

U.S. Department of Education

**Simulated Work-Based Learning**  
*Instructional Approaches and*  
*Noteworthy Practices*

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# Simulated Work-Based Learning *Instructional Approaches and Noteworthy Practices*

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**NATIONAL CENTER FOR INNOVATION  
IN CAREER AND TECHNICAL EDUCATION**

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Prepared for the  
U.S. Department of Education  
Office of Career, Technical, and Adult Education

**AUGUST 2017**

This report was produced under U.S. Department of Education Contract No. ED-VAE-12-C0051 with RTI International, which subcontracted with Sapien Solutions. RTI International administers the Department of Education's National Center for Innovation in Career and Technical Education. Carolyn Lee served as the contracting officer's representative. The views expressed herein do not necessarily represent the positions or policies of the Department of Education. No official endorsement by the U.S. Department of Education of any product, commodity, service or enterprise mentioned in this publication is intended or should be inferred.

**U.S. Department of Education**

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August 2017

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## ACKNOWLEDGMENTS

National Center for Innovation in Career and Technical Education researchers would like to thank the following individuals who provided information for use in the development of this report:

### **Alabama**

Dr. Philip Cleveland – Interim State Superintendent/Deputy State Superintendent, Division of Career and Technical Education (CTE)/Workforce Development  
Mr. Thomas Reed – Director, Bryant Career Tech Center, Mobile County  
Ms. Courtney Taylor – Health Sciences Instructor, Bryant Career Tech Center, Mobile County  
Mr. Ben Tyler – IT and Computer Sciences Instructor, Bryant Career Tech Center, Mobile County  
Mr. Ken Dawkins – Principal, Lamar County School of Technology, Lamar County  
Mr. Edward Crenshaw – Public Information Specialist, Alabama State Department of Education

### **Kansas**

Ms. Natalie D. Clark – Business Education Consultant, Kansas State Department of Education, Topeka; Former School-Based Enterprise Instructor, Stafford United School District 349, Stafford  
Dr. Brian Inbody – President, Neosho County Community College, Ottawa  
Ms. Debra Callahan – Clinical Simulation Coordinator & Nursing Instructor, Neosho County Community College, Ottawa  
Dr. Mary Jo Taylor – Superintendent, Stafford United School District 349, Stafford  
Ms. Angie Mietchen – Simulation Coordinator, Washburn Institute of Technology, Topeka  
Ms. Harmony Hines – Vice President for Compliance, Midland Care Connection, Topeka

### **Montana**

Mr. Matthew Springer – Project Director, RevUp: Empowering Montana's Workforce, Great Falls College, Montana State University, Great Falls  
Ms. Lisa Skriner – Director of Workforce and Resource Development, City College, Montana State University, Billings  
Mr. Guy Lund – Career & Placement Center, Miles Community College, Miles City

---



### **North Carolina**

Ms. Jo Anne Honeycutt – Director of CTE, Public Schools of North Carolina

Mr. Stan Winborne – Director of High Schools/CTE and Public Information Officer,  
Granville County School District, Granville County

### **West Virginia**

Dr. Kathy D’Antoni – Assistant State Superintendent of Schools, Division of Technical and  
Adult Education, West Virginia State Department of Education

Mr. Clinton Burch – Assistant Director, Office of CTE Innovations, Workforce  
Development and Support, West Virginia State Department of Education

Ms. Donna Van Metre – Director/Principal, James Rumsey Technical Institute, Martinsburg

Mr. Gary Clay – Plant Controller (Retired), Armstrong World Industries, Flooring Division,  
Beverly

Mr. Sam Spears – Continuous Improvement Coordinator, Rubberlite Incorporated,  
Huntington

Mr. C. David Thompson – Chief Information Officer and Vice President of Organizational  
Development, Rubberlite Incorporated, Huntington

### **National**

Ms. Catherine Imperatore – Research Manager, Association for Career and Technical  
Education

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## ABBREVIATIONS

<b>ACTE</b>	Association for Career and Technical Education
<b>CTE</b>	career and technical education
<b>NCICTE</b>	National Center for Innovation in Career and Technical Education
<b>OCTAE</b>	U.S. Department of Education’s Office of Career, Technical, and Adult Education
<b>OSHA</b>	Occupational Safety and Health Administration
<b><i>Perkins IV</i></b>	<i>Carl D. Perkins Career and Technical Education Act of 2006</i>
<b>WBL</b>	work-based learning



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## EXECUTIVE SUMMARY

Work-based learning (WBL) has long been used in career and technical education (CTE) to allow students to practice the knowledge and skills they acquire in the classroom within a “real-world” business or industry setting. High-quality work placements reinforce school-based instruction by providing students with a context for applying academic theory with technical skills, and an authentic backdrop for learning the career-readiness (also described as employability) skills valued by employers. Simulated WBL aims to replicate workplace experiences by allowing students to immerse themselves in a realistic worksite activity without leaving campus (Lateef 2010). Simulations may be adopted for various reasons, including but not limited to the difficulty educators face in placing students with employers; logistical issues, such as the geographical isolation of rural providers or scheduling challenges that limit students’ ability to travel; safety or insurance issues that restrict students’ access or engagement; and labor laws, which may prohibit underage students from working.

Although various definitions of the approach exist, for the purposes of this report, we have defined “simulated WBL” as

an immersive, career-themed experience—offered in a protected setting at an educational institution—that replicates workplace tools, processes, and/or environments to offer students realistic hands-on opportunities to practice, reinforce, and grow the technical skills, employability skills, and academic knowledge learned through classroom instruction.




Relatively little is known about the contribution simulated WBL can make to student learning, its most effective forms or fields of application, or its advantages relative to other forms of instruction. This paper explores the potential benefits that simulated WBL may offer CTE students. It is based on evidence gathered from a review of online resources and telephone interviews with state and local program staff in nine project sites located in five states—Alabama, Kansas, Montana, North Carolina, and West Virginia—using simulation as an instructional tool. Project work focused on classifying the forms that simulated WBL can take, the prevalence of program offerings at the secondary and postsecondary education levels, the perceived benefits of quality programs, and the obstacles to their formation.

Although educators are using a range of approaches to simulate work, the CTE programs in the nine sites we examined fell into three models: 1) those using *simulation tools* to teach



occupationally specific skills; 2) *simulated workplaces*, intended to replicate jobsite conditions; and 3) *school-based enterprises*, operated as student-run businesses that produce and sell products or services. Details of these models and their distinguishing characteristics are described in Exhibit ES-1.

**Exhibit ES-1: Models of simulated WBL and their distinguishing characteristics**

Models of Simulated Work-Based Learning			
	 Simulation Tools	 Simulated Workplaces	 School-based Enterprises
Motivation	Create safe opportunities to teach specific skills or tasks associated with a given job	Replicate a range of workplace environments designed to develop employability skills and increase student engagement	Offer students a holistic experience of running an actual business to foster entrepreneurial skills and deepen student engagement
Intended skills	<ul style="list-style-type: none"> <li>• Critical thinking/decision-making</li> <li>• Preparation/exposure to specific work scenarios</li> <li>• Confidence</li> <li>• Technical skills</li> </ul>	<ul style="list-style-type: none"> <li>• Employability (on time, drug free, interviewing, safety, professionalism, dress)</li> <li>• Teamwork</li> <li>• Responsibility</li> <li>• Leadership</li> <li>• Career awareness</li> </ul>	<ul style="list-style-type: none"> <li>• Entrepreneurism</li> <li>• Critical thinking</li> <li>• Problem solving</li> <li>• Communication</li> <li>• Collaboration</li> </ul>
Typical program elements	<ul style="list-style-type: none"> <li>• Use of common and emergency scenarios</li> <li>• Some clinical credits for simulation time (health care)</li> <li>• Debrief/reflection processes that allow for learning from mistakes</li> </ul>	<ul style="list-style-type: none"> <li>• Classes organized as student-led companies</li> <li>• Time clocks, uniforms, drug testing</li> <li>• Facilities resemble industry settings</li> <li>• Teacher serves as facilitator</li> </ul>	<ul style="list-style-type: none"> <li>• Student-run businesses provide products or services for sale to other people</li> <li>• Business plan development</li> <li>• Teacher serves as facilitator</li> </ul>
Required resources	<ul style="list-style-type: none"> <li>• Simulation tools</li> <li>• Operations and maintenance costs</li> <li>• Additional training for instructors or coordinators</li> </ul>	<ul style="list-style-type: none"> <li>• Professional development</li> <li>• Employer partnership and input/guidance</li> </ul>	<ul style="list-style-type: none"> <li>• Equipment for student businesses</li> <li>• Start-up capital</li> <li>• Additional training for instructors or coordinators</li> </ul>

Each model offers opportunities for CTE students to practice and grow career skills, none of which are exclusive to a given approach. However, the emphasis on skill training does vary by model, which in turn affects the education level at which it is employed and the resources necessary for its success. At the secondary level, educators in sites we reviewed were primarily using simulated workplaces and school-based enterprises to promote the



development of employability and foundational technical skills through broad experiential learning. At the postsecondary level, simulation tools were used more frequently for students to practice basic and advanced skill applications in stand-alone simulators or in more realistic simulated work environments.

## PROGRAM DEVELOPMENT

Educators in the nine sites we reviewed reported common issues when designing and implementing simulated instruction regardless of the different models they used. These central factors included the following:

- **Choosing an Instructional Model**—Simulated WBL experiences can be structured to teach most skills, ranging from basic employability to occupational task-specific. Educators need to begin by establishing their instructional goals, which can inform the approach they use to frame their curriculum. For example, educators interested in offering general career-readiness training, with an emphasis on the development of employability skills, may wish to consider the simulated workplace or school-based enterprise models. In contrast, those focused on more occupationally specific skill instruction might opt to use simulation tools, in isolation or integrated into a replicated workplace setting, to allow students to practice the application of skills.
  - **Preparing Instructors to Teach Simulations**—Changing classroom instructional practice was identified across sites as the greatest challenge to simulated WBL adoption. An emphasis on skill application in authentic settings requires that teachers adopt new pedagogic strategies and modify their curriculums to align simulation tools and scenarios with their learning objectives. As one state administrator observed, teachers are not trained in experiential learning and they need considerable professional development to adjust to new instructional paradigms. Sites described approaches they used for preparing site administrators, teachers, and faculty to use simulations, with strategies ranging from offering targeted technical assistance to phasing in simulations within and across sites over time.
  - **Securing Employer Engagement**—Simulating workplace conditions in classrooms requires close and continued collaboration between educators and employers. Engaging workforce representatives early on helps to ensure that simulations are aligned with contemporary industry practices and standards. Most sites also report holding ongoing consultations with employers throughout the
-



school year to guard against skill obsolescence and to provide opportunities for students and teachers to maintain relationships with the business community.

- **Financing Programs**—Introducing simulated WBL requires some degree of initial investment, from purchasing equipment to retraining staff. Costs vary by instructional model, sophistication of tools, and cost of equipment upkeep and repair. Computerized simulators also may have additional costs associated with site licensing, software updates, and technical support. While simulation tools can produce some instructional cost savings, staff reported that they needed to identify additional funding sources to cover ongoing program operations and maintenance.

## PROGRAM BENEFITS

Program staff were generally enthusiastic about the educational contribution of simulated WBL. Interviews with staff in the nine sites produced qualitative data on the benefits of simulation for the following:

- **Students**—Educators believed that students were more engaged when offered hands-on, simulated instruction. Irrespective of the model, educators shared that simulated WBL familiarizes students with processes or situations they are likely to encounter on the job, builds their confidence, and better prepares them for the transition to work.
  - **Employers**—Employers reported that simulated learning helped enhance students' career awareness and job preparation. Ongoing employer involvement built into many programs also helped create a dynamic environment, in which programs adapted more quickly to evolving workforce needs and conditions.
  - **Instructional providers**—Simulations allowed schools and institutions to offer workplace experiences to more students than they could otherwise serve. Simulations were identified as especially helpful in geographically isolated regions where there were limited opportunities to place students at work sites.
  - **States**—Simulated WBL is seen as a tool for promoting economic development, particularly in instances where adoption occurred at the statewide level. For example, one administrator shared how staff were marketing the simulated WBL used in CTE programs to attract industry to the state, because its emphasis on employability skill development helped guarantee a ready and skilled workforce.
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## CONSIDERATIONS FOR ADOPTION

Interviews with state and local staff indicate that, regardless of the simulation model, educators must anticipate and take steps to address a range of issues that affect program adoption.

### ***1. Do the up-front research to inform program design***

It is important to align CTE programs that use simulated WBL with local assets and economic conditions so that there are job opportunities for program completers. Administrators and instructors should understand the skills prioritized by local employers and select a simulated WBL model that will reinforce their development. Adoption efforts should begin with the collection of workforce data—solicited from employers and industry advisory committees—to assess labor market needs.

### ***2. Engage industry throughout the process***

State and local respondents underscored the importance of involving local employers and industry representatives in the design of simulated WBL for CTE programming. Engaging workforce representatives helps to ensure that simulations are aligned to actual workplace practices and industry standards. These interactions, occurring at regular intervals throughout the school year, help to keep employers involved and provide students and teachers with immediate feedback to guide instruction and continuous improvement efforts.

### ***3. Build buy-in from key education stakeholders***

Teaching within a simulated WBL model necessitates a dramatic cultural and pedagogical shift as students take a more active role in their learning. Instructors using sophisticated new tools also must have advanced technical understanding to ensure they can take full advantage of their equipment. One way of sustaining programs is to offer targeted professional development and training. This can take many forms, including offering one-on-one coaching, hosting workshops, and creating communities of practice. Some schools chose their strongest or most passionate teachers to be the first implementers, since some instructors may be uncomfortable with technology or resistant to change.

### ***4. Plan and budget for the long term***

Budgeting simulated WBL for CTE programs can vary depending on the program. It is important to carefully consider both start-up and operating costs and, ideally, identify stable funding sources before launching simulated WBL for a CTE program. These programs will



need to develop strategies for covering long term equipment maintenance for simulated WBL. Use of simulation technologies may also require hiring a full-time coordinator to help ensure that training conforms to industry best practice in fields relying on sophisticated, highly advanced instructional tools or protocols.

## IN SUMMARY

There is relatively little research documenting the structure and use of simulated WBL. Our exploration of nine sites revealed three different models used to offer simulated WBL, with each providing different advantages. Many sites chose to use *simulation tools* to teach occupationally specific skills, with usage more prevalent at the postsecondary education level. *Simulated workplaces* replicate jobsite conditions to offer both high school and college students realistic instructional environments, with secondary sites often using the approach to emphasize employability skills. *School-based enterprises* operate as student-run businesses that provide students the learning opportunities related to the production and sale of products or services and, in so doing, engage students in all facets of a company. Due in part to the broad application of skills, the school-based enterprise approach was only observed at the secondary level.

Educators considering the adoption of simulated WBL need to consider each model's advantages and tailor their program offerings to their specific community needs. They also can benefit by addressing some key considerations in their program design, including engaging employers, offering professional development and training to instructors, and locating sustainable funding sources to purchase and maintain equipment. While most of our site interviewees praised the use of simulated WBL for CTE programs and offered anecdotal evidence to support their views, rigorous evaluations had yet to be conducted. For this reason, further research is needed to support the introduction, growth, and refinement of this noteworthy instructional practice.

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## INTRODUCTION

Work-based learning (WBL) enables students to practice the knowledge and skills acquired in a classroom setting within a “real-world” business or industry environment. High-quality work placements reinforce school-based instruction by providing students with a context for integrating academics with technical skills, as well as options for learning career-readiness (also described as employability) skills valued by employers. Strategies for delivering WBL vary, with options ranging from less intensive career-exploration activities (e.g., workplace tours and job shadows) that give students a basic understanding of the world of work to more targeted career-preparation engagement (e.g., apprenticeship or clinical experiences) intended to prepare individuals to enter a specific profession (Darche et al. 2009).

Career and technical education (CTE) instructors have long relied on work placements to offer students a context for applying their technical studies. The first recorded use of WBL dates to 1906 when the University of Cincinnati, under the direction of Professor Herman Schneider, launched a cooperative education program that placed university students in part-time employment related to their academic coursework.<sup>1</sup> Cooperative education was formally introduced into federal legislation as part of the *Carl D. Perkins Vocational Education Act of 1984*, which called for grants to improve the management skills and increase the productivity of adults participating in training, retraining, and employment development programs.<sup>2</sup> Successive reauthorizations have commissioned the use of WBL as an instructional tool.<sup>3</sup>

Not all WBL instruction needs to occur in the workplace. Simulated WBL aims to replicate workplace environments and processes so that students can immerse themselves in a career-themed activity without leaving school (Lateef 2010). Although various definitions of the approach exist, for the purposes of this report, we have defined “simulated WBL” as

an immersive, career-themed experience—offered in a protected setting at an educational institution—that replicates workplace tools, processes, and/or environments to offer students realistic hands-on opportunities to practice,

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<sup>1</sup> See <http://magazine.uc.edu/issues/1205/success1.html>.

<sup>3</sup> The *Carl D. Perkins Career and Technical Education Act of 2006* calls for worksite experiences to be incorporated into the contents of Tech Prep programs identified; while Congress consolidated funding for Tech Prep into states’ basic grant allocation beginning in the 2010 fiscal year, some states continue to support Tech Prep programs to offer CTE programming.



reinforce, and grow the technical skills, employability skills, and academic knowledge learned through classroom instruction.

There are a host of reasons why educators may choose to substitute simulations for genuine labor market experience. These include difficulties in recruiting a sufficient number of employers willing to offer students a work placement; logistical challenges, due to the geographic isolation of rural providers or challenges with course scheduling that limit students' range of travel; safety or insurance issues, which may restrict students' access to hazardous jobsites and equipment or interaction with patients; or federal or state labor laws, which prohibit underage students from working. Simulations also may offer students more cost-effective or realistic learning scenarios than might be possible in real life, such as working with high-end advanced manufacturing equipment or performing sophisticated medical procedures that might place patients or students at risk.

Relatively little is known about the contribution simulated WBL can make to student learning, its most effective forms or fields of application, or its benefits relative to other forms of instruction. One notable exception is the field of nursing education, where studies have documented improvements in nurses' critical thinking, self-confidence, technical knowledge, and motor skills (Hayden et al. 2014).<sup>4</sup> Nursing students enrolled in programs involving simulation as a replacement for clinical time also reported an increase in their knowledge, skills, and ability to perform better on real-life medical tasks (Weaver 2011; Curtin and Dupuis 2008). Most study outcomes are associated with high-fidelity simulation techniques, which include employing trained simulation faculty, using formal debriefing protocols, and using realistic physical equipment and environments to instruct students (Hayden et al 2014; Greenawalt 2014; Cant and Cooper 2009; Jeffries 2007). Nursing educators and professional associations have also developed a set of best practices (INACSL 2013) and a vision statement (National League for Nursing Board of Governors 2015) to guide simulation use, which in some cases may substitute for up to half of traditional clinical hours (Hayden et al. 2014).



Students caring for and charting a simulated patient at Neosho County Community College, Kansas

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<sup>4</sup> The use of simulation tools and simulated environments has become so prevalent and popular in the nursing field that there is now a field-specific international teaching and resource organization to provide resources and oversight—The International Nursing Association for Clinical Simulation and Learning. See <https://www.inacsl.org> for more information.



These results suggest that well-designed simulated WBL experiences may be used to promote students' acquisition of technical skills and clinical judgment. However, it is not clear that the outcomes observed in nursing education are generalizable to other fields. If educators are to be encouraged to substitute simulation for traditional WBL approaches, then additional information is needed on the advantages of the approach and barriers to its adoption. This paper explores the potential benefits that simulated WBL may offer CTE students. It uses evidence gathered from a review of online resources and telephone interviews with state and local program staff in nine project sites located in five states—Alabama, Kansas, Montana, North Carolina, and West Virginia—that are making use of simulation as an instructional tool. Project work focused on classifying the forms that simulated WBL can take, the prevalence of program offerings at the secondary and postsecondary education levels, the perceived benefits of quality programs, and the obstacles to their formation.

