Southwestern Business Administration Journal

Volume 19
Issue 1 *Special Covid-19 Issue*

Article 5

2021

Incorporating Online Simulated Environments into an MIS Curriculum to Accommodate for Disruptions Caused by the COVID-19 Pandemic

Richard Taylor
Texas Southern University

Marion Smith
Texas Southern University

Incorporating Online Simulated Environments into an MIS Curriculum to Accommodate for Disruptions Caused by the COVID-19 Pandemic

Richard Taylor
Texas Southern University
richard.taylor@tsu.edu

Marion Smith
Texas Southern University
marion.smith@tsu.edu

Keywords: *Management information systems, Teaching MIS courses, Simulated environments*

Abstract
The Covid-19 pandemic has become a major disruption to colleges and universities around the world with most institutions moving to online-only instruction. As a result, the use of controlled environments to deliver hands-on experiences in typical MIS curriculum courses, such as programming, database management, network administration, information security, and web design was no longer available. This paper discusses a variety of simulated environments where students get hands-on experiences to replace the traditional learning environment in a classroom or computer lab setting.

Introduction

The Covid-19 pandemic has become a major disruption to colleges and universities around the world with most institutions moving to online-only instruction. In the Policy Brief written by the United Nations it is stated, "The COVID-19 pandemic has created the largest disruption of education systems in history, affecting nearly 1.6 billion learners in more than 190 countries and all continents. Closures of schools and other learning spaces have impacted 94 per cent of the world's student population, up to 99 per cent in low and lower-middle income countries" (United Nations, 2020 p.2). In the Spring of 2020, more than 1,300 colleges and university in the United States cancelled in-person classes and moved to online-only instruction. In the Fall, plans were being developed to add in-person classes with social distancing and online learning, with varying degrees of success (Smalley, 2021). Because the COVID-19 pandemic caused instructors to modify their traditional face-to-face classes to an online format, this prompted concerns about the quality of remote education (Smalley, 2021).

Students majoring in MIS and other computer related disciplines faced their own challenges. Technology educators strive for realistic, hands-on experiences to foster student learning. For those courses where students meet in lab settings, instructors needed to find alternative environments where students could engage with specialized software and hardware configurations. This paper offers some alternatives to lab environments typically found in a school. These alternatives include websites and online textbooks that offer simulated environments. Simulated environments have been shown to have a positive effect on technology knowledge (Luse and Rursch, 2021).

Controlled Environments

Noted educational theorist David Kolb emphasizes that the learning process consist of four steps (1984): (1) watching, (2) thinking, (3) feeling, and (4) doing. Business schools are often criticized for using teaching methods that incorporate high level theoretical concepts that concentrate on the first three steps yet lack hands-on experiences (Pal, 2007). Degree programs in Management Information Systems (MIS) often lack the resources to provide students the hands-on experiences that supplement classroom-based theoretical education. The use of controlled environments is an effective way to deliver hands-on experiences in typical MIS curriculum courses, such as programming, database management, network administration, information security, and web design. Controlled environments may be implemented in a variety of forms – the most common being dedicated computer labs or desktop virtualization technologies. However, the cost to create such environments may be prohibitive or schools may lack the necessary on-site support to implement and maintain the controlled environments.

Even if a school has a dedicated controlled environment, students may still be required to be on-site to complete their assignments. This becomes problematic when business schools are closed because of the COVID-19 pandemic. In some cases, more than one dedicated environment is required to accommodate the technological infrastructure requirements for specific hands-on experiences. For example, network management and information security courses require a different type of dedicated controlled environment than courses in database, programming, and web design. Because of ongoing security breaches and ransomware attacks, information security courses may require an environment to test both hardware and software vulnerabilities (Raghavan et al, 2020, Raghavan et al, 2017). In software development courses students need privileges to specific application software such as an integrated development environment (IDE) whereas in system level courses such as network management and security classes, students need privileges to operating system level resources. Some of this may be available for students to download to their personal computers, such as IDE's; however, most will not be available for student home use. Even if available, students can have difficulties installing them on their personal computers because of issues such as operating system compatibility and system requirements.

