Somerset		X	
OST 225 Intro to Desktop Publishing	Somerset		X	
OST 235 Business Communications Technology	Big Sandy		X	
OST 250 Advanced Desktop Publishing	Somerset		X	

A.1 EPIC Credentials (Credentials Newly Available in All-LoD Mode)

Computer & Information Technologies Program – CIT

AAS Degrees

- Computer & Information Technologies: IT Network Administration Associate in Applied Science Degree
- Computer & Information Technologies: Programming Associate in Applied Science Degree
- Computer & Information Technologies: Applications Associate in Applied Science Degree

CIT Certificates

- Cisco Network Associate
- Cisco Networking Enhanced

- Microsoft Network Administrator
- Microsoft Enterprise Administrator
- Computer Support Technician
- Computer Technician
- Computer Tech Basic
- Productivity Software Specialist
- Mobile Apps Development
- Programming
- Web Programming
- A+
- Net+
- Security+

Medical Information Technology Program – MIT
AAS Degrees

- Medical Coding Associate in Applied Science Degree
- Electronic Medical Records Associate in Applied Science Degree

MIT Certificates

- Medical Coding
- Electronic Health Records
- Hospital Admissions
- Medical Receptionist
- Medical Scribe

Health Care Specialist Certificate Program – HCS

Appendix B: Data and Methods

The EPIC evaluation draws on qualitative and quantitative data from multiple sources: interviews with program administrators, faculty, students, and program partners (primarily by telephone); participation in the project's quarterly Workforce and Employer Leadership Council meetings (in person and online); written materials on the program, including information from websites; an online survey of participating students; and student administrative records supplied by KCTCS.

B.1 Qualitative Data

Interviews were conducted in two rounds; the first set was conducted between fall 2015 and spring 2016; the second set was done in winter and spring 2018 (see Table B1 below). Eleven individuals were interviewed in both rounds. To help the research team identify potential informants, EPIC administrators provided a list of the primary EPIC-funded staff members, including the leads for each participating college. The college leads provided contact information for instructors based at their colleges. To identify student respondents, a question was included in the student survey regarding willingness to participate in a telephone survey. Six survey respondents expressed interest and provided their email addresses; all six were emailed but only three responded and were interviewed. We were put in touch with the other two student interviewees through project administrators. Employers and other partners were also recruited via administrators' recommendations. All interviewees provided informed consent to participate. Interviews were semi-structured, audio recorded, transcribed, and analyzed by theme.

Table B1
Interviews Conducted for EPIC Evaluation

	EPIC Leads/Administrators /Student Support Staff	Instructional Staff	Students	Employers	Other	Total
Round 1	15	7	1	2		25
Round 2	10	11	4	1	1	27
Total Interviews	25	18	5	3	1	52
Total Unique Interviewees	17	15	5	3	1	41

B.2 Student Survey

The survey was administered to students in fall 2017. It was developed by CCRC but emailed directly by KCTCS to 1,132 students who were identified as being or having been enrolled in EPIC LoD courses. As the table below shows, the response rate was very low:

Table B2
Analytic Sample for the Survey

Analytic Sample	***N = 67***
Total students who were sent the email	1,132
Respondents	93
Agreed to participate	88
Responded: Enrolled in EPIC courses	78
Familiar with LoD	67

Thus, the results are for the 67 students who agreed to participate and were familiar with the differences between LoD and non-LoD courses.

The survey asked questions relating to the student experience in the EPIC LoD program, including recruitment and enrollment practices, utility of program technology, perceptions of program strengths and weaknesses, and overall student satisfaction. Survey data were analyzed and presented descriptively

B.3 Outcomes/Impact Data Collection and Analysis

The primary goal of the impact study was to examine whether the LoD model significantly improved students' academic outcomes, reduced the time to completion, and enhanced labor market outcomes for students in career-technical education (CTE) programs such as information technology. More specifically, the original plan of CCRC's evaluation was to answer the following research questions: (1) Do students trained using the LoD model have stronger academic outcomes than similar students trained through conventional classroom and other non-LoD delivery methods? (2) Are students able to complete training through LoD more quickly? (3) What are the employment outcomes (employment rate, quarterly earnings, industry of employment) of students in LoD IT programs? (4) How do the employment outcomes for LoD IT program students compare with those who pursue IT training through conventional

(classroom and regular online) modalities? (5) Is the LoD approach to career-technical training as cost-effective as traditional on-campus classroom models?