Project work was informed by a review of website literature, which was used to develop a logic model. This logic model was updated to incorporate evidence surfaced over the course of the project (Exhibit 1). The model identifies the contextual factors and inputs that may affect a state's or local provider's decision to adopt simulated WBL. It also identifies the types of activities that may be used to select a delivery approach and scope of student engagement and assess the outcomes of instruction. Though educators are using differing ways to offer simulations, programs in the sites examined fell into one of three simulated WBL models: those employing *simulation tools*, used to teach discrete technical skills; *simulated workplaces*, designed to build employability skills through immersion in jobsite conditions; and *school-based enterprises*, where students develop entrepreneurship and employability skills by running all or most aspects of a business. Details of these simulated WBL models and their distinguishing characteristics are described below. Finally, the intended results of offering simulated WBL were identified, with outcomes classified into short- or long-term benefits, disaggregated by beneficiary. Potential strategies for evaluating projects also were included.

Readers are urged to use care in interpreting the logic model that is presented. Logic models are tools that provide a visual representation of the underlying factors, activities, and outcomes associated with a given program or initiative. The logic model developed for this report offers a generalized, overarching description of the manner in which simulated WBL has been implemented for use in CTE programs. In practice, the inputs and activities used to offer instruction, and the outcomes that result, will differ across the three simulated WBL models presented and pedagogical approaches that educators employ. Furthermore, the findings contained within this report are primarily based on the information gathered from nine programs identified as offering innovative approaches to simulated instruction. Data on program outcomes were not available in most sites, nor were participant observations based



on scientifically rigorous study. Consequently, the information that follows is not intended to be definitive nor fully representative of the range of approaches that educators are using to offer instruction.

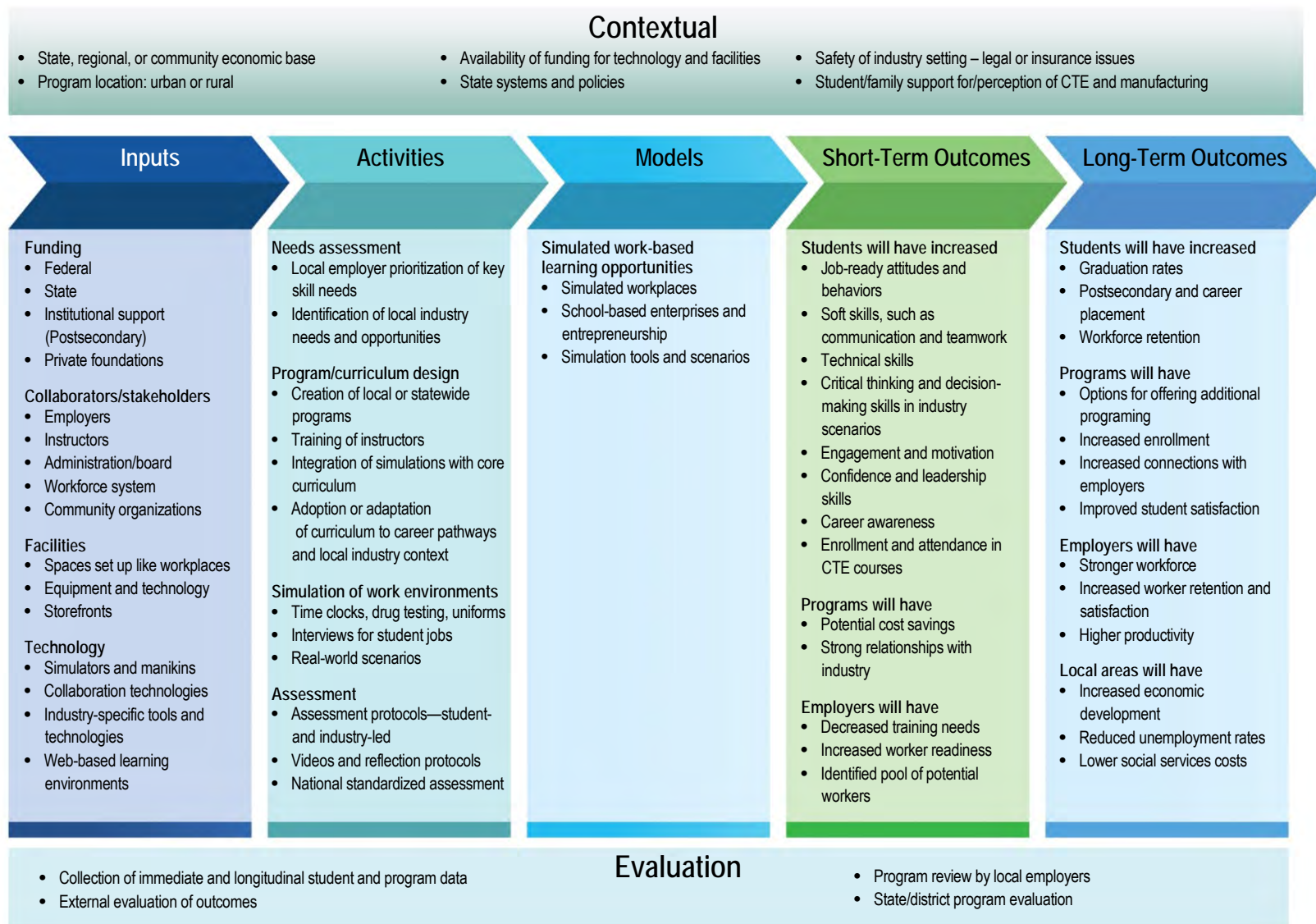
This report highlights the information collected from a review of the limited literature on simulated WBL (refer to Appendix B for the literature and web review) and interviews with state education agency administrators, secondary and postsecondary instructors, and employers. It is intended to provide a framework for understanding the differing forms that simulated WBL may take and the manner in which educators and employers have collaborated to design and implement simulated learning. The report opens with a description of the simulated WBL models identified across the nine sites, followed by a summary of factors affecting the design and implementation of programs.<sup>5</sup> Profiles of each simulated WBL model, using examples from the nine sites reviewed in this study, are provided to illustrate the differing ways that instruction may be delivered using simulated WBL. The report then offers an overview of the benefits that simulated learning approaches may offer and challenges to program delivery. The paper closes with a cross-site synthesis of considerations that educators may wish to consult prior to adopting simulated WBL. A description of the research methods and interview protocols may be found in Appendix A.

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<sup>5</sup> Although interviews were conducted with nine sites, not all are featured as examples in the body of this report. For a detailed review of each site, refer to Appendix C.



**Exhibit 1: Logic model for the use of simulated WBL**





# SIMULATED WORK-BASED LEARNING MODELS

Simulated WBL is designed to offer students realistic workplace experiences replicated in an educational setting. Our review of the literature and interviews with state education agency administrators, secondary and postsecondary instructors, and employers at nine sites indicate that state and local program providers are taking differing approaches to organizing and delivering simulated learning. This variation can be traced to a host of factors, ranging from educators' intended educational goals (i.e., broad career readiness vs. specific job preparation) to the degree of state involvement in career-readiness instruction.

While no two programs profiled were exactly alike, our exploration suggests that each could be classified into one of three simulated WBL delivery models (see Exhibit ES-1). These models include sites utilizing *simulation tools* to teach specific skills or tasks associated with a given job; *simulated workplaces* to replicate a range of workplace expectations and behaviors; or *school-based enterprises* that offer students holistic experience in running an actual business in a given industry. Though there are many programs that distinctly fall into one of these three models, there are also hybrid programs that use components of two of these models to achieve educational objectives for their students.

The three simulated WBL models are united by a common thread: each uses simulation to create immersive learning opportunities to either replace or augment real world experiences through the use of guided instruction (Lateef 2010). Through this facilitated, experiential learning, students have the opportunity to learn and practice skills within a protected environment where they can make and learn from mistakes without producing irreversible consequences. In each of these models and instances where they are hybridized, simulated WBL is generally seen as a complement to other forms of WBL and CTE instruction, rather than a replacement for other modes of instruction.

The following section summarizes the distinguishing characteristics of the three simulated WBL models, with the understanding that though each is distinct, they are not mutually exclusive; in practice, educators may draw on elements of each to offer students a realistic and comprehensive workplace experience. Site profiles are included to help illustrate how each model operates in practice.

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## MODEL 1: SIMULATION TOOLS

Perhaps the most straightforward approach to simulated instruction entails providing students with access to simulation equipment that replicates what is used at the jobsite and engages them in scenarios they would likely encounter at work. Though offering realistic engagement, an important distinction is that the tools themselves are not real; rather, they are designed to duplicate the look, feel, and operation of work tools in order to closely mimic reality. For example, health care students may use a manikin to practice invasive patient care skills, such as inserting an intubation tube or administering an injected medication.

Many contemporary simulation tools are computer-based. Advances in digital technologies, including virtual reality, have produced increasingly realistic simulated encounters. For example, students in construction technologies programs may practice their skills using welding simulators that have them perform a task using simulated tools in a computerized environment. This can offer a multisensory experience along with detailed feedback on their performance. Similarly, a student in transportation and logistics might practice using a driving or flight simulator to replicate operating a vehicle.



A simulation manikin used to train health science students.

There are several advantages to incorporating simulation tools. One is that tools are designed to sharpen students' technical competence through repetitive practice of core skills. It also allows students to think critically and safely engage in high-risk, potentially life-threatening situations, such as a patient going into cardiac arrest or a truck's brake failure on an icy slope. These tools have an added advantage in that they can introduce students to scenarios not available through a traditional WBL placement (e.g., enabling trucking students in a summer program to prepare for winter driving). Simulations can also be cost-effective, reducing consumption of fuel or materials and preventing costly mistakes at the workplace.

In our nine sites, simulation tools and technologies were most often used at the postsecondary level; secondary programs using such tools often did so in partnership with a local community college. This differentiated application across education levels was due, in part, to the high upfront cost of purchasing technologically advanced equipment and training instructors in its use. Skill specificity also was cited: While not unidimensional, simulation tools are often designed for students to practice a specific set of technical skills. This made some tools more suitable for use at the postsecondary level, where students more often are trained for direct entry into a specific field or occupation.

## In Practice: Simulation Tools

At Miles Community College in Miles City, Montana, students in the Commercial Driver's License Program complete part of their training on the college's commercial driving simulator. The simulator replicates a truck cab by providing a realistic video display outside of the truck's "windows" and tactile feedback that reproduces the truck's handling under different conditions, such as on gravel roads or icy surfaces. The simulator produces performance readouts on fuel consumption, "damage" to the truck, and other driving experiences. Students master basic driving skills on the simulator before using the program's real semi on the road. They also use the simulator to train for a variety of emergency scenarios, such as a blowout or brake failure. The ability to simulate driving in crowded urban areas is especially valuable for students since the college is located hundreds of miles from the nearest city.



## MODEL 2: SIMULATED WORKPLACES

Simulated workplaces transform CTE classrooms into work-like environments that immerse students in the culture and expectations of actual workplaces to develop their technical and employability skills. Most frequently, simulated workplaces emphasize replicating industry processes and procedures, particularly at the secondary level. However, simulated workplaces also can recreate the physical work environment to enhance learning.

West Virginia and Alabama have each introduced statewide initiatives called, aptly enough, Simulated Workplace. This initiative aims to improve the career-readiness skills of secondary CTE students and to expand access to WBL for students in remote areas. Here, CTE instruction is delivered in simulated student-run "companies," where projects and tasks derived from the CTE curriculum are completed, while following workplace policies developed with input from local employers. Students in these "companies" must meet the same standards of productivity, quality, and financial performance as in real firms, with profitability measured based on attendance, successful completion of tasks, and attainment of certifications. Students also practice the skills required to find and hold employment in such firms, including interviewing for company



Student laying bricks for a wall in a Simulated Workplace in Alabama.

positions, working within a workplace hierarchy, and taking on management positions with responsibilities like hiring and firing their peers. Students are held accountable both for their individual performance and that of the company. Given the model's strong emphasis on simulating workplace policies and conditions, employer involvement is a key component to ensuring the work environment's authenticity and alignment with local skill needs.



Students in a culinary science Simulated Workplace, Tucker County, West Virginia.

While technical skills are critical to company operation, emphasis is placed on building students' fundamental work skills, such as showing up for work on time, maintaining consistent attendance, working in teams, having a professional demeanor, being drug-free, and demonstrating good oral and written communications skills. Since students take responsibility for honing these skills, simulated workplaces promote a high degree of student ownership, engagement, and leadership skills development.

Simulated workplaces may vary in the degree to which they recreate physical work environments. At its most basic, a simulated workplace may be designed as a learning laboratory. More advanced settings may be indistinguishable from an actual workplace. For example, one college reported creating a hospital room as an instructional tool, outfitting it with a life-like robotic patient, hospital bed, industry-standard equipment, and working utilities. The room was configured, however, to support group learning exercises by providing space for large groups of students, recording equipment, and a debriefing room. In this simulated workplace a nursing student might respond to a health care manikin's simulated heart attack by using actual hospital equipment and working as part of a health care team involving other classmates. Health sciences was the only field in this exploration of simulated WBL where we saw the integration of simulation tools with a simulated environment.



A simulated hospital room in the Regional Simulation Center at the Washburn Institute of Technology, Kansas.

## In Practice: Simulated Workplaces

West Virginia's Simulated Workplace, piloted in 2013, was one of the first statewide simulated WBL initiatives in the country. Simulated Workplace teaches students business processes and skills, as well as employability skills. Students are organized into companies and rotate through different roles where they learn the necessary technical and employability skills for each. At the James Rumsey Technical Institute in Martinsburg, West Virginia, the center's 17 CTE programs are organized as simulated workplaces. Students in each program create and run their own companies and are held accountable for their results. Each day, students dress in uniforms, clock in, and complete projects using real industry equipment. Student foremen and supervisors hire and fire student workers and assign tasks to their work teams. Students interview for their job roles and assume the full responsibilities for those roles, rotating through other roles in regular increments. Some student companies may work on projects with real clients, such as the student-led graphic and web design company called Trifecta Graphics. Twice a year, craft advisory committees composed of local industry representatives visit the classroom and evaluate each program on criteria like compliance with Occupational Safety and Health Administration (OSHA) standards, curricular goals, and fidelity to relevant industry standards. They also participate in end-of-year capstone and portfolio review panels.



## In Practice: Hybrid Program—Simulation Tools and Simulated Workplaces

Health sciences students at Neosho Community College's two campuses in Chanute and Ottawa, Kansas, complete part of their clinical training in one of the school's two simulated hospitals. This setting combines the use of simulated tools and a realistic health care environment into a hybrid environment designed to expose students to real-life scenarios without potential for causing patient harm. Students interact with specialized health manikins (geriatric, pediatric, labor and delivery) in simulated hospital rooms and practice skills in simulated exam rooms, scrubbing stations, pre-op rooms, operating rooms, nursing stations, and secure drug storage and dispensing rooms. The facility is so realistic that the region's hospitals use it as a back-up hospital for catastrophes; at the same time, it is adapted for instruction with video equipment, two-way mirrors, and large rooms to accommodate observers. The program makes extensive use of observation and critical reflection: Students run the simulations (designed by the college's full-time simulation coordinator), critiquing their classmates' actions, and classes watch video of the incidents and conduct a formal debrief after each simulation.



## MODEL 3: SCHOOL-BASED ENTERPRISES

School-based enterprise is a simulated instructional strategy, typically used within secondary schools, that engages students in producing goods or services for sale to the school or wider community. Here, students are responsible for most aspects of the company, including purchasing or creating products, marketing goods, managing finances, and scheduling and paying employees. Common examples include school stores, student-run print or silk screening shops, and food catering businesses.

Like simulated workplaces, school-based enterprises help create meaningful WBL experiences for students in geographically remote areas where there may not be a local employer base to provide WBL opportunities in CTE programs. They help students develop general employability skills, such as teamwork and communications, but they are particularly valuable for teaching entrepreneurship and marketing skills because they allow students to assume all the roles of operating a business. What differentiates school-based enterprises from simulated workplaces is that school-based enterprises involve real commercial activity and generate revenue, some of which may be used by schools to partially offset costs. A second difference is that school-based enterprises typically do not aim to emulate professional standards of dress or use workplace features, like time clocks.

### In Practice: School-Based Enterprises

Students in marketing and entrepreneurship classes at Kansas' Stafford Unified School District 349 develop firsthand experience in running a business through the Stafford Entrepreneurship and Economic Development (SEED) Center. Here, students form their own businesses, individually or in groups, to produce products while learning entrepreneurship and marketing principles. Students develop a business concept and draft a business plan, which they present to a local banker for review as one of the program's assessment activities. They receive \$200 in start-up capital from the school and can use school-provided equipment, such as laser engravers and screening and printing machines, in their operations. Students market their programs from a downtown storefront that was donated by a local business owner and retain 70 percent of all sales, with the remaining 30 percent used to defray the school's costs. The program is closely integrated with the school's marketing and entrepreneurship curriculum.



## PROGRAM DEVELOPMENT

Irrespective of the simulated WBL model used to organize CTE programming, educators in sites reported addressing a cross-cutting set of considerations in designing and implementing simulated instruction. This section synthesizes sites' experiences to identify the central factors that state and local educators considered in adopting simulated WBL, using information collected from staff interviews or review of site-provided resources as examples.

### MOTIVATION

Sites' rationales for offering simulated WBL experiences varied. In West Virginia and Alabama, states' motivation to introduce the Simulated Workplace curriculum came in response to employer dissatisfaction with the work ethic of recent high school CTE graduates. While employers were mostly satisfied with the quality of students' technical skills, they observed that students graduating from CTE programs lacked basic employability skills, such as the ability to show up regularly and on time, to communicate and work in teams, and to pass mandatory drug tests. Although a formal evaluation of the program has yet to be performed, during interviews staff in both states reported receiving positive feedback from employers about the job readiness skills of students participating in the program.

**“[Employers] weren’t talking any more, they were screaming: ‘Just give me somebody who will show up on time, be drug-free, and give me a full day of work. We’ll train them.’”**

*Assistant superintendent of state schools, West Virginia Department of Education*

Sites employing heavy machinery or patient interactions cited safety as an influencing factor. At Miles Community College in Miles City, Montana, students in the Certificate of Applied Science in Heavy Equipment Operations traditionally relied on “cab time” to practice and apply their learning. The addition of a commercial driving simulator expanded students' learning options by allowing them to practice driving in unsafe or difficult conditions reproduced by the tool.<sup>6</sup> Instructors believed that simulated learning helped make students safer drivers because they could practice for dangerous conditions and receive immediate feedback in a controlled setting.

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<sup>6</sup> Miles Community College Commercial Driver's License simulator: <https://www.milesc.edu/DegreesPrograms/HeavyEquipment/Operations.aspx>.

For instructors at Washburn Institute of Technology (Washburn Tech), located in Topeka, Kansas, the shift to simulated WBL was motivated by several factors, including the desire to extend learning opportunities to include situations that students may not see in their clinical rotations and provide opportunities to learn and work on an inter-professional medical team. Students in 12 different health care programs at Washburn Tech use the college's Regional Simulation Center<sup>7</sup> to practice procedures in a simulated workplace setting, using manikins in place of human patients. Staff members report that this has eliminated medical risks while improving learning outcomes because students can debrief their actions and treatment with



An occupational therapy facility within the Regional Simulation Center at Washburn Institute of Technology, Kansas.

data and video. Students in Kansas may substitute simulation time for up to 20 percent of their clinical hour requirement for licensure. The facility also is used by regional health care professionals to participate in continuing education workshops and training. This shared use of facilities has provided students with exposure to a wider range of professional connections and relationships, which has helped improve students' prospects of future employment.

Though site motivations to adopt simulated WBL were strong, site representatives cautioned against moving too quickly in the development process. Most agreed that simulations are more likely to be sustained if they can be phased in over time. This can help ensure buy-in at all levels, especially with administrators, who may question start-up costs, and faculty, who may lack experience using simulation tools or facilitative teaching methods. For example, in West Virginia, implementation of the statewide Simulated Workplace initiative began with a pilot at selected sites, with additional sites added over time. This allowed state administrators to make program adjustments and refinements based on the lessons learned from the initial sites.