When schools lack the resources for controlled environments, or during Covid-19 school closures, educators teach students how to use desktop applications instead of client server applications. For example, some schools offer courses that teach Microsoft Access (a self-contained desktop application which can be downloaded and installed on a student's personal computer) instead of Oracle because vendor specific applications may require schools to purchase costly licenses and may require students to be on-site in computer labs to use the application.

Even in introductory classes where Microsoft Office skills are taught, students are required to have access to the software. Software may be available in the school labs however students benefit from having personal access from their own computer. Microsoft has made their software available to students to help ease this issue. Even if students have the software installed on their computer there are problematic issues such as the computer configuration (RAM, storage, etc.), or the operating system they are using (Windows, Macintosh OSX, etc.) (Rodriquez, et. Al, 2008). Microsoft Office 365 can eliminate some of those issues, but Microsoft Office 365 does not offer full functionality, limiting what can be taught.

Alternatives to Controlled Environments

A proposed solution to the above-mentioned issues is to utilize online tools that simulate the learning environment of the software that is being used for the class. The use of simulations is grounded in action learning and is the basis for experiential learning (Kolb, 1984). Evidence shows that using simulation results in a shorter learning curve than traditional lecture-based classes (Shute, 2007). Airline pilots, engineers, stock traders, firefighters, healthcare workers all use simulators to contribute to their learning (Kaufman & Lauve, 2010). Software simulations have also been effective when a workforce is required to learn enterprise-wide software programs such as SAP (Bosman, 2002).

With simulated environments, students get hands-on experience with basic activities, or with events they may be unlikely to encounter in a traditional learning environment (Aldrich, 2002). Simulated environments provide an environment where failure has relative few consequences. Using simulated environments to learn is based on the simple strategy—practice makes perfect. Some simulated environments provide computer-generated feedback that does not require a professor to be present to offer their own feedback (Yusuf and Al-Banawi, 2013). With the effects of the COVID-19 pandemic forcing the use of home-based online learning, it can take a professor additional time to provide feedback to a student, ultimately delaying the learning experience. This immediate feedback from the online simulated environments allow students to continue their work, knowing they are doing the work properly or if they are having difficulties. The automatically generated feedback can show the students what they are doing wrong so they make the necessary corrections and continue with their work (Hasan & Khan, 2020).

Simulation software can be installed on individual computers, however using an online simulated environment provides standardized around the clock access for all students as long as they have an internet connection. However, all students may not have a reliable internet connection from their home (Coman et al., 2020). With schools being closed because of the COVID-19 pandemic, public libraries may provide a way for students to access the online environment as long as they remain open and available to students. With a standardized environment, instructors can be assured that students are using the same version of software and encountering the same situations. In a classroom environment, this ultimately allows the instructor to focus on teaching the class without the distraction of individual student interruptions due to computer or software issues. Because of the COVID-19 pandemic, teachers are not as readily available to help students, so keeping a standardized environment is essential to the success of the student, since teacher interaction may come from online support from Zoom or some other online communication method.

Examples of Simulated Environments

Several university-focused online simulated environments are available through textbook publishers. For example, simulated environments to learn network administration or information security management are available through Cengage Learning. Each of these simulated environments allow students to make system changes that would not be allowed on school's existing networks, or on a dedicated network that has been configured for the school. Textbook publishers also offer simulated environments to learn software, such as SAP and Oracle, which would typically require schools to purchase expensive licenses. Online simulated environments offered through the textbook publishers typically accompany specific textbooks to compliment the

learning environment. The online simulated environments offered by the textbook publishers are purchased by the students as stand-alone products or as add-ons to a specific textbook.