To answer these research questions, CCRC proposed to collect KCTCS student unit record data matched with unemployment insurance (UI) records. To address the endogeneity issue resulting from students' self-selection into LoD courses, we proposed to conduct the analyses using a quasi-experimental "difference in difference" (DID) method strengthened by propensity score matching. Within each college, CCRC would have individual student-level data on "pre-model" student cohorts who entered a specific career-technical program (e.g., MIT) prior to implementation of the LoD delivery model, as well as on "post-model" cohorts, who entered the same programs after initial implementation. To isolate the effects of enrolling in LoD, CCRC would compare the pre-post difference between two groups of students in IT programs: (1) Those who enter programs with a LoD focus and therefore in the post-program period would experience LoD EPIC recruitment and intake processes, versus (2) Those who enter the same IT areas, but in programs without a LoD focus, and therefore experience similar recruitment, intake, and curriculum in both the pre- and post-program periods. This design would test the intent-to-treat effect, as some students who enter LoD programs may participate more fully in the LoD option than others. We proposed to bolster the DID design with a propensity score matching approach, to only compare pre-model and post-model students who share similar demographic characteristics.

However, due to data availability issues, our analyses diverged from the original plan. First, we were not able to collect UI wage records from KCTCS. As a result, it was not feasible to conduct any analyses on students' employment outcomes. Second, we did not receive quantitative data on EPIC program offerings or program completions. Instead, the data we received only included whether a specific course was offered in the LoD delivery method. In addition, in the data we received we found that the vast majority of students who had ever taken any LoD courses only took one or two courses in that delivery format. Therefore, our analyses eventually focused on course-level outcomes, instead of program completion outcomes.

Appendix C: EPIC Consortium Colleges

Table C1
Epic Consortium Colleges

College	Location/City	Campus Setting	Region	Enrollment size	Number of Staff	Number of Instructional Staff	Number of Campuses
Big Sandy Community and Technical College	Prestonsburg	Town: Remote	Eastern Kentucky	5,057	350	197	4
Jefferson Community and Technical College	Louisville	City: Large	North-central Kentucky	11,902	833	489	6
Hazard Community and Technical College	Hazard	Town: Remote	Eastern Kentucky	3,275	294	140	5
Somerset Community College	Somerset	Town: Remote	Eastern Kentucky Coalfield	6,621	514	267	6
Southeast Kentucky Community and Technical College	Cumberland	Town: Distant	Southeast Kentucky	3,135	308	122	5
West Kentucky Community and Technical College	Paducah	Town: Remote	West Kentucky	6,065	605	305	1 main campus, three off-campus sites

Source. Colleges' descriptive characteristics were retrieved from the Integrated Postsecondary Education Data System (IPEDS) website in August 2018.

Appendix D: Competencies

CIT 105 Introduction to Computers Course Overview

Provides an introduction to the computer and the convergence of technology as used in today's global environment. Introduces topics including computer hardware and software, file management, the Internet, e-mail, the social web, green computing, security and computer ethics. Presents basic use of application, programming, systems, and utility software. Basic keyboarding skills are strongly recommended.

Competencies. Upon successful completion of this course, the student can:

- Describe basic computer functions and use correct computer terminology.
- Utilize computer technology as a tool to locate, access, manage, evaluate, prepare, present and use information.
- Identify trends in information processing and new emerging technologies.
- Explain the impact of computers upon society including effects of social technologies, green computing, dangers of excessive use, and disposal of obsolete equipment.
- Identify and analyze ethical issues such as copyright, privacy, responsible use, and security as related to computing.
- Explain the difference between application, programming, system, and utility software.
- Use a graphical user interface-based operating system to manage files, folders and disks.
- Use application software packages to prepare basic documents, spreadsheets, databases, and presentations.
- Describe and explain basic data communications and network technologies and functions.
- Identify and use basic e-mail and Internet communication functions and understand their capabilities.

- Describe globalization and challenges including technological barriers, electronic payments, and varying cultures.
- Describe cloud computing and its impact on business and personal systems.
- Identify how possessing computer skills can improve one's employability and quality of life.

Table D1
Course Modules

Module Name	Credit/Contact Hours	# of Lessons
Module 1: Computer Basics	0.5 (7.5 contact hours)	4
Module 2: Systems and Utility Software	0.6 (9 contact hours)	3
Module 3: Internet, Email, and Networks	0.8 (12 contact hours)	4
Module 4: Globalization and The Cloud	0.5 (7.5 contact hours)	3
Module 5: Software Basics	0.6 (9 contact hours)	4
Total Credit Hours	3.0 (45 contact hours)	18

Figure D1
Breaking Competencies Into Learning Outcomes and Objectives – Example