## CHOOSING AN INSTRUCTIONAL MODEL

Simulated WBL experiences can be structured to teach skills ranging from basic employability skills to occupational task-specific skills. Educators and institutions need to begin by establishing instructional goals and desired programmatic outcomes, which in turn guides selection of an instructional model. Those interested in offering students exposure to

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<sup>7</sup> Washburn Institute of Technology – Regional Simulation Center:  
<http://www.washburntech.edu/career-programs/health-care/sim%20lab.html>.



workplace expectations and developing employability skills may be better served by adopting simulated workplaces, like West Virginia and Alabama, or a school-based enterprise model similar to that used in Stafford Unified School District 349, which are better suited to the teaching of career-readiness skills. For example, the Stafford Entrepreneurship and Economic Development Center provides students with firsthand experience in launching and running a business in a program that is closely integrated with the school's marketing and entrepreneurship curriculum. The experience has taught students important lessons about starting a business and cross-cutting marketplace skills while providing a context for their technical skill instruction.

In contrast, sites focused on more technical skill instruction tended to purchase simulation tools that could be used to replicate specific job skills. For example, City College, located in Billings, Montana, purchased a welding simulator to allow instructors to demonstrate, and students to practice, contemporary welding processes without using consumables in the lab. Instructors reported the simulation tool was beneficial for students because it allowed them to practice their skills until they felt confident enough to use real equipment. In Billings, as in other sites, simulated WBL was used to complement, not replace, classroom instruction and clinical practice.

## SECURING EMPLOYER ENGAGEMENT

In a traditional WBL placement, students travel to a worksite where they learn from and are supervised by industry professionals. Ideally, students participating in a CTE program that uses simulated WBL will achieve similar results without ever leaving their classrooms. For this to occur, there needs to be close collaboration between educators and employers to ensure that classroom standards, equipment, and curriculum align with industry-recognized practices. Exhibit 2 summarizes the differing forms this engagement may take, ranging from serving on advisory panels to conducting performance audits and providing feedback on students' work.

**“We develop customized training for incumbent workers based on the skill improvement requested by employers, such as local refineries. Simulators are utilized in a variety of ways since employees are able to have a hands-on experience without negatively impacting their work environment. They can practice and understand why they are doing it, and see different outcomes for the choices they make.”**

*College Administrator, Billings, Montana*

Educators reported differing strategies for securing employer engagement. Many sites consulted employers in the initial design of their programs and chose instructional models that developed employer-identified priority skills. Several sites engaged employers deeply as partners in multiple stages of the learning process. For example, Stafford Unified School District 349 partnered CTE students in the school’s culinary arts and graphic design programs with employees from the town’s flour mill to create an authentic simulated WBL experience. The school district was seeking a way to meet new requirements from the state school lunch program to use more whole grains while ensuring that it produced food that was palatable to students. Stafford students reengineered the mill’s flour blend and conducted market research, recipe development, and taste testing, all the while receiving digital feedback, via Google Drive, from mill employees. Students also designed a logo and brand identity for the new product and ran a marketing and sales campaign to reach food distributors serving districts around the state. Students pitched the new product to a national distributor, who provided them opportunities to represent the product at a national trade show. This close industry involvement helped to ensure that the simulation was anchored in contemporary business practice.

**Exhibit 2: Business engagement in simulated WBL**





Other sites offered different examples. In Granville County, North Carolina, employers visit Virtual Enterprises International (VEI) firms and provide them with a real business problem, which becomes the students' job to solve. At James Rumsey Technical Institute in West Virginia, employer teams conduct inspections of student companies at the school's simulated workplace, evaluating their equipment, curriculum, and compliance with OSHA guidelines and other industry standards. In other programs, like the Surgery Technician Program at Neosho County Community College in Kansas, professionals come to the college to demonstrate proper medical technique, using the college's simulation equipment. For example, a local surgeon visited and demonstrated how to perform an autopsy using the program's SynDaver—a simulated cadaver. Students had the opportunity to interact with the surgeon and learn the skills for assisting with a surgery. Local employer partners can also benefit from the presence of simulators and simulated environments. Ransom Hospital, a medical facility close to Neosho County Community College, uses the simulated hospital on weekends to help train its incumbent staff members and run different scenarios. They replicate situations that have arisen at the hospital in order to develop and test new protocols to improve patient care. Employers that choose to provide a higher level of engagement and commitment can influence and shape the programs with which they partner. For example, Midland Care Connection, a community-based, home hospice health provider in Kansas (and one of the largest employers in the area), partnered with the Regional Simulation Center at Washburn Technical Institute to contribute to the training of its future workforce. Following suggestions from Midland, the college created a "home health environment" simulation that helps students prepare for patient care situations they would encounter working at Midland. Midland's influence has thus shaped training opportunities and allowed students to become better prepared to work in a home health care setting, as well as be more employable in the region. The college also receives guidance from an employer advisory board made up of representatives from local employers in the health care field who periodically meet with Washburn Tech representatives to provide feedback and industry support.

**"To be able to run that through as a multi-disciplinary approach and experience is really what real-life health care is. You hardly ever get that from a training environment."**

*Vice President,  
Midland Care Connection*

## PREPARING INSTRUCTORS TO TEACH SIMULATIONS

Changing instructional practice was identified across sites as perhaps the single greatest challenge to simulated WBL adoption. An emphasis on skill application in authentic settings requires that teachers adopt new instructional strategies and modify their curriculum to



integrate and align simulated scenarios to their learning objectives. As one state administrator observed, teachers are not trained in experiential learning and need considerable professional development to help them adjust to new instructional paradigms.

While there are many layers of “buy-in” necessary to introduce and sustain a simulated WBL environment, sites focused on two key groups: administrators and faculty. District and college administrators need to be trained on the best ways to provide their faculty with the incentives, training, and supports to adjust their practices, and instructors need to be willing to adapt their existing instructional methods and curricula to meet the needs of the program and their students.

Interviews with site staff offered insights into how different programs approached this training function. In Alabama, which has adopted a statewide strategy for offering simulated workplace experiences, new school directors attend an end-of-summer conference, hosted by the Alabama Department of Education, at which they receive information and training on the model. State education agency staff believe that this training helps school directors, some of whom are not knowledgeable about CTE, to develop a better understanding of the program goals and of how to support teachers in delivering instruction.

Classroom instructors also need training and support to effectively incorporate and use simulation in the classroom. Due to their hands-on approach, most simulated WBL offers a high degree of student autonomy and, in those CTE programs offering more comprehensive experiences, greater accountability toward their fellow students. This can be a difficult transition for teachers who have been trained in traditional pedagogical approaches that emphasize the instructor as the classroom leader. Sites such as the Lamar County School of Technology in Alabama chose to phase in their simulated workplace model, starting by

emphasizing practices that were already in widespread use in order to help teachers see the connection to their current methods. Staff in sites using a holistic approach to simulated instruction, such as the VEI program in North Carolina, stressed the importance of providing CTE teachers with professional training since the model, which creates a virtual business within a school, entails a more decentralized approach to instruction. One school even provided teachers with an extra month in their contract to afford extra preparation and training time.



Virtual Enterprises International students working in a group to complete their midterm case study project, Granville County, North Carolina.



Staff in sites using simulation tools, which tend to be more skill-targeted and technically sophisticated, reported facing a different set of issues. Several respondents referenced the possibility of expensive equipment going unused because faculty were not appropriately trained on its setup and use. Colleges must provide professional development in the operation of simulator equipment, as well as ongoing technical support, if staff are to be able to make full use of the technology and to manage software updates and troubleshoot technology glitches.

Some schools, especially postsecondary institutions, chose to hire a simulation coordinator who was responsible for collaborating with faculty to integrate simulations into the curriculum. Coordinators also may be charged with acquiring and maintaining the equipment and simulation space, as well as planning and leading students through simulation activities. In these instances, the simulation coordinator met with the classroom instructor beforehand to solicit input on the skills students should be practicing. For example, in Kansas, each of the colleges spoken to employed simulation coordinators, who often collaborated with other simulation coordinators to share best practices. Coordinators in the Kansas City

**“People that receive the simulator have to be able to have the knowledge to operate that simulator. You can’t just order one and expect anyone in the college to be able to run it.”**

*College Administrator,  
Neosho County Community College*

metropolitan area meet on a monthly basis as a part of Simulation User Group Across the Region to consider issues related to health care simulation. In addition to these groups of local practitioners, some states have simulation alliances that provide a forum for collaboration and help to train people in coordinator-like roles. There are also nationwide associations, like the Society for Simulation in Healthcare,<sup>8</sup> that provide similar services on a larger scale.

## FINANCING PROGRAMS

The cost of introducing simulated WBL is not inconsequential: All sites reported that program startup entailed some degree of investment for the purchase of equipment and/or retraining of staff. Costs varied across a number of dimensions, including the model used to deliver instruction, technical sophistication of simulation equipment, and costs for maintenance and repair.

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<sup>8</sup> See <http://www.ssih.org/>.



An agriculture science student works in her company's greenhouse, Clay County, West Virginia.

Alabama and West Virginia reported minimal start-up costs for their Simulated Workplace initiatives. Since most CTE programs already had the tools and classroom space needed to teach the curriculum, costs were primarily related to providing professional development for high school teachers and administrators. Due to its program protocols, West Virginia incurred additional costs for providing students with uniforms and implementing school-based drug testing, which are covered by the state. In Granville County, North Carolina, program administrators reported more substantial costs to cover annual dues to VEI, which is a proprietary program, as well as student travel to program competitions.

The start-up costs for simulation tools, particularly those using technologically advanced equipment, can be considerably more expensive. While many colleges used federal or state grants to purchase tools, funding restrictions in some cases limited expenditures for ongoing operations and maintenance. One college administrator told of a \$300K mobile training lab her college had purchased with a grant; when the grant ended, the college did not have sufficient resources to maintain the satellite uplink required for simulator use. High-fidelity simulators require regular software updates, technical support, and maintenance, which may require the continuing purchase of site licenses and repair contracts. Also, technology must be replaced on a regular cycle because it rapidly obsolesces. While simulation tools can produce some instructional cost savings, staff often reported that funding offsets were not sufficient to cover ongoing program operations and maintenance.



## PROGRAM BENEFITS

Interviews with respondents at project sites revealed that scant data exist to document the benefits that simulated WBL offers. At the time this paper was prepared, sites were still experimenting with strategies for collecting data. The most common data collected across states related to attendance; programs emphasizing employability skills reported the use of time clocks (Alabama and West Virginia) or key fob entries (Washburn Tech in Kansas) to track who is present during that workday and how long they attend. West Virginia is instituting the Balanced Scorecard that will allow schools to track their progress toward meeting eight state-identified indicators of success that are aligned with indicators of performance contained within the *Perkins IV* legislation.<sup>9</sup> Despite the lack of research-backed evidence, program staff members were generally enthusiastic about the benefits simulated WBL afforded.

## BENEFITS FOR STUDENTS

Project staff interviewed for this exploration of simulated WBL reported that students were more engaged when offered hands-on, simulated instruction. Irrespective of the simulated WBL model, educators shared that simulated WBL familiarizes students with processes or situations they are likely to encounter on the job, builds their confidence, and better prepares them for the transition to work.

Simulation also gives students the opportunity to apply the technical and academic skills they have learned to situations they are likely to see in the workplace, which helps them develop critical thinking and decision-making skills. The ability to learn from mistakes is an especially valuable aspect of simulated WBL—particularly in hazardous and high-stakes fields, like health care. By using high-fidelity simulators, schools like Washburn Tech provide their students with the opportunity to practice their skills, make mistakes, and debrief with instructors about their work in a protected environment where no harm will occur to the patient.

Each of the three models also offers some unique benefits for students. For instance, simulated workplaces may be the most suitable model to help build employability skills. Due

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<sup>9</sup> See Sec. 113(b)(2) of *Perkins IV*. A table showing the alignment between the West Virginia Balanced Scorecard and the eight *Perkins* indicators is in Appendix C: James Rumsey Technical Institute.



to their emphasis on replicating the workplace, these programs were reported in our exploration of simulated WBL as especially helpful for developing students' professionalism, teamwork, communication skills, and work ethic. They also develop leadership skills and strengthen students' sense of initiative. Although the programs we explored are in early stages and have only anecdotal evidence, employers are enthusiastic about early indications that the programs are building students' workplace readiness. School-based enterprise can offer similar benefits and was also noted as being a powerful tool for teaching entrepreneurship; in sites, emphasis was placed on hands-on practice of key competencies, such as business planning, operations, and financial management.

For more occupationally specific or technical training, particularly in high-risk fields, simulation tools were cited as especially beneficial for promoting critical decision-making. As



Students at Neosho County Community: Nursing College practice resuscitating a simulated patient, Kansas.

an administrator at Neosho County Community College commented on the use of simulation in their nursing programs: "You really can't test critical thinking skills in real life very well because you're talking about a human being, and you're not going to let them screw up... But in a simulator, that's where it shines—in teaching critical thinking skills—because they can make a mistake and not hurt anybody." Using peer observation and debriefing processes to analyze mistakes is a highly useful strategy for extending learning opportunities.

## BENEFITS FOR EMPLOYERS

Simulated instruction, regardless of which model is used, was noted as helping produce employees who are better prepared for the job. Students develop a better sense of the professional norms and behaviors that are expected of them and of the situations they are likely to face. By ensuring graduates carry these skills into the workplace, programs allow employers to focus their on-the-job training to more specialized skills. As one employer at a large manufacturer in West Virginia noted, "We'd rather manufacture products than teach kids soft skills. That's time we have to take away from the job. We'll teach them how Armstrong makes wood flooring and what our equipment does. I'd rather not sit there trying to teach about communications." This benefit is equally true for building students' readiness around more technical skills, where programs are producing graduates who have had experience handling many of the scenarios they are likely to encounter on the job.

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Simulated WBL gives employers opportunities to engage in CTE programs to ensure programs align with the specific skills they need for their workforce. Participation in advisory committees, simulation exercises, and review panels gives employers an opportunity to shape their future workforce. The ongoing employer involvement built into many of the programs creates a dynamic environment where programs can adapt more quickly to evolving workforce needs and conditions. It also can be a recruiting tool; respondents in North Carolina and West Virginia shared stories of students who were hired by employers that were involved in simulated WBL, whether at skills competitions, on program audits, or portfolio review boards.



Virtual Enterprises International students from Granville Central High School, North Carolina, placing at their state business plan competition.

## BENEFITS FOR SCHOOLS AND INSTITUTIONS

Simulation is a tool that allows schools and institutions to overcome a range of barriers to offer WBL to more students than they could serve otherwise. It is especially helpful in geographically isolated regions, where there may be few local work placements. Simulated WBL can help these schools save on transportation costs while connecting students with rigorous WBL opportunities. It also is helpful in fields where there are limited WBL placement opportunities, such as health sciences, where colleges are using simulation to overcome the limited availability of clinical field placements. Simulated WBL also can provide learning opportunities for students in hazardous fields where liability may make it unsafe or difficult for them to gain workplace experience.



Students watch their classmate practice welding skills in their Simulated Workplace, Alabama.

At the secondary level, sites report that the experiential learning opportunities are attracting more students to enroll in CTE courses. One director indicated that he expected enrollment to decrease when his center instituted Simulated Workplace because it was a more structured experience than students were accustomed to, but instead the program had seen annual enrollment increases for the past four years.

Many educators are passionate about the value of experiential learning and believe that simulated WBL



allows them to offer more beneficial learning opportunities. A community college president said that he saw his college's health sciences simulation program as a way to bolster his school's reputation for excellence and innovation, and that he was looking for ways to incorporate simulation into other programs at the college. Schools have also found that simulations provide an effective way to engage employers and the community. For example, employer reviews of simulation processes can engage employers without requiring high levels of coordination or time and do so without exposing them to legal or liability issues.

## BENEFITS FOR STATES

State directors see simulated WBL as a powerful tool for expanding career training opportunities to remote areas, which can strengthen the workforce. Several state administrators cited simulated WBL as an economic development strategy, as well. For example, Alabama is marketing its Simulated Workplace program to recruit industry by making the case that they will have a ready and waiting workforce.





## CONCLUSION: CONSIDERATIONS FOR ADOPTION

WBL gives students the opportunity to apply technical skills and academic knowledge acquired in the classroom within a real business or industry setting. High-quality work experiences can reinforce school-based instruction by providing students with a context for using information, as well as options for learning new career-readiness skills valued by employers. Unfortunately, a number of factors—ranging from safety to logistical—can restrict educators’ ability to place students at a jobsite. Simulated WBL aims to replicate the benefits of work-based instruction by allowing students to immerse themselves in a career-themed activity without ever leaving the classroom.

A review of the literature and online resources, a consultation with the Association for Career and Technical Education, and interviews with state education agency administrators and secondary and postsecondary provider staff surfaced numerous examples of simulated WBL characteristics but no single agreed-upon definition. For the purposes of this paper, “simulated WBL” is defined as

an immersive, career-themed experience—offered in a protected setting at an educational institution—that replicates workplace tools, processes, and/or environments to offer students realistic hands-on opportunities to practice, reinforce, and grow the technical skills, employability skills, and academic knowledge learned through classroom instruction.

A synthesis of simulated WBL offerings in five states revealed three differing models educators are using to organize and deliver instruction. Although these approaches may neither account for the universe of approaches to offering simulated WBL nor be mutually exclusive, as there are situations where multiple models are used in combination, they nonetheless offer a useful framework for understanding the forms it may take. The simulated WBL models include the following:

- **Simulation tools**—Equipment that reproduces industrial experiences or workplace situations in a safe, campus-based environment that allows students to develop technical competence through repetitive practice of core skills, as well as critical thinking in responding to high-stakes scenarios.



- **Simulated workplaces**—Classroom environments designed to immerse students in the culture and expectations of workplaces by replicating worksite settings, processes, and procedures to develop students’ technical and employability skills.
- **School-based enterprises**—Companies managed and operated entirely by students that allow them to develop entrepreneurship and employability skills, and practice technical ones, by operating a business that produces revenue for themselves or their schools.

As documented in this report, educators adopt simulated WBL for various reasons, including but not limited to the following:

- **Logistics**, due to the geographical isolation of rural providers or scheduling challenges that limit students’ ability to travel.
- **Safety**, which affects students’ ability to work in hazardous industries or situations that may threaten their own health or that of others.
- **Cost**, to reduce instructional expenses related to the use of high-cost consumables or mistakes due to students’ mishandling of equipment.
- **Access**, owing to limitations on the number of students that employers can reasonably accommodate.

Developing and implementing high-quality simulated WBL offerings can be a complicated task. Interviews with state and local staff in sites offering different approaches indicate that, regardless of the model, educators must anticipate and take steps to address a range of issues that affect program adoption. Our findings identified the following considerations.

## 1. DO THE UP-FRONT RESEARCH TO INFORM PROGRAM DESIGN

It is important to align simulated WBL in CTE program offerings with local assets and needs. There is little value in investing significant resources in outfitting classroom and training instructors if there are few job opportunities for program completers. Equally important is to understand the skills prioritized by local employers and select a program model that will reinforce their development. Adoption efforts should begin with the collection of workforce data—solicited from employers and industry advisory committees—to assess labor market needs.

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Educators in the nine simulated WBL sites we explored also emphasized the importance of visiting other CTE programs using simulated WBL during their program planning and design stages. Site visits were particularly important among educators implementing simulated workplaces, which entailed replicating key workplace features. These observations were also important in informing the types of professional skills and training that teachers would need to succeed in this new instructional paradigm.

Respondents also expressed the importance of researching the offerings of simulation tools and facility requirements before purchasing. It is important not only to compare the features and costs of different simulation technologies but also to compare the training, technical support, and maintenance offerings of each option.

### SITE EXAMPLES

*Engage employers and workforce development boards to inform program design.*

- **West Virginia** organized industry-specific advisory groups to identify workforce needs and business protocols and policies that became the basis for the goals and objectives of the Simulated Workplace initiative.
- **City College (Montana)** works closely with its local and state economic development agencies to help define upcoming needs to ensure programs are aligned.