Relying on textbook publishers is not the only way to take advantage of online simulated environments. Vendors may provide access to training modules via their website. While some may be offered at no cost, more advanced training can be costly. Many online simulated environments are freely available on the internet, such as w3schools, codeskulptor, and OracleLive. MIS faculty can utilize these free tools to supplement course content for subjects such as web design, programming, and database management. Below are examples of some of the free internet-based controlled environments that are available.

One example of a simulated environment that can be used in a hardware or networking class is found in the product MindTap by Cengage. MindTap is an online learning platform accessed by a web browser. The platform integrates coursework, etextbooks, study tools and assessments. To simulate a computer lab consisting of more than one computer where students perform network administrative tasks, Cengage Network+ Guide to Networks offers Live Virtual Machine Labs to simulate a network environment. The graphic below (Figure 1) shows the virtual desktop computer that is a member of network. With the use of the virtual desktop, a student can use software installed on the virtual computer to complete local computers tasks and use networking software to access other computers on the virtual network and complete network administrative tasks. This benefits the students who would not be able to practice and develop the skills associated with a physical networked environment. This benefits the instructor because all students have access to the identical virtual environment without concerns of software or hardware compatibility issues that students often encounter when using their personal computers.

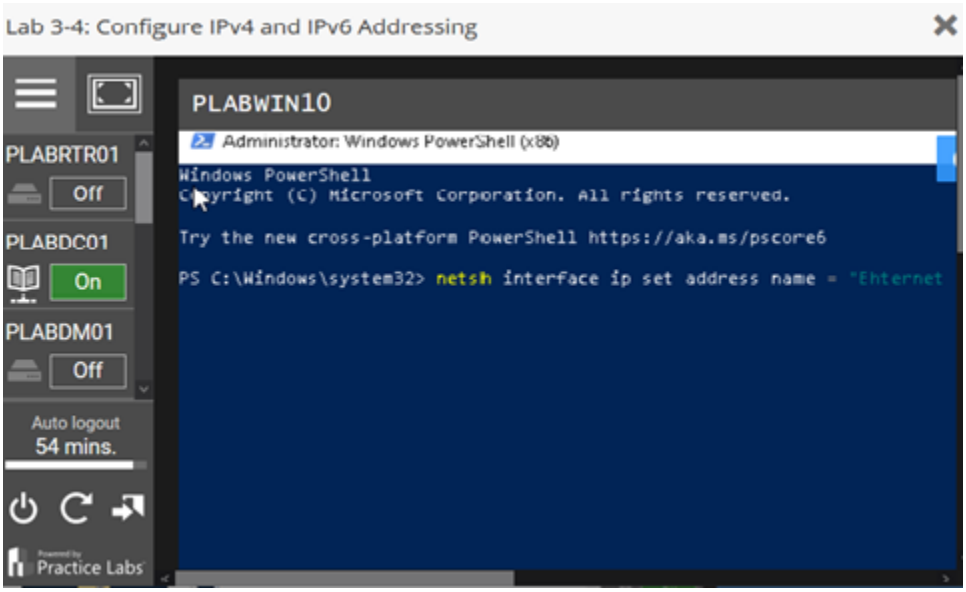

Figure 1 Cengage Network+ Guide to Networks, 8e West et al

CodeSkulptor is an online Python programming environment. It was created in 2021 as a tool for teaching Python programming to beginners. There are three benefits to using CodeSkulptor to students when learning Python: they do not need to install any software, they all have the same

Python version and editor, and they can access the programming environment using a web browser. (See https://py3.codeskulptor.org/about.html). This is a benefit to the instructor because all students have access to the identical virtual environment without concerns of compatibility issues that arise when installing an editor or a Python interpreter across difference types of devices that students use to connect to the internet. Students can write code in the editor shown in the left panel (Figure 2) and the output is shown on the right panel (Figure 3).