*Visit other sites to inform program design.*

- **Alabama** sent a delegation of state and local CTE leaders and instructors to observe Simulated Workplace programs in West Virginia before adapting and launching their own statewide initiative.
- **Granville County Public Schools (North Carolina)** arranged for instructors to travel to Tennessee to observe VEI courses in action before implementing the program.
- Administrators at **Neosho County Community College (Kansas)** visited several other simulated hospitals and learned from their mistakes (e.g., failing to design rooms big enough to accommodate a large group of students) before designing their own facility.

*Research all considerations of simulation tools before investing.*

- **Miles Community College (Montana)** encourages programs to consider all aspects of simulation tools—functionality, warranties, licensing costs, tech support and training—before investing in the technology.



## 2. ENGAGE INDUSTRY THROUGHOUT THE PROCESS

State and local respondents highlighted the importance of involving employers and industry representatives in the design of simulated instructional environments. Engaging workforce representatives helps to ensure that simulations are aligned at the outset to actual workplace practices and industry standards. These interactions, occurring at regular intervals throughout the school year, help to keep employers involved and also provide students and teachers with necessary feedback.

Maintaining ongoing relationships with employers also helps to ensure that instruction keeps pace with evolving workplace conditions and demand. As one employer stated, “Our businesses don’t change every two to three years. Our businesses are changing every six months with new technologies and other things that are coming in.” Participants stressed the need for an ongoing feedback loop, which some achieved by hosting advisory councils at the program site or by arranging for periodic visits to simulated classrooms to solicit employer feedback on scenarios, equipment, and tools. Others used employers to run specialized trainings or conduct program quality reviews.



## SITE EXAMPLES

*Engage industry in program advisory committees.*

- **Alabama** and **West Virginia** have active industry advisory boards that provide ongoing input at the state level and at all local sites.
- At **City College (Montana)**, industry representatives give periodic feedback through program advisory committee meetings held during the course of the year. Those meetings, which take place at the college, allow employers to meet students and review the instructional setting.
- **Washburn Tech (Kansas)** convenes local health care employers to advise its simulation program; feedback from one particular employer led the college to add home health care settings to its simulation environments.

*Use employers to review student work and program quality.*

- In **West Virginia**, each Simulated Workplace program engages a team of local employers to visit classrooms to audit programs for compliance with OSHA standards, curricular goals, and fidelity to relevant industry standards.
- Employers in **West Virginia** serve on portfolio review panels. Seniors in the program develop and present a portfolio to the panel for feedback.

*Engage employers to train and guide students.*

- At **Neosho County Community College (Kansas)**, surgeons from the local hospital help train students in the college's surgical tech program by conducting surgeries on the college's SynDaver manikin.
- At **Stafford Unified School District 349 (Kansas)**, the local flour mill provided students the opportunity to develop and market a new flour blend, reviewing student marketing concepts, and a distributor helped students market the product at a trade show.

*Make simulation tools available to industry for incumbent worker training.*

- **City College (Montana)** has made its simulation tools available to a local mining company for incumbent worker training; this has also allowed students to participate in simulations to receive industry-sanctioned training exercises.
- **Miles Community College (Montana)** took a heavy equipment simulator to a safety week held by a local construction company for its employees, which helped build connections to the field.
- At **Neosho County Community College (Kansas)**, staff from a local hospital use the college's simulated hospital to trouble-shoot scenarios and refine procedures, which has promoted relationship building between college staff and students.



### 3. BUILD BUY-IN FROM KEY EDUCATION STAKEHOLDERS

Stakeholder buy-in is essential for simulated WBL success, especially during the start-up phase. As one simulation coordinator observed, “You have to have the buy-in from the administration. If you don’t, you’re not going to have any success.” Consequently, it is essential that school/college, district, and/or state leadership (depending upon the scale of implementation) embrace the vision and value of simulated, experiential learning. Leaders must understand the functions and purpose of simulated WBL before they can champion the undertaking, so it is also important to provide stakeholders at all levels with opportunities to experience simulations first-hand to build their support.

Instructor buy-in is also key to program success. Teaching within a simulated WBL model necessitates a dramatic cultural and pedagogical shift as students take a more active role in their learning. Sites using sophisticated new tools also must have advanced technical understanding to ensure they can take full advantage of the technology. One way of gaining support is to offer targeted professional development and training. This can take many forms, including offering one-on-one coaching, hosting workshops, creating communities of practice, and enlisting support from student leaders. Some schools chose their strongest or most passionate teachers to be the first implementers to test and refine the model and then, once programs were operating successfully, encouraged instructors who were less comfortable with change to visit classrooms to gain a first-hand appreciation of its benefits.

To help faculty make this transition, state and local CTE directors advise that it is best to start small, both in the number of sites and the scope of the program offerings. Beginning with a handful of “early adopters,” who are most open to trying a new approach, and working with them to refine the model can lead to early successes that can be showcased to build enthusiasm in the field. CTE directors also suggest focusing on a few core elements of a program model before adding in other elements, so as not to overload instructors with multiple new demands at once. In the words of a center director from Alabama: “This is something that needs to be phased in. If you don’t phase it in, it’s too big, it’s hard to get buy-in, and it seems like you’re upturning the whole apple cart for everybody.”





## SITE EXAMPLES

*Work with leaders to ensure they are champions of simulated WBL.*

- **Neosho County Community College (Kansas)** first sought to get its board and administrators to support making a significant financial investment in the simulated hospital. Outreach focused on how the simulation could be a public relations tool and jumping-off point to offer premier programs across the college.
- **Lamar County School of Technology (Alabama)** advises shared-time CTE centers to have clear and regular communications with principals and counselors from their feeder schools so staff understand the program and can direct students their way.
- In **North Carolina**, state leadership is promoting the benefits of VEI. The state formally recognized VEI in its approved courses, and the state director has been an enthusiastic supporter.

*Support faculty in understanding and embracing the culture change.*

- **West Virginia** state education agency staff worked with schools around the state to help pilot successful models of Simulated Workplace classrooms and then invited educators from other West Virginia schools to see the practices firsthand.
- At **Bryant Career Tech Center (Alabama)**, leadership focused on helping teachers see how they were already implementing many of the Simulated Workplace protocols to help reduce the barriers to adoption. They have also educated teachers on the benefits of shifting to a more facilitative role, with one lead teacher noting, “I see Simulated Workplace as a way to get 20 teaching assistants (i.e., students) in your class.”
- **Neosho County Community College (Kansas)** provided release time to allow faculty to watch live and videotaped simulations that stoked their enthusiasm for the approach and helped them understand how it could deepen student skills.

*Keep things manageable by phasing in new programs gradually.*

- **Lamar County School of Technology (Alabama)** chose to phase in their implementation of Simulated Workplace protocols by focusing on just a few protocols in the first year, working closely with teachers to make sure those elements were working as planned before adding on more in subsequent years.
- **West Virginia** took a deliberate approach to scaling up the number of program sites, starting with a small number of ready teachers and then expanding to the networks and colleagues of those early adopters for the second stage of expansion before continuing to roll out the program more widely.



## 4. PLAN AND BUDGET FOR THE LONG TERM

Budgeting for simulated WBL in CTE programs can look different from CTE programs that do not include simulated WBL. It is important to carefully consider both start-up and operating costs and, ideally, identify stable funding sources before launching simulated WBL. This is especially important for programs using capital-intensive simulation tools and technologies, which can require significant ongoing operating and maintenance costs beyond the initial capital investment. Depending on the CTE program, simulation technologies may also require a full-time coordinator, particularly in fields relying on sophisticated, highly advanced instructional tools or protocols. This can help to ensure that training conforms to industry best practice.

### SITE EXAMPLES

*Identify and budget for long-term operating costs, not just equipment purchase.*

- **Washburn Tech (Kansas) and Neosho County Community College (Kansas)** encourage health care programs to hire a full-time simulation coordinator to manage the complex work involved in creating high-fidelity health care simulations. This is consistent with best practices noted by the International Nursing Association for Clinical Simulation and Learning.

*Develop a sustainability model for covering operating and maintenance costs.*

- **City College (Montana)** is making its simulation technologies available to employers and providing customized incumbent workers trainings on a fee basis. They advise building operating and maintenance expenses into initial grant budgets when using grant funds to purchase simulation tools.
- **Neosho County Community College (Kansas)** instituted a modest increase in student lab fees to establish a replacement fund for health manikins, which are typically upgraded every three to five years. They also paid for a full-time simulation coordinator by recouping expenditures for clinical instruction, since the simulations can count for up to 20 percent of clinical hours.
- **Granville County Public Schools (North Carolina)** has obtained small grants and sponsorships from local businesses to help cover dues and other expenses related to its VEI program.
- **Stafford Unified School District 349 (Kansas)** recaptures 30 percent of earnings from students' school-based enterprise sales to help offset program costs.



## IN SUMMARY

Our exploration of simulated WBL in nine sites in five states revealed three different models currently used to offer simulated WBL, with each providing different advantages. Although some variation was observed, at the secondary level, educators were primarily using simulated workplaces and school-based enterprise to develop students' employability and foundational technical skills. *Simulated workplaces* are intended to replicate jobsite conditions and emphasize the acquisition of employability skills, while *school-based enterprises* operate as student-run businesses that produce and sell products or services, allowing students to experience all facets of running a business. These programs emphasized experiential learning, often cutting across a span of careers in a given industry area, to expose students to a range of occupations and help them master basic career-readiness skills. At the postsecondary level, *simulation tools* were used more frequently, either on a stand-alone basis or as part of a realistic simulated physical work environment. Many sites choose to use simulation tools to emphasize and teach occupationally specific skills and practice basic and advanced skill applications.

Institutions and educators considering the adoption of simulated WBL need to consider each model's advantages and tailor their program offerings to their specific community's needs. This includes engaging with local, state, or regional employers to ensure that the simulated WBL develops the skills that local industry prioritizes as being in greatest demand. It is also important to provide professional development and ongoing training for instructors to help them develop the pedagogical and technical skills needed to deliver effective experiential CTE learning opportunities. Finally, these programs should bear in mind the costs associated with acquiring new technologies or specialized facilities, anticipating and planning for the full range of start-up, maintenance, and sustainability costs.

While interviewees had overwhelmingly positive comments about simulated WBL and its benefits, both for schools and students, they acknowledge that it is based on anecdotal evidence. Most programs are in their early stages of implementation and, as of yet, lack processes and standards for rigorous program evaluation. In order to expand and refine the practice of simulated WBL in CTE, it will be crucial to refine sites' evaluation procedures and conduct research into the benefits and outcomes of CTE programs using simulated WBL.



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## APPENDIX A: METHODS

The main objective of this exploration of simulated work-based learning (WBL) is to determine the extent and depth to which states may be using simulated WBL to provide their secondary and postsecondary students with career-themed education and training. It also examines the potential benefits that simulated WBL may offer students who do not have ready access to other forms of WBL. The National Center for Innovation in Career and Technical Education (NCICTE) researchers used the following research questions as a basis for this exploration:

1. What is simulated WBL and what are its programmatic features?
    - What types of experiences are offered through simulated WBL at the secondary and postsecondary education levels?
    - How is instruction delivered (e.g., virtually; using hands-on, in-class applications; via school-based enterprises)?
    - In what industry fields are simulated WBL options most prevalent?
    - What forms of technology-enabled instruction are being used?
  2. How are simulated WBL opportunities in career and technical education (CTE) programs created?
    - What is the motivation for states or local providers to develop simulated WBL (e.g., economic, geographic, and/or safety concerns)?
    - Who participates in program development?
    - How are employers engaged in program design?
  3. How prevalent is simulated WBL?
    - What are the characteristics of sites offering simulated WBL experiences?
    - Have any states or local providers made a significant commitment to using simulated WBL for instruction?
    - What is the scale of student participation in sites offering simulated WBL experiences?
  4. What evidence exists on the benefits of simulated WBL?
    - What are the most promising models identified in the literature?
    - Are there outcome data that might be used to provide insight into program effectiveness (e.g., rates of student completion and transition into employment
-



- or advanced education, completion of industry certificates or credentials, workplace effectiveness)?
- How effective is simulated WBL in various modes of delivery (e.g., virtually; using hands-on, in-class applications; via school-based enterprises)?
5. What are the obstacles to developing simulated WBL in CTE programs?
- What are the most common challenges to program implementation?
  - What strategies are being used to overcome obstacles?
  - How does the cost of offering simulated WBL differ by approach?
  - To what extent are districts with limited resources able to implement simulated WBL in CTE programs?

Researchers conducted literature and internet research (detailed in Appendix B) on the extent to which simulated WBL is currently offered throughout the United States and drew on those findings to identify five states that currently offer state-wide or local simulated WBL in CTE programs at the secondary or postsecondary level. Proposed states were finalized for inclusion based on input from the U.S. Department of Education's Office of Career, Technical, and Adult Education (OCTAE).

Once states were identified, NCICTE researchers began data collection by conducting structured telephone interviews with each state's CTE director, using a standardized protocol developed in consultation with OCTAE staff. Copies of the interview protocols are included in this appendix. At the end of each state CTE director interview, we requested the name of a local CTE program administrator within their state who we could interview to gather targeted simulated WBL program information at the local level. During the interviews with state and local educators, we requested up to two additional recommendations for employers or other educators associated with the simulated WBL program with whom we should talk. For states that yielded three or four employer contacts, we narrowed the selection to the two that were most involved with these programs at the state or local level.

To gain a deeper understanding of simulated WBL programs in the United States, researchers also contacted the Association for Career and Technical Education (ACTE) for pertinent information regarding simulated WBL. Exhibit A-1 is a list of all interviewees for this phase of the project.



**Exhibit A-1: Distribution of interviewees, by state**

Interviewees	Alabama	Kansas	Montana	North Carolina	West Virginia	United States
State CTE Director	1	1	1	1	1	
Local CTE Administrator	2	3	2	1	1	
Employer Partner		1			3	
Association for CTE						1

All telephone interviews, conducted by NCICTE researchers, lasted approximately an hour to an hour and a half and were audiotaped. The audio tapes were used to augment notes written up post-interview. Interview questions were e-mailed to the interviewees prior to the scheduled interview so that they could have time to review and gather any supporting documentation that they could share with NCICTE researchers. The protocols were used to standardize interviews to ensure that comparable information was obtained from each interview. Interview teams consisted of a lead interviewer and a note-taker, and all NCICTE staff participating in interviews were trained on the use of the protocols.

## INTERVIEW PROTOCOLS

The interview protocols were designed to gather detailed information outlined in the original research questions. Four protocols were developed to interview the following respondents:

- CTE State Directors
- Local CTE Educators
- Industry Partners
- Industry Expert/ACTE

***Text throughout the protocols in all capital letters indicates interviewer instructions that are not to be read aloud to respondents.***

### ***CTE State Directors***

1. First, let me just verify the program information that we sent to you via email: [VERIFY THE FOLLOWING. IF NOT KNOWN AHEAD OF TIME, ASK FOR THIS INFORMATION]
  - a. PROGRAM DESCRIPTION
  - b. INDUSTRY FIELD(S)
  - c. SCOPE
  - d. YEAR STARTED
2. How would you define simulated work-based learning, in your own words?



## Program Creation

3. What was the motivation behind developing a statewide approach for offering simulated WBL programs (e.g., economic, geographic, and/or safety concerns)?
4. What has been the process used to develop simulated WBL programs in your state?
5. Who participated, or has participated, in the development of these programs?
6. How were employers engaged in the design of these programs, if at all?

## Programmatic Features

7. How is the simulated instruction delivered (e.g., virtually; using hands-on, in-class applications; via school based enterprises)?
8. What types of technology-enabled instruction are being used? (An example would be computer-simulated welding practice.)
9. How are businesses in your state involved with simulated WBL
  - a. With respect to curriculum, assessment, and instruction?
  - b. With respect to resources? (including financial, equipment and materials, and in-kind donations)
10. Do you capture any data or metrics on your state's simulated WBL programs (e.g., number of sites offering, students participating, student outcomes, etc.)?
  - a. If so, how are these data used by the state?
  - b. Would it be possible for us to get a copy of these data? (We plan to use this data to provide further information on the types of data collected about simulated WBL programs.)

## Challenges/Benefits/Costs

11. What have been the most common challenges to program implementation?
    - a. What strategies were/are being used to overcome those challenges?
  12. What do you see as the greatest benefit of simulated WBL programs
    - a. For students?
    - b. For programs, schools, districts?
    - c. For employers?
    - d. For the state?
    - e. For the local, regional, or state economy?
  13. What tradeoffs between simulated WBL vs. traditional WBL did you consider when developing your program?
  14. Is there a cost-savings component in using simulated WBL in comparison to other WBL approaches?
-



- a. How does the cost of using simulated WBL differ by instructional delivery?
15. What resources did your state need to implement its simulated WBL programs?
  - a. Are any of your state's [districts or community colleges] unable to implement simulated WBL programs due to limited resources?
  - b. Do you receive any incentives to implement simulated WBL programs? From whom?
16. If you were implementing a new simulated WBL program today, what would you do differently?
17. If you could give one piece of advice to a state considering developing a simulated WBL program, what would it be?

### Follow-Up

18. Can you recommend the names of two organizations or individuals within your state with whom we could speak further about your state's simulated WBL programs?

### CTE Local Educators

1. What is your role at [institution/district]?
2. How long have you been in your current role?
3. What is your professional background? What did you do before this current position?
4. Now, let me just verify the program information that we sent to you via e-mail: [VERIFY THE FOLLOWING. IF NOT KNOWN AHEAD OF TIME, ASK FOR THIS INFORMATION]
  - a. EDUCATOR ROLE
  - b. PROGRAM DESCRIPTION
  - c. INDUSTRY FIELD(S)
  - d. SCOPE
  - e. YEAR STARTED
5. How would you define simulated work-based learning, in your own words?

### Program Creation

6. What was the motivation behind developing simulated WBL programs in your [institution/district] (e.g., economic, geographic, and/or safety concerns)?
  7. What process was followed to create simulated WBL programs in your [institution/district]? Specifically,
    - a. Who participated in the development of these programs?
-

- b. How were curricula and instructional tools selected?
- c. Were employers contacted to help with program design?
- d. How were employers engaged in program design?
- e. What other groups (e.g., professional associations) were consulted?
- f. Are there written guidelines for these programs?
  - i. If yes, would it be possible for us to get a copy of these guidelines, for reference?

### Programmatic Features

- 8. For the current simulated WBL program(s) operating in your [institution/district]
  - a. What is/are the instructional method(s) used for your simulated WBL programs (e.g., virtually; using hands-on, in-class applications; via school based enterprises)?
  - b. What types of technology-enabled instruction are being used? (An example would be computer-simulated welding practice.)
  - c. What is your best estimate of the percentage of students in your [institution/district] who participate in programs offering simulated WBL experiences?
  - d. How are businesses involved with simulated WBL programs at your site (e.g., mentorship, skills assessment, instruction, program evaluation)?
  - e. Have you seen any differences in how simulated WBL is offered in different industries? If so, what do you think accounts for these differences?
- 9. Do you capture any data or metrics on simulated WBL programs (e.g., student outcomes, etc.)?
  - a. If so, what are the data used for?
  - b. Would it be possible for us to get a copy of these data? We plan to use this data to provide further information on the types of data collected about simulated WBL programs.)

### Challenges/Benefits/Costs

- 10. What have been the most common challenges to program implementation?
    - a. What strategies were/are being used to overcome those challenges?
    - b. If you were implementing a new simulated WBL program today, what would you do differently?
  - 11. What advantages does simulated WBL offer over traditional WBL?
  - 12. What do you see as the greatest benefit of simulated WBL programs
    - a. For students?
    - b. For your school district/institution?
-



- c. For participating employers?
  - d. For the state?
  - e. For the local, regional, or state economy?
13. What strategy or strategies have worked well in implementing simulated WBL programs?
14. Is cost savings taken into consideration in offering simulated WBL in comparison to other WBL approaches?
- a. How does the cost of offering simulated WBL differ by instructional approach or delivery method?
15. What resources are needed to implement simulated WBL programs?
- a. Have any sites been unable to implement simulated WBL programs due to limited resources?
  - b. Are there any incentives for implementing simulated WBL programs?

### **Follow-Up**

16. Can you recommend the names of two organizations or individuals within your state with whom we should speak?

### **Industry Partners**

1. How did your company get involved with [state/institution]'s simulated WBL program? When and how was your involvement solicited?
  2. Why did your company get involved with the program?
    - a. Were you offered any incentives to participate? By whom?
  3. How was your company involved with the design/creation of [state/institution]'s simulated WBL programs? Specifically,
    - a. Did you participate in curricular design and the selection of assessments?
      - i. If yes, what form did this involvement take?
    - b. As the program has evolved, how as your involvement changed?
    - c. What form does your current involvement in the program take?
  4. What types of financial or nonfinancial involvement does your company have with the program? Specifically,
    - a. Does your company provide resources to help with the operation of the simulated WBL program?
    - b. Does your company receive any financial or other benefit from the state [school district/institution]?
-



5. What do you see as the greatest challenge in being involved in a simulated WBL program?
6. What is the greatest benefit with being involved in a simulated WBL program
  - a. For your company?
  - b. For students?
  - c. For the state?
7. If you could give one piece of advice to a company considering becoming engaged in a simulated WBL project, what would it be?

### **Follow-Up**

8. Can you recommend the names of two organizations or individuals within your state with whom we should speak?

### **Industry Expert/ACTE**

1. Could you give us a brief overview of ACTE and the kind of work you do?

### **Type of Work and Definition**

2. Does ACTE have a formal definition of simulated work-based learning?
  - a. If not, how would you define simulated work-based learning, in your own words?
3. What is the extent and type of work that ACTE has done regarding simulated WBL (e.g., state vs local levels, and policy, research, technical assistance, etc.)?

### **Research/Policy**

4. Are you familiar with the level of research that has been done to define or describe simulated WBL? If yes, would you say the level of research in this area is extensive or not very extensive?
5. Do you know any states that conducting research regarding simulated WBL?
6. Which states or programs do you see as taking the lead on developing simulated WBL?
7. Has ACTE been involved with, or seen examples of, policy about simulated WBL, either at the state or local levels (e.g., assisting states with developing policy, policy research, etc.)?
  - a. If yes, briefly describe the type of policy and how ACTE has been involved.

### **Programmatic Features of Simulated WBL**

8. What are the primary ways you see simulated instruction being delivered (e.g., virtually; using hands-on, in-class applications; via school based enterprises)?
    - a. Do you see it being used more extensively in some fields than others?
-



9. What types of technology-enabled instruction do you see being used? (An example would be computer-simulated welding practice.)
  10. How have you seen businesses involved with simulated WBL?
  11. What do you see as the greatest benefit of simulated WBL programs?
    - a. Do you see opportunities for simulated WBL programs to help provide access for students/communities that are geographically isolated or otherwise underserved?
  12. What have been the most common challenges for states to implement a simulated WBL program?
  13. If you could give one piece of advice to a state considering developing a simulated WBL program, what would it be?
  14. How do you see simulated WBL changing in the future – either in the scale or the nature of its use?
-

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# APPENDIX B: LITERATURE AND WEB REVIEW

## SIMULATED WORK-BASED LEARNING IN THE LITERATURE

Our review of the literature on simulated work-based learning (WBL) revealed very little that discusses it within a career and technical education (CTE) context. In fact, our research team was only able to find studies that mentioned simulated WBL as a subcategory of WBL. A notable exception is the health care field, in which there has been extensive research on the use of simulators and simulations to train medical professionals. While illuminating, these studies cannot be generalized across fields, and their inclusion here should be viewed as an attempt to fill a large gap requiring further study.

At the beginning of this project, our research staff searched professional and academic CTE journals, Google Scholar, online resources from national organizations, such as ACTE and Advance CTE, and government literature from the U.S. Department of Education. These searches only revealed two sources, both of which relegate simulated WBL to a subcategory of WBL. Based on a review of the relevant literature, and data collection from 13 site visits across the state of California and interviews with educators and scholars, Darche et al. (2009) categorize simulated WBL as a WBL activity that simulates a work environment in the event that extenuating circumstances (rural community, student socioeconomic status, district/school funding, insurance difficulties) limit a student's ability to participate in a standard WBL environment. For their report, Haltinner et al. (2012) collected qualitative data about school-based enterprises in secondary schools across Michigan and Wisconsin from CTE educators using a web-based survey. Based on their analysis of 156 responses, the authors found that educators place simulated WBL under the same umbrella as school-based enterprises—a school-based, WBL activity. Neither of these papers provide any detail or nuance to simulated WBL, though Darche et al. allude to potential reasons why it may be necessary.

Federal legislation also provided little insight. Neither the *Workforce Investment Act*<sup>10</sup> nor the *Workforce Innovation and Opportunity Act* make any reference to simulated WBL

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<sup>10</sup> See <https://www.doleta.gov/usworkforce/wia/act.cfm>.



environments.<sup>11</sup> The *School-to-Work Opportunities Act of 1994* provided a definition of WBL but made no mention of simulated environments. Draft legislation introduced on June 28, 2016, to reauthorize the *Carl D. Perkins Career and Technical Education Act of 2006 (Perkins IV)*, H.R. 5587—the *Strengthening Career and Technical Education for the 21st Century Act*, acknowledges simulated environments within their mention of WBL. This is the first mention of simulation within U.S. legislation.<sup>12</sup>

## WEB REVIEW

Web searches were used to fill in the gaps that our literature review left behind. We found online resources from professional organizations and CTE programs that provide services specific to non-worksite work-based education. One of the largest and most prevalent of these organizations is DECA, an international nonprofit that provides secondary and postsecondary students with school-based curriculum to prepare students for careers in hospitality, management, finance, and marketing. Students create and run school-based enterprises, typically in the form of a student store, and gain valuable skills that are directly applicable to “real-world” careers.<sup>13</sup> Virtual Enterprises International (VEI) is another organization that helps students with the technical expertise, employability skills, and experience in business and marketing through providing the platform, resources, and activities to create and run their own virtual business. VEI gives students the opportunity to run a classroom-based business called a “firm,” complete with an organizational hierarchy and structure, while also interacting with other “firms” from around the world.<sup>14</sup>

In addition to organizational resources found on the web, many state educational programs made reference to implementing simulated WBL. A majority of states, including North Carolina and Kansas, which make use of simulations, do not have a state-level policy regarding the use of simulation and defer to districts to make decisions and implement programs that best fit their students’ needs. Other states, such as Virginia, mention simulated WBL within their state CTE guides and strategic reviews of existing practices as a potential method of providing WBL in the future but do not provide any greater detail (Virginia Department of Education 2014).<sup>15</sup> In contrast, some states, such as West Virginia, have a

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<sup>13</sup> See <http://www.deca.org>.

<sup>14</sup> See <http://www.veinternational.org>.

<sup>15</sup> The Virginia Department of Education (2014) contributes a review of both literature and current practices within secondary schools in Virginia to identify opportunities for the expansion of WBL across the state. This review includes qualitative data collection and analysis of surveys administered to CTE teachers throughout the state regarding educational current practices and training levels.



state-wide policy regarding the implementation of a single program across all districts.<sup>16</sup> The resources posted by these states were very helpful in defining simulated WBL characteristics that were not present in any literature, such as student acquisition of employability skills, employer engagement for nonworkplace-based programs, classroom-based workplace structure and systems, and issues of safety.

## SIMULATED WORK-BASED LEARNING IN NURSING

While there is little research regarding simulated WBL overall, the health care field has an extensive research base regarding simulation use in education and training. Curtin and Dupuis (2008) reviewed a “quality simulation program” with medium-fidelity manikins. Program success was measured through student feedback and perception of skills practiced and gained. Their review begins, “The benefits of simulation in nursing education are well documented.” Documentation within the health care field shows four movements to date in health care training simulation use with the current (fourth) movement dealing with “advances in accessibility as well as beginning forays into the area of teaching and learning and research.”<sup>17</sup> The prevalent use of simulation tools and simulated environments in the nursing field has given rise to the International Nursing Association for Clinical Simulation and Learning (INACSL), an international teaching and resource organization that provides resources and oversight for simulation use in the nursing field. In 2015, the INACSL published a list of standards for best practices in simulation, including the use of consistent terminology, maintenance of professional integrity, development of clearly written participant objectives, inclusion of multiple methods of simulation, acquisition of a proficient facilitator, time for adequate debriefing of simulation events, use of appropriate assessment, opportunity to engage in simulation enhanced inter-professional education, and design of adequate simulations.

A variety of studies focused on student outcomes from the use of simulation in training for nurses favors human patient simulation. The majority of these studies focus on the use of high-fidelity simulation tools, allowing for a “real-life” presentation of different medical scenarios (Curtin and Dupuis 2008; Hayden et al. 2014; Issenberg et al. 2005; Weaver 2011). These studies focusing on high-fidelity simulation report more beneficial outcomes than scenarios where lower fidelity simulations are used (Lateef 2010).<sup>18</sup> Greenawalt (2014) reported on the National Council of State Boards of Nursing National Simulation Study, a

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<sup>17</sup> Harder (2009) provides a review of literature on developments in the use of simulation in training for nursing throughout the 20th century.

<sup>18</sup> Lateef (2010) presented a literature review on the benefits (skills and teamwork development, increased patient safety) of realistic simulations in medical training.



national randomized, controlled, multi-site, longitudinal research study of the use of simulation for training of pre- and in-service nurses. To measure the training and performance outcomes for three groups of students (50 percent clinical simulation, 20 percent clinical simulation, and control), the authors used performance in seven courses common to all institutions, and valid and reliable assessments, such as the National Council Licensure Examination and the Clinical Learning Environment Comparison Survey. In this report, she defines high-fidelity simulation with the following requisite components: formally trained and dedicated simulation faculty; employing INACSL's standards of best practice in simulation; using a theory-based debriefing method that engages subject matter experts; and creating a realistic simulation environment that uses industry-standard equipment and supplies, such as human patient simulators, a simulated clinical environment, virtual procedure stations, and electronic medical records. One aspect of realistic simulation environment created is the use of high-fidelity medical manikins; these manikins, created and provided by medical equipment companies, can “interact” with students using computer programs and by providing vital sign reaction to simulated treatment (Lateef 2010). Issenberg et al. (2005) reviewed 109 journal articles from five academic databases and coded conditions for the use of high-fidelity simulation. The most important condition was “providing feedback” with 47 percent of the studies examined indicating that this was of highest importance.

The use of high-fidelity simulation and the presence of a scale of industry best practices allows for researchers to study and measure a wide variety of objective and subjective outcomes: student confidence, knowledge growth and transfer, technical skill gain, critical thinking, overall satisfaction, and stress levels. Overall, research shows that the use of high-fidelity simulation in nursing education has resulted in educational benefits to nursing students in critical thinking, confidence, and growth of knowledge and skills. There is a need within the field for additional interprofessional learning and collaborative practice in order to be most successful at replicating the actual medical environment.

Simulation use in training for nurses has been shown to improve critical thinking skills (Cant and Cooper 2009; Hayden et al. 2014; Weaver 2011). Cant and Cooper (2009) used the Critical Appraisal Skills Programme criteria to evaluate 12 experimental and quasi-experimental studies relating to outcomes for nursing programs using simulation as a method of instruction. They found 45 percent of the studies they evaluated that mentioned critical thinking to have found statistically significant gains in critical thinking skills for students using simulation. These studies point to using simulation as a tool to provide key skills related to an incumbent nurse's ability to critically think and make decisions, such as problem recognition, clinical decision-making, prioritization, clinical implementation, and reflection (Hayden et al. 2014). In the study by Hayden et al. (2014), different groups of



nursing students receiving different amounts of simulation training (none, 25 percent, and 50 percent) were given diagnostic tests to determine their abilities in the aforementioned areas at three intervals (six weeks, three months, and six months). All groups showed statistically similar gains in all areas, no matter the “dosage” of simulation received. While Hayden et al. provide diagnostic results pointing to the positive impact of simulation, Weaver (2011) analyzed existing literature from academic and professional databases to judge the critical thinking outcomes of students using high-fidelity patient simulation as a part of their training program. The literature review uncovered that students self-reported that the use of simulation and their overall training had been helpful in training them to critically think and problem solve.

Nursing students participating in programs involving simulation as a replacement for part of their required clinical time also report an increase of knowledge after they have performed and practiced skills learned through simulation (Weaver 2011). They report having the adequate knowledge and skills to perform better on real-life medical tasks (Curtin and Dupuis 2008). Beyond student perception, these gains are also corroborated using diagnostic assessments of student skill; there is statistically significant knowledge gain over time greater than or equal to the knowledge gain of students only experiencing clinical training and no simulation (Cant and Cooper 2009). For students participating in simulation as a replacement for part of their clinical training, they receive the added educational benefits of being exposed to and able to practice uncommon medical events and procedures, as well as the opportunity to practice their skills in a setting where they can receive timely feedback and assessment (Lateef 2010). One study even shows that there can be comparable results between students receiving 100 percent clinical time and students receiving up to 50 percent of their training time in a simulated environment (Hayden et al. 2014); another study, however, indicates that students participating in simulation actually perform better than their 100 percent clinical counterparts (Lateef 2010).

One of the ways in which simulation can be beneficial to nursing trainees is that it can offer an environment in which to engage in interprofessional learning and collaborative practice, not only with their cohort and instructors, but also with other medical professionals from varying fields (National League for Nursing Board of Governors 2015). Studies increasingly stress the need for collaboration in simulation and training for crews, teams, work units, and organizations as a way to make them stronger and better prepared to work in the medical setting, where, on any given day, there could be a variety of cases requiring collaboration and contact with two or more departments (Gaba 2004).<sup>19</sup> Additionally, in order to practice and reevaluate skills, incumbent nurses and medical staff could benefit from participation in

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<sup>19</sup> Gaba (2004) provides a literature review that outlines the dimensions of use for simulation (target trainees, settings, benefits, etc.).



simulations with trainees. Not only can they practice skills and procedures together, but they can also build on their communication and teamwork practices to be more efficient and effective care givers (Aebersold and Tshannen 2013).<sup>20</sup>

Finally, nursing students often see a gain in professional confidence after using simulation as a training mechanism. They report that they feel more confident in their abilities to transfer the skills and procedures they have practiced in simulation settings to clinical settings with real-life patient treatment and contact (Curtin and Dupuis 2008). In the simulation setting, students are in a “do no harm” environment; they can make mistakes without irreparable consequences and are given multiple opportunities to practice the treatment (Lateef 2010; Weaver 2011). They also have increased exposure to simulated emergency or rare medical situations, giving them the opportunity to practice and apply their responses in that scenario (Lateef 2010). Having practiced and experienced these situations before, students feel more confident in their abilities and training, as the scenario was relatively free of negative consequences, and they were able to debrief the scenario and continue to practice their skills.

In summary, while the use of high-fidelity simulation in nursing has been able to provide valuable information on the outcomes of the use of simulation, we are unable to state generalizable results that would be wholly transferable to simulated WBL within a general CTE setting because the majority of these studies are field specific. There is a large gap in research and ample room for further study into how the use of simulated environments can be used to prepare secondary and postsecondary students.

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<sup>20</sup> Aebersold and Tshannen (2013) provide an overview of techniques used in simulation and a review of relevant research regarding ways simulation can be used to positively impact patient care.



## APPENDIX C: SITE INTERVIEW SUMMARIES



**SITE NAME: BRYANT CAREER  
TECHNICAL CENTER**

**Location: Irvington, Alabama**

### ***Overview***

Alabama has modeled its Simulated Workplace after the West Virginia Simulated Workplace initiative. Piloted in 2015, Simulated Workplace is used within all 16 career and technical education (CTE) career clusters recognized by Alabama. Although there is no formal mandate, Alabama's goal is for every CTE center in the state to become a Simulated Workplace by school year (SY) 2018–19.

Bryant Career Technical Center (Bryant Tech), a secondary-level CTE center located in Irvington, Alabama, offers each of its 13 CTE programs as a Simulated Workplace. The CTE programs include:

- Cosmetology
  - Plumbing/Pipefitting Technology
  - Horticulture
  - Welding Technology
  - Health Science
  - Turfgrass Management
  - Industrial Maintenance
  - Automotive Technology
  - Agricultural Mechanics
  - Computer Services and Information Systems
  - Electrical Technology
  - Aircraft Mechanics
  - HVAC-R
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## ***Filling a Need: Origins***

On a state level, Alabama began to seek a way to improve the employability skills of graduating students after receiving negative feedback from industry partners. According to partners, while Alabama's graduating CTE students had strong technical skills, they did not possess basic employability competencies, such as the ability to show up on time and work as a member of a team. Simulated Workplace, which is designed to help high school students gain employability skills, is promoted by the state as a benefit to industries choosing to locate themselves in Alabama.

At Bryant Tech, the motivation behind developing Simulated Workplace was Alabama's efforts to move all CTE centers toward integrating Simulated Workplace into their programs. Piloting began in SY 2015–16, with the goal of full implementation by SY 2018–19. Representatives from Bryant Tech attended professional development training on Simulated Workplace and received copies of the Simulated Workplace manual. From this experience, the staff at Bryant Tech was able to see that some, though not all, of the components highlighted in the 12 protocols of Simulated Workplace<sup>21</sup> were already in place at Bryant Tech.

Instructors determined that the best way to fully incorporate Simulated Workplace into their school was to divide the 12 protocols of Simulated Workplace into three phases. The first encompassed protocols that were already in use or that staff had made some progress toward adopting. Implementation efforts around the remaining protocols were split evenly between the other phases, with four new protocols added in phase two and four in the final phase. Bryant Tech is currently in the second phase of implementation and plans to continue to introduce protocols until full implementation in SY 2018–19.

## ***How It's Set Up: Structure***

Simulated Workplace at Bryant Tech takes the form of a classroom workplace where students create and run their own companies. Students are taught using professional-grade equipment, rather than simulation tools. The one exception is for the health sciences programs, which incorporate simulation tools due to the need to replicate patient care or perform invasive procedures that cannot be performed by students.

Simulated Workplace has not changed the technical curriculum at Bryant Tech, though it has added a stronger foundation for the teaching of business processes, basic academic skills

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<sup>21</sup> The 12 protocols of Simulated Workplace are (1) student-led companies; (2) project-based learning/student engagement; (3) formal attendance procedure; (4) drug-free work zones; (5) application/interview process; (6) company name and handbook; (7) company meetings; (8) safety training; (9) workplace teams; (10) 5S continuous quality improvement; (11) on-site business inspections; and (12) accountability (data review, reporting, and technical assessments).



(legible handwriting, vocabulary, math skills), and employability skills. Students take on different workplace roles, including managerial, administrative, and production functions, which are taught in the context of their company's work.

Classrooms are structured so that the teacher is the chief executive officer and the students are responsible for running the Simulated Workplace company. As in a business, students must first apply and interview for their positions. Although students' actions are ultimately accountable to the teacher, students are more often in a position where they are accountable to other students who hold a more senior role in the Simulated Workplace company. For example, a student serving as a production worker may need to report to the Simulated Workplace company's human resources manager, who is responsible for maintaining a professional environment.

To instill a greater sense of personal accountability among students, one Bryant Tech teacher shared that he had implemented a simulated paycheck system. Students in his Simulated Workplace company receive a simulated paycheck at the end of the week, rewarding them for good work (clocking in correctly, attending regularly, being promoted, etc.). Students then use the simulated paycheck to buy extra credit points, at an instructor-set price, on tests and exams. This helps create a connection between the workplace skills and grades. Other teachers are now adapting this simulated paycheck system for rollout in the Simulated Workplace companies that they supervise.

Because students bus in from other schools around the county, they may arrive at different times. Instructors meet students in their classrooms when they arrive, using the time before classroom instruction begins to discuss Simulated Workplace company tasks and provide guidance for the day. Once everyone has arrived and the day's administrative tasks are complete, the class heads to their lab where they clock in and begin their work for the day, now as an employee in a Simulated Workplace company, rather than a student in a classroom.

Since Simulated Workplace is still in its pilot stage, Bryant Tech has not yet collected any student outcome data, except for data from time clocks, used to assess student tardiness and how well they are using the time clocks. The time clocks at Bryant Tech are biometric, the same as those used by industry; students have to use their fingerprints to clock in and out as they would at a typical worksite. Educators use the time clock data to track attendance and tardiness.