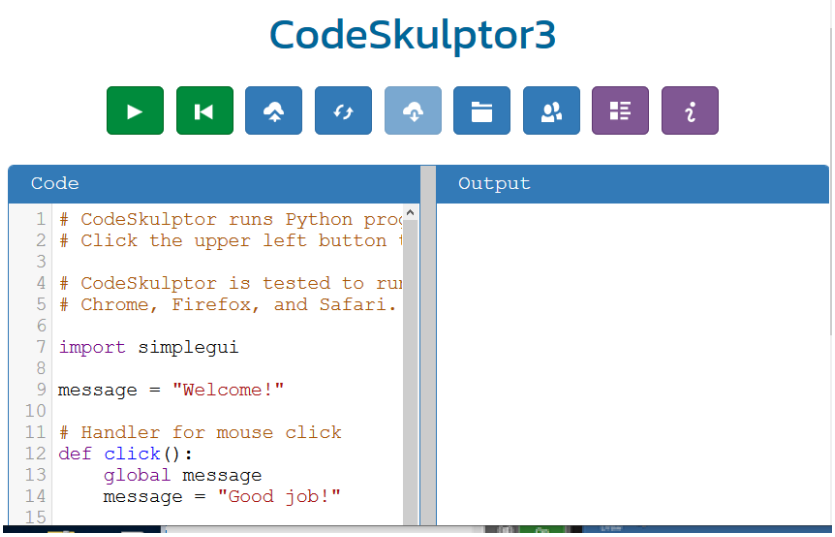

Figure 2 CodeSkulptor3

Figure 3 CodeSkulptor3

The interactive teaching and learning environment Pearson's MyLab Programming accompanies the textbook, *Introduction to Programming Using Python*, written by Liang Y. Daniel. As illustrated in the above graphics, the learning environment contains an interactive interface with two windows. The left window allows students to select a homework problem. WORK AREA tab of the right window is active, a problem is displayed in the upper pane. The student types the solution as Python code in the lower pane and then clicks the submit button to check the answer. After the submission is checked for syntactical and logical correctness, the RESTULTS tab becomes active and displays feedback to the student. Although the MyProgrammingLab experience does not act as a cloud-based Python interpreter, it does provide a mechanism for

students to experience writing and assessing Python code for the given problem without the need of having a Python compiler installed on their personal computer.