Administrators at Bryant Tech report that the implementation of Simulated Workplace did not require any additional expenditures because they already had the necessary professional equipment. While Bryant Tech did choose to purchase time clocks as part of its adoption effort, they were not necessary for successful implementation. Based on experience, the

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administration at Bryant Tech believes that Simulated Workplace will not save money, but it also will not cost more than traditional forms of CTE instruction.

### ***Who Provides Help: Key Partners***

One essential statewide component of Simulated Workplace in Alabama is a partnership with business and industry. CTE programs and schools are required to earn business and industry certification (BIC),<sup>22</sup> provided through a partnership between the state department of education and local business and industry. Before beginning Simulated Workplace, Bryant Tech already had advisory committees; which established knowledge of industry needs and practices streamlining the creation of tools and processes to assess industry needs, such as employability skills. Because Bryant Tech is still in the process of integrating and piloting protocols, advisory members do not currently play an evaluative or auditing role at the school.

The Alabama State Department of Education has provided essential support for Simulated Workplace as a statewide initiative. The state has conducted professional development for leadership teams from different career tech centers, integrated coverage of Simulated Workplace in the New Director Academy training for new local CTE directors, and distributed Simulated Workplace manuals for use in planning and implementing new Simulated Workplace sites. Additionally, designated officers, one for each career cluster, work alongside the Southern Regional Education Board (SREB) to support schools that are implementing Simulated Workplace.

Bryant Tech administrators reported that it was critical to secure up-front buy-in from instructors because instructors will, in turn, influence student buy-in to the program. To do so, the school provided for teacher involvement in state-sponsored professional development trainings. Resistance to implementing Simulated Workplaces was also muted because, according to school administrators, most instructors were already applying the techniques outlined in the Simulated Workplace manual. All that had to happen was to integrate these Simulated Workplace techniques into the more formalized structure of the program.

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<sup>22</sup> BIC is an evaluation tool used by the Alabama State Department of Education (ALSDE), Division of CTE/Workforce Development, to assist local CTE programs to improve by setting standards by which all programs can be measured. The BIC review process is used to validate that CTE programs at the local school systems comply with and maintain quality standards as agreed upon by business and industry, education professionals, and the ALSDE.

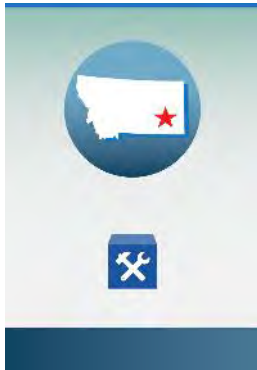


### ***What They Know Now: Stakeholder Observations***

Administrators at Bryant Tech reported that they had observed shifts in student attitudes and behaviors in the two years since Simulated Workplace was implemented, due in part to the opportunity to practice skills on actual workplace equipment. Those shifts include students (1) holding each other accountable within their companies; (2) taking responsibility for their own actions and those of their peers; (3) exhibiting leadership skills; and (4) having an enhanced understanding of the routines and expectations of the professional field they wish to join.

One important lesson that Bryant Tech administrators learned was the importance of phasing in a large change like this over time. The administrators believe part of the phasing-in process should include providing instructors opportunities to visit a Simulated Workplace to observe instruction in an unprompted, unrehearsed environment. They also suggest creating a timeline for protocol implementation, noting that it would be helpful to provide schools with additional guidance for when and how to implement each of the 12 Simulated Workplace protocols.





## SITE NAME: MILES COMMUNITY COLLEGE

Location: Miles City, Montana

### **Overview**

At Miles Community College (Miles) in Miles City, Montana, the Commercial Driver's License (CDL) program makes extensive use of simulation tools. During this year-long course of study, students use a simulator during lab time to experience truck cab and road conditions they might encounter on the job. Every student who participates in the CDL program uses the simulator in addition to on-the-road practice. Non-program students participating in a short-term (5 1/2 weeks) preparation course for the state CDL test also have simulator access.

### **Filling a Need: Origins**

Miles purchased its simulator in 2014, with the intention of giving students basic training for driving a large vehicle and better preparation for scenarios they will encounter on the roads once they leave the program.

Instructors can program the simulator to mimic (1) different kinds of terrain, weather conditions, and trailers (e.g., flatbed or shipping containers) so that students may experience and practice shifting, driving, and negotiating a truck in a variety of traffic and weather conditions, while in the safety of a lab; (2) emergency scenarios, allowing students to react to potentially dangerous situations and analyze their response, which can help prepare them for a real-life encounter; and (3) situations not encountered near the college, including how to respond to heavy traffic, narrow streets, and other characteristics of urban areas. The simulator includes a realistic display and responsive design that provides sensory, visual, and auditory feedback to the "driver."

### **How It's Set Up: Structure**

The CDL program at Miles consists of classroom instruction and practical and simulated lab time. The classroom and laboratory portions are run by an instructor who has been trained to program the simulator effectively. The use of the simulator varies in each class and, in



some cases, may be personalized for individual students to help them practice skills they do not already have.

Simulator software provides readouts on students' driving performance and efficiency as compared to industry-specific benchmarks. These readouts also note any potential damage to the simulated truck and fuel consumption. These data are used to provide immediate feedback to students but are not yet tracked in a systematic way to provide any summative assessment.

The simulator was purchased using money from a Trade Adjustment Assistance Community College and Career Training (TAACCCT) Round III grant administered by the state of Montana (RevUp). Maintenance is another expense, but the simulator at Miles is new enough that there have been no additional hardware or software costs to date. Faculty members report that they are planning on using *Perkins* grant funding in the event that service is required.

Program administrators believe purchasing the CDL simulation equipment has ultimately saved the college money by reducing costs associated with maintaining and servicing a real truck. For example, instructors reported that they have already saved money by not having to buy fuel and not having to replace as many "chewed up" tires on their practice truck.

### ***Who Provides Help: Key Partners***

Local employers have been helpful in justifying the simulator's expense. Area trucking companies report that they are experiencing a driver shortage, in part because of company policies requiring new drivers to have six months of previous driving experience. A number of employers located near Miles have agreed to apply simulator hours toward the experience requirement, which has helped ensure that program graduates find employment. Faculty reported that these employers have, to date, hired over 50 percent of the program's graduating cohort, in part because they value the experience students have had using the simulator and consider it an appropriate substitute for some of the behind-the-wheel hiring requirements.

Without state support, the simulator acquisition would not have been possible. Federal TAACCCT grant money, administered by the state of Montana, covered the upfront costs of acquiring a simulator for the CDL program, providing the college more leeway to save and acquire funds for simulator maintenance.

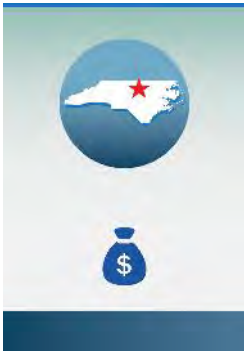




### ***What They Know Now: Stakeholder Observations***

Program administrators have observed that the driving simulator has been beneficial for their students. Based on these observations, program administrators say that completers are better prepared to get in an actual truck cab and drive, and more graduates are being hired by local companies because of their simulator experience.

Miles's program administrators have observed that the experiences using the simulator have been almost entirely positive. However, better planning for space requirements would have allowed for increased student use, as only one student at a time can use the simulated truck cab, and lack of space makes it difficult for other students to observe their peers' simulator lessons.



## Site NAME: GRANVILLE COUNTY PUBLIC SCHOOLS

Location: Oxford, North Carolina

### **Overview**

Granville County Public Schools (Granville County), based in Oxford, North Carolina, offers high school students the opportunity to participate in virtual school-based enterprise through the use of the Virtual Enterprises International (VEI) platform. VEI is a New York-based, nonprofit organization that, for an annual fee, provides schools with a web-based curriculum and network focused on building student skills in business and marketing.

VEI creates an online environment where groups of students from around the world run companies within a virtual economy designed to teach them about business finance, information technology, and marketing. Each student receives a virtual salary that they can use to buy virtual goods and services within the VEI economy as well as create virtual products that they can sell online to those participating in the VEI virtual business community. Class sizes in Granville County for VEI range from 15–25 students, with offerings provided at all three high schools in the district.

### **Filling a Need: Origins**

Granville County was the first of 12 school districts across North Carolina to use VEI for programs in business and marketing. Since there is no statewide program for simulated WBL using VEI, programmatic decisions are made independently at each district level. Granville County began using VEI due to teachers' and administrators' dissatisfaction with traditional WBL, which they viewed as antiquated and inadequate to prepare students to enter the workforce. Due to the rural setting of Granville County, instructional programs that used simulation were considered advantageous to providing a worldwide connection for students who otherwise would be isolated. The administration in Granville County learned about VEI in 2008 and travelled to Tennessee to observe a VEI simulation in action, implementing VEI shortly thereafter, and the simulation is now fully implemented in all three high schools in the district. Following Granville County's lead, 11 other school districts across North Carolina are now using VEI.



## ***How It's Set Up: Structure***

VEI is offered as an entirely online, internet-based program, which makes it ideal for students in rural settings, such as Granville County. Students are offered the opportunity to acquire skills that could previously only be attained through traditional WBL or an apprenticeship. Students can learn the day-to-day operations of how to run a business, communicate with potential clients and customers, and market and sell virtual goods and services without leaving their school or classroom.

Granville County still offers an entry-level business and marketing course that is traditionally structured using textbook-based classroom learning. This course often directs students toward participation in VEI, but it is not a prerequisite for participation. VEI level 1 is offered as a year-long course where students create companies and work together on the VEI online platform. VEI level 2 requires prior participation in VEI level 1 and expands upon the lessons from VEI level 1, going more in depth into maintaining a business. All VEI classes function on a block schedule to allow students enough time to work together and make progress on their firms.

VEI classrooms in Granville County are set up to look like an office environment; there are no student desks, but rather office-style furniture arranged into cubicles to create office space for each firm. There are also conference rooms, a secretarial desk, and areas designated for group collaboration. Curriculum and instruction is primarily web-based, with the exception of supplemental instruction and guidance on processes provided by classroom instructors. During the first nine weeks of the school year, instructors help students acquire the skills, knowledge, and relationships necessary to be successful at creating and running their virtual firms. Instructors teach basic but essential skills, such as Excel and Web design during this time and provide ongoing feedback and course correction to students as they create and launch their firms. Once these foundational skills are established and students are actively operating their firms, teachers gradually release control of the classroom, allowing students to run their own businesses.

Instructors use a variety of assessments to evaluate student learning. One is through the student-created firms themselves. Student supervisors evaluate their employees using rubrics created by their instructors, and the instructors then translate the scores on these rubrics to grades. In terms of formalized assessment, students finishing the VEI level 1 course take a multiple choice post-assessment.

Students also take the National Occupational Competency Testing Institute Business Solutions assessment, a national exam widely used for pre-employment testing and job skills assessment, that is recognized by top business schools. In addition to these assessments, students compete at state- and national-level events, such as the annual North Carolina

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Trade Show, and International Trade Fair in New York. Granville County students have been successful in these competitions, with teams being recognized for excellent work across an international field of competitors. At Granville County, contracts for VEI instructors are for 11 months, while contracts for all other instructors are for 10 months. The additional month is used to compensate VEI teachers who must take on additional leadership duties, including participation in national VEI conferences.

Each year, Granville County is responsible for paying annual dues to VEI and covering competition registration and travel costs. While we do not have exact cost data, district administration has referred to the program cost as substantial and holds that the program is so beneficial that the benefits outweigh the costs. Some program costs are offset by several local businesses that donate some financial resources to sponsor school events and subsidize student travel to the state and national competitions mentioned above. Businesses also support the program in non-financial ways, which are discussed in the following section.

### ***Who Provides Help: Key Partners***

VEI is a fully functional, autonomous program that does not require business involvement, though partnerships with local business are used to make the program more relevant. In addition to their roles as sponsors for events and activities, business and industry partners in Granville County visit VEI classrooms, serve as advisors, provide students with real work tasks from their businesses, and solicit students' help and advice.

Granville County has received strong support from the state CTE director and the Department of Public Instruction throughout the research and implementation process. Administrators from Granville County credit their adoption of VEI to the support provided by the North Carolina State CTE director, who advocated on behalf of their programs at the state level, allowing them to implement the VEI program without excessive obstacles. Granville County has also received good publicity on a state and national level because of the director's efforts to publicize its success.

The surrounding local communities are also taking on roles in helping VEI students gain real-world experiences. For example, one year a local municipality contacted Granville County with a request that VEI students help create a marketing plan for the town, which was to be presented to the board of commissioners. The students created graphics, slogans, and marketing materials that were ultimately accepted by the board to serve as the marketing plan for that town.





## ***What They Know Now: Stakeholder Observations***

There have been a variety of benefits to using VEI for both students and the district. For students, VEI is credited with helping build the necessary leadership and employability skills youths need to succeed in the workforce. Through VEI, students are also able to expand their worldview through interaction with students in different parts of the world, and participation in the global economy.

At the district level, Granville County has received public recognition for its work. In the words of the district CTE director: “It’s helped people in our district see that we don’t have to keep doing what we’ve always done. There are innovative things out there that even a small county like Granville can do. ... Programs like this are contagious, and help others to see what is possible” (Stan Winborne, Director of High Schools/CTE and Public Information Officer, Granville County School District, Sept. 23, 2016)

One of the hurdles Granville County has overcome is the difficulty in finding teachers qualified in using VEI. The school believes this obstacle is the reason simulated WBL has not spread more quickly throughout the state. Administrators believe that, for the program to be successful, VEI requires a nontraditional teacher who has worked in industry before becoming a teacher to bring that additional work perspective.



## SITE NAME: LAMAR COUNTY SCHOOL OF TECHNOLOGY

Location: Vernon, Alabama

### **Overview**

In 2015, Alabama launched its Simulated Workplace initiative, which was modeled after West Virginia's initiative of the same name, and is now used within all 16 CTE career clusters. Alabama's goal is to have every CTE center in the state become a Simulated Workplace by SY 2018–19, although there is no formal mandate for this transition. The Lamar County School of Technology (Lamar), a secondary-level career technical center, was one of the first sites in Alabama to use simulated WBL.

Lamar has incorporated Simulated Workplace into all five of the school's departments (cosmetology, welding, automotive, health care, and precision machining). Simulated Workplace classrooms are organized as student companies, with students' activities designed to reproduce real-world work environments and expectations. Students interview for jobs, clock in using time clocks, receive simulated paychecks, complete tax forms, and wear industry uniforms. The program is described further in the Structure section below.

### **Filling a Need: Origins**

State educators shared that employers from around the state voiced concerns about the workforce preparation of secondary students. These complaints became the motivation for Alabama's statewide adoption of Simulated Workplace as a tool for improving students' career readiness. The state also relies on Simulated Workplace as an economic development strategy. Alabama markets the program to attract industry to the state; recruiters point to the program as an example of the state's commitment to creating a skilled workforce possessing the essential technical and employability skills employers value.

Lamar launched simulated WBL in response to similar feedback from industry partners, who expressed that students graduating from technical education programs did not possess the skills necessary to be good employees. While they had strong technical skills, employers reported that students did not exhibit basic employability skills, such as the ability to show up on time, work in teams, or demonstrate a sense of personal responsibility.



Lamar has employed a phased adoption of Simulated Workplace, piloting and refining new elements each year. During its first year, the school focused on student attendance and timekeeping by using paper time cards, building student responsibility, an essential workplace skill. The next year, the program received a state grant designed to help it implement elements of West Virginia’s Simulated Workplace initiative. Using grant funds, Lamar purchased time clocks, uniforms and a name card maker; that year, the school also introduced the “company within the classroom” model and a job application and interview process, preparing students for finding employment after graduation or further training. The following year, instructors developed an employee manual and implemented a rubric-based grading system to provide students with objective feedback on progress and skills. The school continues to refine and adjust its Simulated Workplace through a continuous improvement approach that draws on lessons learned. For example, when the school heard from employers that students’ basic math and literacy skills needed to be strengthened, it responded by incorporating KeyTrain and its paired assessment, WorkKeys.<sup>23</sup> KeyTrain is a web-based career curriculum offered through ACT, designed to boost essential literacy and math for CTE students.<sup>24</sup>

While some schools in Alabama use Simulated Workplace as a discrete lesson unit that operates for a limited duration, Lamar has integrated the entire model into its curriculum so that student companies operate throughout the year and serve as a core part of the center’s instructional approach. Instead of spending part of their day in a traditional classroom, students take all instruction in the Simulated Workplace setting. Lamar’s feeder high schools, which students attend part time, do not currently offer the full Simulated Workplace instructional approach in their CTE classes as it would be more difficult to implement due to shorter class periods. However, they have begun to incorporate time keeping into their CTE classes.

### ***How It’s Set Up: Structure***

Simulated Workplace establishes companies within CTE classrooms that reproduce real-world work environments as closely as possible. One departure from the West Virginia model is that students continue to receive some traditional classroom instruction, though they still spend a significant part of their day working in their companies. Students apply for positions in their simulated companies with duties that differ by department, based on industry practice. They complete projects while operating in their company positions. The initiative aims to give students real-world experiences that mirror those of the workplace.

Lamar developed a grading rubric that it employs for Simulated Workplace activities. The rubric, which measures attendance, productivity, demeanor, preparedness, discipline, and

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<sup>23</sup> See <http://www.act.org/content/act/en/products-and-services/workforce-solutions/act-workkeys.html>.



safety, accounts for half of students' overall grade; tests and assignments comprise the other half. In addition, the school introduced a school-wide profitability competition this year to provide additional incentives for students to improve their workplace readiness. The competition ranks the "profitability" of each student company by assigning profit and loss values to a number of different individual and team performance criteria, such as attendance, credential attainment, performance in skill competitions, safety violations, tobacco use, and grades in academic courses. Instructors score the companies every three weeks, and the companies compete over the course of the school year for best overall profitability. By awarding "profit" to the desired workplace behaviors, the competition gives students a sense that everything they do matters and helps build student ownership and responsibility for actions while cultivating positive workplace behaviors.

The key features of Lamar's Simulated Workplace are detailed in an employee handbook, which is distributed in lieu of a traditional student manual. The school updates the handbook annually and engages students in the revision process as a way to promote ownership. The adjustment of the program's performance criteria is used as an occasion to talk with students about the rationale for different workplace behaviors.

While Lamar's Simulated Workplace has adopted many of the elements of the West Virginia Simulated Workplace model, it does not currently conduct universal drug testing due to budget constraints. Additionally, Lamar has not yet instituted the employer inspections that are core to West Virginia's approach. At the same time, Lamar has added extra elements that exceed West Virginia's initiative, such as its profitability competition and the incorporation of the KeyTrain basic skills training and WorkKeys assessments to address gaps in basic math proficiency and literacy. Lamar is further along in its implementation of Simulated Workplace than many other CTE centers in Alabama.

For Lamar, the costs of implementing Simulated Workplace are minimal. The primary cash outlay was \$55,000 for program staples (uniforms, etc.) purchased by the aforementioned state grant. While uniforms and nametags enhance the realism of the Simulated Workplace environment, and the time clocks facilitate easier data collection on attendance and punctuality, it is possible to implement Simulated Workplace without these elements. According to the state's deputy superintendent, Simulated Workplace does not require extra funds and may actually diminish costs because of reduced transportation expenditures that would otherwise be necessary if students were to work off-site.

### ***Who Provides Help: Key Partners***

Industry is involved in Lamar's Simulated Workplace in several ways. Each spring, local employers serve on hiring panels to help students practice their interviewing skills. Employers also serve on the school's advisory council, where they provide feedback to

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program and school administrators. Statewide tax incentives entice businesses to participate, but most businesses do so out of a sense of civic responsibility.

Faculty buy-in is a key condition for successful implementation of Simulated Workplace. At Lamar, the principal has worked closely with faculty members to understand their needs and concerns. The principal has been particularly sensitive to teachers' perspective that new initiatives often create more planning time and work. To head off complaints, the school has implemented Simulated Workplace in phases, relying on instructor input to determine which program elements to incorporate and when. Simulated Workplace adoption has been helped by the fact that all instructors at Lamar left industry to enter the profession; consequently, they understand the need to adapt CTE programs to prepare students for employment.

Alabama has supported local Simulated Workplace models in several important ways. Apart from the grant awarded to Lamar, the state has arranged for additional technical assistance through the SREB. This training supports the work performed by the designated officers for each career cluster in helping schools implement Simulated Workplace. SREB is also working to help schools implement program standards, which will play a key role in schools receiving future state funding.

### ***What They Know Now: Stakeholder Observations***

Lamar has received positive feedback from employers who have interacted with students during the employer interview process, in which they have praised the confidence and professionalism of the students. In some instances, employers have even hired students they interviewed as a part of Simulated Workplace. Program administrators feel Simulated Workplace has been a valuable way to expand access to WBL opportunities for students in rural, low-socioeconomic status, and urban environments where there are either too few employers or too many students to place. At the state level, education agency administrators reported a belief that students are more prepared for both college and careers, although there is no formal evaluation to assess this observation.

The key lesson from Lamar is the importance of gradually phasing in a new program like Simulated Workplace because it requires a shift in instructor mindset and teaching culture. Clear communication, teamwork, and support between teachers and administrators are critical to the implementation process. The school's principal used a continuous improvement methodology in which a few elements are implemented, tested, and refined before adding more elements or aspects of the model. This allowed for the lessons learned one year to be incorporated into the initiative in the subsequent year.





## SITE NAME: NEOSHO COUNTY COMMUNITY COLLEGE

Location: Chanute and Ottawa, Kansas

### Overview

Neosho County Community College (Neosho), with two campuses located in Chanute and Ottawa, Kansas, provides the largest two-year nursing program in Kansas. The college maintains two simulated hospitals and a lab for training occupational therapy assistants, one on each campus. Both simulated hospitals have an operating room; the hospital in Chanute has four large simulated hospital rooms, and the hospital in Ottawa has six. All 10 rooms are equipped with a medium- or high-fidelity manikin that can be programmed to display medical symptoms and reactions to treatment. All health sciences students participate in simulations at least once a semester, with the frequency varying by class and program.<sup>25</sup>

### Filling a Need: Origins

Neosho has been using simulations in its health care programs for over 15 years. Originally, simulations were offered on manikins set up in classrooms partially converted to resemble hospital rooms. In 2010, the college used funding through *Title III, Part A of the Higher Education Act*<sup>26</sup> to remodel and expand its simulated health care facilities and, coupled with college funds, built a new campus in Ottawa that provided a simulated hospital environment. To inform the design of the new facility, college administrators traveled to other simulated hospitals in the region and reviewed the literature to identify ways to better adapt the facility for simulated training. The new facilities opened in 2011.

The health care programs at Neosho first began to use simulation manikins when training students to perform blood draws, suture, and conduct other minimally invasive procedures. This allowed students to practice as many times as necessary to feel comfortable and get the procedure right. Later, health care program instructors discovered that using simulation

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<sup>25</sup> While the nursing program was the focus of data gathered from this site, Neosho also uses a simulated workplace model for students in its construction program to build cabins for the Kansas Department of Wildlife, Parks, and Tourism. Neosho has a simulated welder that provides the user with tactile feedback while welding and gives an x-ray view of the weld at the end.

<sup>26</sup> This U.S. Department of Education program helps eligible higher education institutions expand their capacity to serve low-income students by providing funds to improve and strengthen institutions' academic quality, institutional management, and fiscal stability.



ensured student exposure to specific situations and required the use of certain skills which could arise during a clinical rotation. As the program progressed, it became increasingly difficult to find clinical rotation space at local hospitals to accommodate each student. New restrictions in local clinics and hospitals on the number of students allowed for clinical rotations and clinical hours requirements necessary for graduation meant the school could not credential as many students as it did previously. Neosho was eventually able to secure the state licensing board's agreement to count simulation hours toward the clinical hours requirement, enabling the school to use simulation to credential more students than would otherwise be possible.

### ***How It's Set Up: Structure***

Neosho's 10 simulated hospital rooms are used by instructors and students for instruction, practice, assessment, and debriefing purposes. These rooms are housed within a fully simulated hospital environment, complete with a nursing station, a medicine storage room that uses a barcode scanner to dispense dosages, and specialized use rooms, including pre-operation (complete with scrubbing stations and clean storage), geriatrics, and labor and delivery. Each room is sized to be larger than those found in actual hospital facilities to allow for groups of students to work and observe others. The rooms also contain a camera system and two-way mirrors to allow instructors and other students to observe without intrusion. The simulated hospital is fully functional as, in case of an emergency, an actual hospital. In 2011, a tornado touched down in nearby Joplin, Missouri, damaging the hospital there. Neosho's simulated hospital has since been approved as a back-up by the Federal Emergency Management Agency to help with such catastrophic events.

While students may take classroom instruction outside the simulated hospital setting, every student makes use of the simulated facility as part of each course. The simulated hospital also provides opportunities for instructors to simulate unique events, such as natural disasters and mass casualties, where up to 75 local volunteers pretend to be injured and/or deceased. This opportunity allows students to practice triage and respond to emergency situations.

Neosho uses a variety of technologies, tools, and resources to help students fully engage in the classroom and prepare to enter the field. In the classroom, all efforts are made to keep lessons current and engaging, so technologies such as text polling, videoconferencing, and Prezi are used to present information and solicit student participation. Specialized rooms have high-fidelity manikins that act as patients students would see in a specialty setting. For example, the manikin in the labor and delivery room is programmed to present with symptoms of a woman in labor and gives birth. All simulations are programmed by the school's simulation coordinator and run by the instructor or fellow students. The college also has a SynDaver (a simulated cadaver). This manikin has been manufactured to feel and

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react like a real cadaver. Students in the surgical technician program use the SynDaver when they learn how to assist surgeons.

Simulated learning allows for students to be tested more often, and there is greater opportunity for guided debriefing which allows students to learn from mistakes without jeopardizing patient safety. Since students spend a great deal of time in the simulated hospital, they also have the opportunity to observe and evaluate their peers by helping run simulations and “throwing curveballs” (i.e., building surprise symptoms and injuries) into simulations. These exercises are videotaped, allowing students and instructors to view and debrief the exercise—for example, analyzing students’ reactions to stressors and discussing the decisions made.

A key asset in running Neosho’s simulated hospital is the full-time simulation coordinator. The coordinator develops the curriculum and programs the simulated tools to make students’ experience as realistic as possible. The coordinator keeps up to date with all of the latest simulated technologies and often helps with videotaping and debriefing. This role removes pressure from the instructors to create the curriculum and provides additional instructional support in the simulated hospital. The coordinator works with instructors to identify the tools needed in a lab to master a particular skill or assessment and then designs simulations that meet those objectives. The coordinator is also responsible for organizing the mass casualty exercise. Recently, simulation coordinators from across the region have begun to meet to share ideas and effective practices for how to conduct simulations and use the technology.

All of the simulated tools and environments used in Neosho’s simulated hospitals were paid for using *Title III* grant funding, and the simulation coordinator position was funded by making cuts to the clinical instruction staff. Because clinical instructors are equally expensive, the college’s decision had no net cost effect. To cover the replacement and maintenance of manikins, Neosho instituted a student fee for the simulation labs.

### **Who Provides Help: Key Partners**

Industries and businesses participate in the program and, in some instances, make use of the simulated hospital’s facilities. On weekends, teams from local hospitals come to Neosho to troubleshoot issues they have had with particular procedures and to practice these procedures using the manikins and SynDaver. This engagement has helped forge connections between the school and local hospitals, who are the primary employers of Neosho’s graduates. Surgeons from local hospitals have also come to Neosho to instruct students in the surgical technician courses and train them to assist in surgery. Based on this relationship, surgeons have started giving preference to Neosho graduates over other candidates when hiring, since they are already aware of Neosho students’ skill sets. The college also has advisory committees that meet twice yearly to advise faculty, simulation

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coordinators, and administrators on the kinds of scenarios and skills that should be featured during simulations.

Neosho has received a significant amount of state support in the form of funding and legislation. Faculty from Neosho successfully petitioned the Kansas State Board of Nursing to allow simulation exercises to fulfill up to 20 percent of the required clinical time for nursing licensure. They also provide instruction to secondary-level students because of state legislation. Under SB 155 in Kansas, any secondary school student can take courses within technical programs at postsecondary institutions at no cost. As a result, Neosho has seen a 20–30 percent increase in enrollment not just in their health sciences programs, but overall.

The buy-in and support of the college's board of trustees, administration, and faculty were deemed essential to program success. A significant effort has been made to help these stakeholders understand the kind of education taking place in the simulated hospital and the contribution the facility has made to student recruitment and learning. They understand that offering state-of-the-art facilities and programs generates positive publicity and financial support, which has helped to create more advanced programs.

### ***What They Know Now: Stakeholder Observations***

According to students and the college president, in clinical settings, students on clinical rotations are not exposed to as many critical medical situations needed to prepare for the field and are frequently even asked to leave the patient's room during an emergency. At Neosho, they have created an environment where students are the ones reacting to those emergencies, widening their skills and growing their ability to act in critical situations.

Making the facility available to neighboring hospitals opened up new lines of communication. This has benefited the college and students, by building relationships with doctors and nurses, through offering them a facility in which to improve their skills, as well as the surrounding community, which has access to more skilled and trained health professionals.

In the process of creating and implementing the simulations in the health care programs at Neosho, college staff realized early on that it would be difficult to train instructors and make them responsible for simulations while also planning course work for their students. Faculty also lacked the time and technical expertise to learn how to program and maintain the equipment. Consequently, the college created a simulation coordinator position to take on the responsibilities of running the simulation labs. Staff reported that the role of the simulation coordinator is key to conducting meaningful simulations. They have also trained new hires in faculty and administration to use simulation demonstrations and videos so that they are more comfortable with the role of simulation.





## SITE NAME: REGIONAL SIMULATION CENTER, WASHBURN INSTITUTE OF TECHNOLOGY

Location: Topeka, Kansas

### **Overview**

The Washburn Institute of Technology (Washburn Tech) is home to the Regional Simulation Center (RSC), a replicated clinic/hospital setting outfitted with state-of-the-art, high-fidelity simulation equipment. Simulations are offered in the following 12 career training programs relating to medicine:

- Certified Nursing Assistant
- Certified Medical Assistant
- Licensed Practice Nurse
- Emergency Medical Technician
- Surgery Technician
- Phlebotomy
- Emergency Communication
- Health Information Technology
- Physical Therapy Assistant
- Occupational Therapy Assistant
- Home Health Aide
- Respiratory Therapy

### **Filling a Need: Origins**

Washburn Tech administrators decided to create the RSC under a TAACCCT Round IV (KanTRAIN) grant to address a shortage of qualified nurses and other health care professionals in the Topeka area. The decision was also made in response to requests from local employers, who wanted assurances that graduates possessed basic employability skill sets before entering the workforce. The creation of the RSC has allowed Washburn Tech to use high-fidelity simulation to provide training that deepens students' clinical skills and prepares them for professional success while enhancing patient safety in the wider communities they will serve.



## ***How It's Set Up: Structure***

The RSC opened in November 2015. A simulation coordinator was hired shortly thereafter to manage the facility and design high-fidelity simulations to align with course curricula. The coordinator works with instructors to plan and execute clinical simulation exercises that extend students' learning beyond the skill demands of their clinical placement. As a former health care instructor, the coordinator is well aware of students' skill needs and the specialized knowledge they can learn using RSC's simulation tools.

The RSC is a simulated workplace environment that replicates hospital surroundings. Students are expected to conduct themselves professionally while on site and to treat patients—real or manikins—as if they were in a hospital setting. As part of their training, students are also expected to respond to routine and emergency scenarios as they would in the workplace.

The hospital is laid out along a hallway with four bays for patient treatment, each containing a high-fidelity simulation manikin. The building also has a nurses' station and a rehabilitation center for students in the Physical and Occupational Therapy Assistant programs. Additionally, there is a two-bay simulated operating room where students from the Surgical Technician program, and those in related professions, can gain experience and debrief on situations encountered. The RSC has Smart TVs, SMART Boards, smaller areas for discussion, and a dedicated room for debriefing with a Smart TV and three walls entirely made of white board materials. The room also doubles as a quiet study/library area.

One of the most important components of the RSC is its use of high-fidelity manikins and a simulated medication dispenser. These high-fidelity manikins can be programmed to present almost any symptom or function a human can exhibit. They simulate breathing and blinking, have a heartbeat, and can be catheterized, among other things. Students use the medication dispensing equipment to prepare and administer medications for their simulated patients. In addition to the high-fidelity manikins and tools for simulated medication administration, students using the RSC use hospital-grade equipment so that they become familiar with the actual equipment they will use during clinical rotations and in the workforce.

The combination of simulated tools in a simulated workplace allows program faculty and staff to provide students with scenarios that they might not otherwise practice during their clinical rotations. For example, few students are offered the opportunity to catheterize a patient during their clinical rotation and, in some instances, have been asked to leave the room during an emergency "code" situation. With the advent of the RSC, there has been a more concerted and sustained effort to incorporate the use of simulation into each discipline and program offered at Washburn Tech. The administration and RSC staff shared that the



use of simulated scenarios and simulation tools in training, particularly in nursing, can reduce student stress both during practice scenarios and in real life.

One scenario that took place in November 2016 was called “The Big Sim.” The Big Sim was a multistage simulation activity that taught students how different roles work together within a hospital setting. Every student participated in an extended, day-long scenario that transferred a patient (manikin) from one specialty group to another, eventually incorporating all 12 programs. The scenario began with a patient who fell in a home health care environment and was transported by emergency medical personnel to the hospital environment, where the patient was triaged and prepared for surgery by nursing students. The patient was then transferred to the surgical technician students for surgery, to the nursing staff for post-operative care, and finally to the physical and occupational therapy students for rehabilitation. The staff estimates that 500–600 students participated in two rounds of the scenario.

Curriculum and activities in the RSC align with the learning goals and requirements of certifying bodies, such as the Kansas Board of Nursing. Moreover, some of the accrediting agencies count simulations as fulfilling part of a student’s clinical requirements. As an example, RSC has adopted the TeamSTEPPS 2.0 curriculum, a system designed by the Agency for Healthcare Research and Quality and the Department of Defense to optimize communication and collaboration among team members. The goal of this program is to help students to gain the necessary teamwork and employability skills needed for employment after graduation.

The RSC is beginning to collect data on the amount of time students use the facilities at the RSC. To do so, they are tracking student entries into the RSC using a new key fob system that was recently installed. Staff are still in the data collection phase and plan to analyze and report on these data in the future.

### ***Who Provides Help: Key Partners***

Local industry, business, and community partners have provided input and support to Washburn Tech throughout the planning and implementation process for the RSC. Representatives from local hospitals and health care companies serve on internal and external advisory committees with Washburn Tech, where they can share the workforce skills their companies need.

One company that has been very involved in the creation and running of the RSC is Midland Health Care Connection (Midland Care). Midland Care is a Topeka-based agency that provides community-based health services, such as hospice home health care, adult day care, and assisted living. Midland Care does not provide financial or in-kind resources to help with

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the operation of the program, but it does provide field placements for students doing their clinical rotations from Washburn Tech, primarily those in the nursing program. Midland Care collaborated with Washburn Tech on the use of Washburn Tech's mobile clinic and, through that collaboration, became involved in the advisory committee for the RSC.

As a participant on the RSC advisory committee, Midland Care representatives advocated for simulations that more closely match scenarios their employees encounter in home, community, and institutional environments. Washburn Tech has now allocated space for a home setting, and it incorporated the new setting into the Big Sim in November. Midland Care has also suggested creating simulation training certificates for students; this idea is currently under consideration.

One of the ways in which the RSC would like to partner with local hospitals and health care providers is to offer use of the RSC for employee training and practice. Midland Care is one of the companies the RSC has approached for this partnership. Washburn Tech envisions employers using the simulation facilities for incumbent worker training and have made programmatic adjustments to accommodate the needs of prospective partners.

### ***What They Know Now: Stakeholder Observations***

The benefits Washburn Tech has experienced are multilayered. At the institutional level, the perception of Washburn Tech has changed for the positive over the last five years, thanks in part to the RSC. Administrators are now working with the Kansas Board of Nursing to become a certified facility to be used for continuing nursing education and professional growth.

For students, the incorporation of simulated learning offers exposure to real-life experiences while fostering the growth of critical thinking and decision-making skills. Students have the opportunity to work in multidisciplinary teams and settings that provide them with a more realistic workplace context. Students also gain the knowledge and confidence to diagnose critical medical emergencies, such as strokes and heart attacks, and to do so in a low-stress environment that allows them to practice without putting patients at risk. Simulation has been embraced by the Washburn Tech administration, and the staff reports that there will be continued support for the use of simulation in lab learning.

Reflecting on the lessons learned over the past two years, staff members at Washburn Tech emphasized they would have included industry experts early in the design and implementation process to ensure the space and materials were appropriate for the most relevant fields and programs. The staff would also employ additional simulation coordinators, as that role is essential in helping students and instructors use the RSC effectively, while also playing a key administrative role in keeping the RSC running appropriately.





## SITE NAME: JAMES RUMSEY TECHNICAL INSTITUTE

Location: Martinsburg, West Virginia

### Overview

Simulated Workplace is a statewide initiative to provide simulated WBL experiences for all secondary CTE students in West Virginia. Simulated Workplace turns CTE classrooms into student-led, simulated companies that are organized and run using standard business practices. It is designed to provide students with the support and training necessary to cultivate employability skills and technical knowledge valued in the workplace. The use of Simulated Workplace as a universal instructional approach for secondary CTE is written into West Virginia state policies 2510 and 2520.13. As of SY 2016–17, 19,000 CTE students are participating in Simulated Workplace programs within West Virginia, with learning options offered in 132 programs of study spanning the 16 career clusters recognized by the state.

The James Rumsey Technical Institute (JRTI) exemplifies how Simulated Workplace is modeled. JRTI operates as a shared-time facility in which students attend their home high school for a half day to receive academic instruction, and JRTI for the other half of the day to receive technical instruction. JRTI serves approximately 440 secondary-level students, all of whom participate in Simulated Workplace. Instructors from JRTI have partnered with local businesses to create programs to help students develop and refine their professional skills. While the intent of technical instruction is to prepare students for entry level positions in their chosen field, students also earn the necessary academic qualifications to attend college should they so choose. In fact, half of the technical programs offered at JRTI are designed to prepare students to attend college. Students have a choice of the following 17 CTE programs from which to choose:

- Automotive Technology
  - Carpentry
  - Cisco
  - Diesel Technology
  - Early Childhood Education
  - Electrical Technology
  - EMS/Fire Science
  - Graphic Design
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- Certified Internet Webmaster/Game Design
- Informatics
- Law and Public Safety
- Masonry
- Multimedia Publishing
- Pro-Start (Culinary Arts)
- Robotics
- Therapeutic Sciences
- Welding

### ***Filling a Need: Origins***

The motivation for West Virginia’s adoption of Simulated Workplace came from employers, who for years had expressed concerns about the quality of the technical skill sets and work habits of recent high school graduates. State CTE Director Dr. Kathy D’Antoni, shortly after starting in the role, convened members of the West Virginia Manufacturer’s Association to identify the technical and workplace skills and habits desired in new employees. One key need was employability skills, in particular, those relating to worker attendance, communication, and teamwork. Simulated Workplace was developed to give students the opportunity to learn these skills by practicing them in a realistic, controlled environment.

West Virginia’s Simulated Workplace, piloted in nine schools in SY 2013–14, was one of the first statewide simulated WBL initiatives in the country. It has grown exponentially since its launch, and in SY 2016–17, was selected as the sole, statewide instructional model for CTE programs.

JRTI was one of the initial pilot schools, incorporating Simulated Workplace into its Warehousing program. The following year, nine other programs joined the pilot, and by 2015, the initiative was being used for all secondary programs at JRTI.

### ***How It’s Set Up: Structure***

Simulated Workplace at JRTI takes the form of a classroom workplace where students create and run their own companies. Although each CTE program offers simulated WBL experiences, students are taught using professional-grade equipment used in the workplace. The curriculum emphasizes business processes and employability skills. Students take on different roles found in an actual company, including managerial, administrative, and production functions, which are taught in the context of their company’s work. Some companies operate as school-based enterprises that generate actual revenue; others operate as simulations, in which students learn business-vetted skills without selling an actual

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product. Though the environment is simulated, the tools used and techniques learned and practiced parallel those found in the workplace. Simulated Workplace also makes frequent use of online communication technologies, such as Skype, to enable students, teachers, and administrators to communicate with one another, employers, and potential customers.

Prior to the adoption of Simulated Workplace, CTE instructors taught classes using equipment purchased from area suppliers or donated by local employers. Following adoption, JRTI used a portion of its *Carl D. Perkins Career and Technical Education Act of 2006 (Perkins IV)* allocation to supplement its new equipment needs. In some instances, the instructional equipment necessary to offer a realistic workplace environment is too expensive or sophisticated to be purchased and maintained at JRTI. In these circumstances, it is more cost effective for students and instructors to travel to a nearby employer worksite to practice their skills. Other programs may depend less on equipment and more on situational skills within workplace environments. These programs, like law enforcement, public safety, emergency medical services, and fire and health services, require more orchestration for students to gain the necessary experiential practice. These programs incorporate increasingly complex emergency and disaster simulations for students to practice skills, which requires scheduling multiple participants. These simulations are observed by instructors and graded using a skills rubric for students' chosen fields; the criteria on these rubrics are sometimes derived from state curriculum and guidelines.

At its heart, Simulated Workplace is about changing the culture of the classroom from passive learning to direct experience. In this new model, the teacher's role shifts from lecturer to facilitator. When teachers need to provide skills-based training to the class as a whole, they refer to it as "professional development" rather than a lesson. As with the statewide model, at JRTI, a student workplace "foreperson" is responsible for ensuring every student develops a set of specified skills based on their fields and positions. To do so, the foreperson may organize daily meetings, supervise workplace processes, and direct students to address the key elements of the curriculum. Students rotate through different work roles on a roughly three-week cycle to facilitate their learning of a range of employability and technical skills. Student-run companies go so far as to simulate what working in the "real world" looks like: they wear uniforms, clock in and out daily, and submit to mandatory drug testing. As of SY 2016–17, 98 percent of students participating in Simulated Workplace tested drug free.

Seniors participating in Simulated Workplace within JRTI and across the state have recently begun to develop portfolios to present to industry representatives at the end of their school year. These portfolios include notable work and responsibilities in the workplace, any certifications and licenses earned through the program, and their attendance and drug testing



records. JRTI staff report that portfolio development better prepares students to interview for positions in the field and to showcase their skills and abilities.

In addition to portfolio evaluation, local business and industry members participate in craft advisory committees that weigh in on the curriculum to make sure it aligns to industry needs. At JRTI, members of these committees visit student companies twice yearly to complete official evaluations and provide feedback to each secondary-level program.

Given the relatively recent statewide adoption of the Simulated Workplace model, formal assessments of students' skill holdings do not yet exist. As a result, program and student outcomes are exclusively anecdotal. To get additional feedback, the West Virginia Department of Education has teamed up with Marshall University and West Virginia University to develop metrics for Simulated Workplace. They have developed a Balanced Scorecard using evaluation criteria that address state-identified indicators of student performance, as well as those contained within the federal *Perkins IV* legislation (See Exhibit C-1). The plan is for this tool to play a central role in assessing the outcomes of Simulated Workplace programs throughout West Virginia. The scorecard is currently being piloted in nine sites across the state, representing a range of district characteristics.



**Exhibit C-1: Alignment of West Virginia Balanced Scorecard with Perkins indicators**

West Virginia Balanced Scorecard Indicator	Perkins Indicator ( <i>Perkins IV, Sec. 113(2)(A)(i-vi)</i> )
<b>Percent CTE completers (12th grade)</b>	(iii) Student rates of attainment of each of the following: (I) A secondary school diploma.
<b>Percent completers obtaining industry credentials</b>	(iii) Student rates of attainment of each of the following: (III) A proficiency credential, certificate, or degree, in conjunction with a secondary school diploma (if such credential, certificate, or degree is offered by the State in conjunction with a secondary school diploma).
<b>Percent completers meeting technical assessment required for each individual concentration</b>	(ii) Student attainment of career and technical skill proficiencies, including student achievement on technical assessments, that are aligned with industry-recognized standards, if available and appropriate.
<b>Percent completers meeting West Virginia summative assessment</b>	(i) Student attainment of challenging academic content standards and student academic achievement standards, as adopted by a State in accordance with section 1111(b)(1) of the Elementary and Secondary Education Act of 1965 and measured by the State determined proficient levels on the academic assessments described in section 1111(b)(3) of such Act.
<b>Attendance</b>	(C) ADDITIONAL INDICATORS OF PERFORMANCE.— An eligible agency, with input from eligible recipients, may identify in the State plan additional indicators of performance for career and technical education activities authorized under this title, such as attainment of self-sufficiency.
<b>Graduation rate</b>	(iv) Student graduation rates (as described in section 1111(b)(2)(C)(vi) of the Elementary and Secondary Education Act of 1965).
<b>Percent CTE positive placement</b>	(v) Student placement in postsecondary education or advanced training, in military service, or in employment.
<b>Percent EDGE credits completed</b>	(C) ADDITIONAL INDICATORS OF PERFORMANCE.— An eligible agency, with input from eligible recipients, may identify in the State plan additional indicators of performance for career and technical education activities authorized under this title, such as attainment of self-sufficiency.

Because Simulated Workplace is primarily an instructional approach, state administrators anecdotally report that it does not cost more than the implementation and use of a traditional CTE program. With few exceptions, instructional changes were directed at program organization and classroom culture. The only additional costs of program implementation were due to the adoption of workplace uniforms and mandatory drug testing, for which state funding was provided. The state also supplies additional funds to support instructors’ professional development.

In some programs and sites, Simulated Workplace may be integrated with the use of simulator technology. In these sites, the purchase of simulation equipment for instructional use is not usually covered by state funds. CTE programs have the option of applying for state-funded program modernization grants, and CTE students may apply for funding for specific needs directly through contacts with the CTE state director. JRTI programs that use



large quantities of consumable materials, such as those in the culinary and carpentry programs, have to find alternative sources of funding, for example, in some cases selling products to offset instructional costs. Programs can also accept donations of new and used equipment and materials from the business community.

### ***Who Provides Help: Key Partners***

Local businesses play key roles in helping Simulated Workplaces, teachers, and students to succeed statewide as well as at JRTI. Every other year, student companies are formally inspected by a trained team of inspectors from local businesses in related fields. Inspectors evaluate the company's operations and equipment against the curriculum and other standards (e.g., Occupational Safety and Health Administration (OSHA) standards for manufacturing industries). If rated unsatisfactory, the inspectors help the students in the simulated company write an improvement plan. All data are captured in a statewide database, which is used by West Virginia state education CTE administrators to offer professional development and training to help teachers strengthen their CTE programs. The inspections have provided a valuable feedback loop as well as meaningful opportunities for students to interact with and learn from employers. Some students have even been hired by employers that conducted their inspections. Employers are also invited into JRTI to conduct demonstrations or advise and mentor program students

To better serve the needs of their community, teachers and administrators at JRTI maintain relationships with the local chamber of commerce. Staff also maintain a presence on the region's workforce development committee, which comprises members from local educational institutions, such as JRTI; chamber of commerce members; representatives from vocational rehabilitation providers; philanthropic organizations, such as Goodwill; and government agencies delivering career and skills training. Students at JRTI also have access to a full-time job placement coordinator, who maintains connections between the students and local businesses seeking new employees.

School administrators from JRTI credit the success of Simulated Workplace to the comprehensive leadership provided by the West Virginia Department of Education. They cited the ability of administrative staff to listen to and take feedback from school administrators on better ways to adopt and adapt to the new system. The state employs four part-time business liaisons who recruit business partners and inspectors from around the state. State agency staff members shared their vision that, over time, student companies would engage with businesses located around the country to help expand instructional possibilities. To help realize this goal, the state employs an additional part-time business liaison who is working to build relationships with national businesses that are willing to Skype with student-run companies. While outreach efforts are still in their early stages, West Virginia education agency staff members report that they are hopeful that this method can

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offer all students, and those enrolled in rural schools in particular, access to a wider range of professional possibilities.

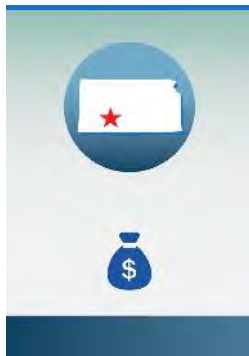
### ***What They Know Now: Stakeholder Observations***

Simulated Workplace at JRTI has been described by staff as beneficial for both students and prospective employers. In offering students the opportunity to learn in context, Simulated Workplace has engaged students on a deeper level, creating an environment where students feel respected, motivated, and have more meaningful involvement in their learning. Educators also reported that they believed that students are developing the work readiness and technical skills necessary for success in the workplace. Anecdotal, verbal reports from participating statewide employers, such as Armstrong Manufacturing, note that they are delighted with students' workplace readiness as a result of the program. They believed that the workplace readiness was due to students having the experience of applying for and getting jobs as well as practicing the skills necessary to keep those jobs.

At the school level, the support and buy-in from teachers and administrators is key to Simulated Workplace's success. One challenge in adopting Simulated Workplace has been getting local-level staff to embrace the shift in their instructional roles. At JRTI, staff reported that simulated WBL requires a significant pedagogical change, one that is different from how they were formally trained. They reported that the professional development provided by the states has assisted them in adopting the new classroom approach. The state has also trained instructional coaches—typically CTE instructors who have demonstrated exceptional teaching abilities—to help teachers and administrators adapt to this new instructional paradigm.

Having completed the implementation process, West Virginia state CTE education agency administrators recommend starting any implementation of a simulated WBL program with a “coalition of the willing” and focusing on incremental implementation. One critical element is enlisting innovative, “superstar” teachers to be a part of the initial piloting process. In this role, teachers can serve as exemplars for others who can see how Simulated Workplace works and learn more about effective teaching strategies.





## SITE NAME: STAFFORD UNIFIED SCHOOL DISTRICT 349

Location: Stafford, Kansas

### **Overview**

Stafford Unified School District (USD) 349 is a K–12 district located in Stafford, Kansas, a rural farming community. Stafford uses school-based enterprise extensively in its CTE programs to offer students an opportunity to apply technical skills in a simulated workplace setting.

School-based enterprise is used as a core approach in Stafford’s marketing and entrepreneurship program. Its centerpiece is the Stafford Entrepreneurship and Economic Development (SEED) Center, a program where students form their own businesses to provide services and products while learning entrepreneurship and marketing principles.

The district has also used other elements of simulated WBL outside of the SEED Center. For example, in the culinary arts program, the classroom has been converted to a commercial kitchen environment, and students have participated in virtual partnerships with area industry.

### ***Filling a Need: Origins***

Stafford’s motivation for promoting marketing and entrepreneurship skills among CTE students was to support economic development for the small rural community. The school superintendent launched the SEED Center in 2004 after learning, while conducting her dissertation research, that students were leaving town because they did not see job opportunities there. She hypothesized that training students in entrepreneurship might encourage them to start a business within the town, which might help retain them following graduation.

Stafford launched the SEED Center as a charter school in 2004, which made it eligible to receive annual state funding of \$50,000, which was supplemented with small donations and grants from local businesses. A few years later, the state informed the district that it was no longer eligible to receive funding under the charter program. However, because the program did offer a CTE career pathway that was recognized within Kansas’ newly launched career



pathway program, the site was able to access enhanced staffing allocations for CTE classes through the state's education funding formula.

### ***How It's Set Up: Structure***

Stafford's SEED Center uses the state's CTE marketing and entrepreneurship curricula for classroom instruction, which is reinforced through the use of school-based enterprise. As a part of their CTE studies, students create and operate a business, either independently or with their peers. Students leave campus during the school day to attend the SEED Center, operated as a dedicated commercial storefront in Stafford's business district, where they run their own businesses.

To launch their businesses, students develop a business plan and review it with representatives from a local bank to gain professional feedback. Once their business plan is approved, they receive a seed grant of \$200 from the district to finance their start-up costs. Student businesses have included trophy engraving, leather billfold production, VCR-to-DVD transfer, car detailing, and screen printing. Businesses operate from the SEED Center storefront, where goods and services can be sold to members of the community. Students retain 70 percent of their earnings, with the balance paid to the district to cover overhead expenses. The district provides a range of equipment, housed at the SEED Center, which students can use for their businesses, including a laser engraver, a garment printer, and an oversized, professional-grade printer.

Recently, students in the school's Entrepreneurship, Culinary Arts, and Graphic Design programs participated in a unique WBL partnership with the town's flour mill, with instruction occurring virtually and in the classroom setting. The school district wanted to serve bread and rolls that complied with the state's new lunch program nutritional requirements and were also palatable to students. With support from the town's flour mill, Stafford's students engineered a new flour blend and conducted market research, recipe development, and taste testing of products. Students designed the logo and brand for the new product and ran the marketing and sales efforts to reach food distributors serving districts across the state. Students even pitched the new product to a national distributor that gave them the opportunity to represent the product at a national trade show. The project was documented in a video that was funded by the Kansas Health Foundation.

The downtown commercial storefront has been an important resource for the SEED Center, as it allows students to operate in an authentic retail environment. Their experience serving customers is credited with helping them develop employability skills. The district does not collect data on program outcomes or student performance. Students are regularly assessed using rubrics that measure a range of skills, including punctuality, customer service,





and salesmanship. The district also uses activities like the external business plan review as an assessment activity.

### ***Who Provides Help: Key Partners***

The SEED Center has been the beneficiary of both financial and in-kind contributions from area businesses. A local businessperson donated the use of the downtown storefront space that houses the SEED Center. Local bank employees also volunteer to review student business plans. Perhaps the greatest financial support comes from community members and local firms, who patronize the student-run businesses; their purchases help fund the program and generate earnings for students.

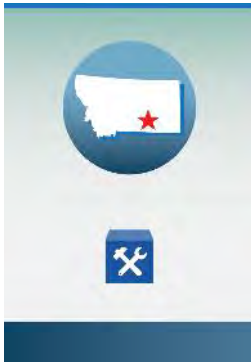
The Culinary Arts program benefits from assistance provided by employees at the local flour mill. Mill employees serve as student mentors and, in the case of the school lunch flour project, contributed time and expertise to assist students in product development and marketing. The flour mill also provided students with product samples, and a local distributor underwrote the costs for students to participate in local and national trade shows.

### ***What They Know Now: Stakeholder Observations***

The primary benefit of the SEED Center has been teaching students employability skills, such as responsibility, ownership, and communication skills. The SEED Center has also established Stafford as an innovative CTE center with a reputation that attracts visitors from other communities who want to study and adapt the program for their communities.

The school and district administration have learned a great deal about the challenges of creating a model like the SEED Center in a small, rural environment. Since there are not as many potential customers or clients, many new businesses can fail, and the rural environment needs to be taken into consideration when planning a business. They have also learned that student and instructor buy-in are essential for the success of the program and businesses created. Students who are serious about their companies tend to have very profitable businesses, but others' businesses may flounder when students' commitment wavers. Part of this responsibility falls to the instructor to motivate and inspire students to do their best work.





## SITE NAME: CITY COLLEGE, MONTANA STATE UNIVERSITY BILLINGS

Location: Billings, Montana

### ***Overview***

The Workforce Training Center at City College at Montana State University Billings (City College) uses simulation tools to support its programs in hazardous materials (HAZMAT), OSHA guidelines, national incident management systems, welding, advanced manufacturing, and health care. Although City College participates in a consortium along with other postsecondary institutions in Montana, its simulation tools implementation takes place at the institutional level. City College uses these simulation tools to incorporate activities that give students hands-on experience with what they will encounter when they become employed, and to bring work-based simulation and training to students in diverse and rural areas.

### ***Filling a Need: Origins***

CTE programs at City College are developed in response to industry and community needs. Motivations for incorporating simulation into programs were to make education and training more relevant to local and employer needs, give students hands-on experiences similar to those they will face in their careers, and ensure that students are prepared to enter the workforce. The use of simulation tools in the mobile training laboratory (described in the Structure section) also provides hands-on learning opportunities for students who are enrolled in courses through City College but located in remote locations across the state.

### ***How It's Set Up: Structure***

Students enrolled in CTE coursework receive instruction through a mix of simulation tools and instructor-delivered lessons. This mix of simulated WBL models was implemented because it was believed that combining instructional modalities offered greater benefit than offering instruction using only one or the other model.

Instructional programs at City College incorporate a wide variety of simulation tools to provide students with a range of workplace experiences. For example, students in the nursing program spend lab time on high-fidelity, computer-programmed manikins that can reproduce the conditions of an actual medical emergency. This allows nursing students to



practice their responses in a controlled, safe environment, after which they can debrief their actions with fellow students and instructors using computer and video evidence collected by the manikin during the scenario. For students participating in a health care program remotely due to living in rural areas, City College uses MedBots (wheeled robots with Apple iPads) which allow students to watch, communicate, and participate in classes as if they were there in person. Similarly, the welding program has acquired a welding simulator to make demonstrations and lab time realistic, without the need for metallurgic consumables, which can be expensive to provide. The welding program also allows students to practice until they feel confident enough to use actual equipment. Faculty members receive regular trainings on how to use both simulated and real tools and, in turn, train students to ensure both the correct and regular use of equipment in the classroom setting. The mobile training laboratory, used for HAZMAT courses and training, provides access to simulated training software and allows City College instructors the opportunity to reach more students in rural and remote areas of Montana.

The cost of simulation tools and technologies at City College has presented a challenge. TAACCCT grants from Rounds III and IV were key sources of revenue for equipment acquisition. In some cases, the educational programs have been able to use student equipment fees to offset instructional expenses, but grants are often necessary to cover start-up costs associated with equipment purchase. Industry partners have donated used tools and equipment but, to date, have not stepped forward to cover the cost of new simulation equipment. While college faculty report having historically relied on grants to purchase equipment, operation and maintenance costs can present a significant obstacle to program sustainability, since long-term operating and management costs are not always captured in the grant proposals. For example, City College's mobile training laboratory cost \$300,000 to build, and when the grant ended, there was not enough funding to continue its use, lowering the mobile training laboratory's return on investment for the TAACCCT grant.

### ***Who Provides Help: Key Partners***

Industry and local businesses play a significant role as City College program partners. All instructional programs have external commitments and engagements with local business and industry. Industry members visit the college, meet students, tour the labs, and provide feedback to program staff through periodic advisory committee meetings. Feedback is given on how the training received through their program compares to training provided by the industry. In turn, the faculty and administration frequently serve on committees sponsored by regional and industry partners, further helping City College develop new programs and update existing programs to better meet industry needs.

City College also works closely with its local economic development agency (Big Sky Economic Development), Billings Job Service, and the Montana Department of Labor and

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Industry to ensure that college offerings align with projected workforce needs. In addition, the Montana State Workforce Investment Board is engaged in making sure that educational programs are responsive to both state and local needs. A consortium of the above named partners as well as K–12 representatives, higher education representatives, Billings Works, the Billings Chamber of Commerce, and local industry sponsors, confer on an annual basis with City College to identify emerging workforce needs.

### ***What They Know Now: Stakeholder Observations***

City College faculty report that the greatest benefit to using simulation tools in CTE is the realistic experience it provides for students. Through simulations, students gain more experience with the skills they will need to perform at worksites in their fields. Simulated WBL also affords students opportunities to practice and apply skills learned through internships and apprenticeships, which are not available to all students. Students living in rural parts of the state with no local industry do not always have access to work-based education and training. Simulated WBL allows these students to participate in a WBL experience that they might not be able to benefit from otherwise due to their location.

Integrating and adopting simulation tools into teaching and curriculum has been a learning experience. Based on its experience, the City College faculty recommends consulting local industry partners early in the program design process and maintaining that communication over time. It also suggests developing a plan to finance the maintenance of purchased equipment to ensure proper working order on a long-term basis.



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