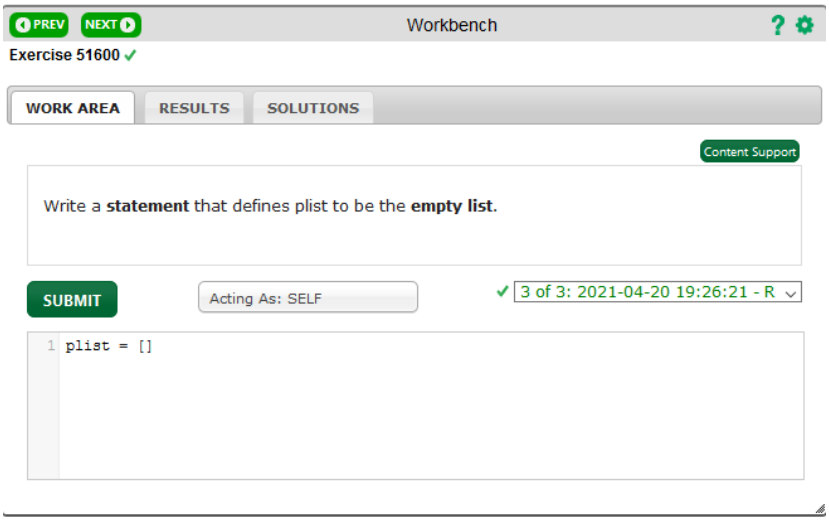

Figure 4 Pearson's MyProgrammingLab

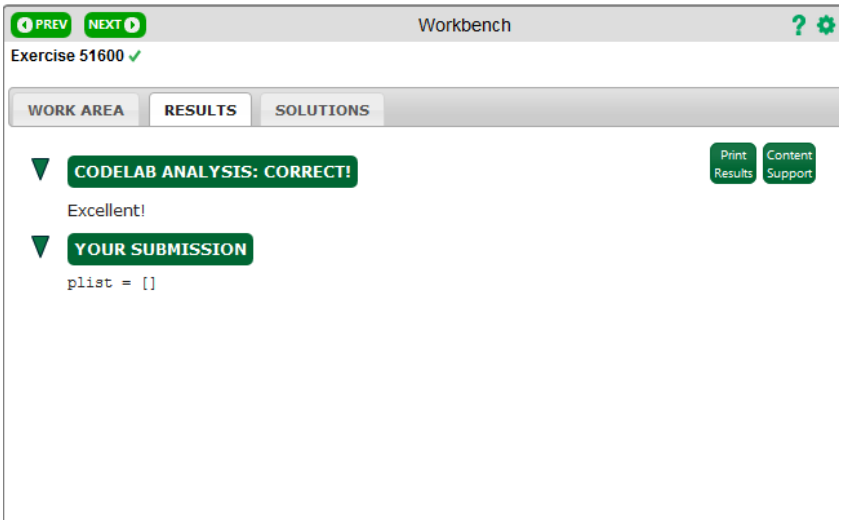

Figure 5 Pearson's MyProgrammingLab

SoloLearn is a website offering tutorials on a variety of programming languages. It also provides a code playground that can be used in a web design course. The code playground can be used independently of the tutorials offered by SoloLearn on web technologies: HTML, CSS, JavaScript, and Responsive Web Design. Students in a web design class would select the Web playground. The Web playground is divided into four panels; HTML, CSS, JavaScript, and CONSOLE. Students can write their HTML, CSS and JavaScript code in the respective panels and then the results web page is displayed in the CONSOLE panel. This web-based simulated environment is a good option for a web literacy class or other technology classes that introduce students to HTM, CSS, or JavaScript. One limitation is that SoloLearn does not provide more advanced capabilities

that are commonly found in an Interactive Development Environment like Visual Studio Community or NetBeans.

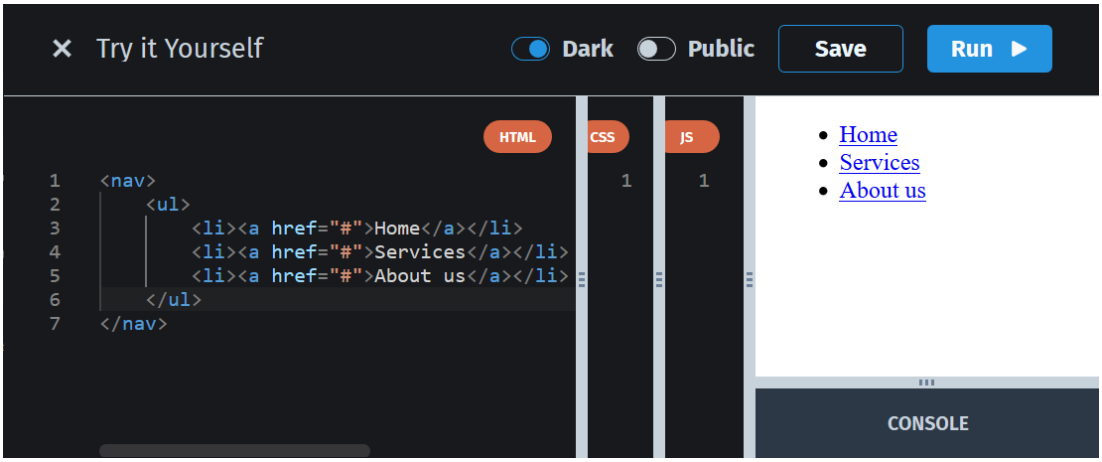

Figure 6 SoloLearn.com

A useful online simulated environment for web development is W3Schools (www.w3schools.com). W3Schools offers HTML, XML, CSS, and JavaScript. Tutorials on each of the subjects are available to students. Students can see the code, then are able to see the results of the code. Students are also able to make changes to the code and immediately see those results. W3Schools also offers quizzes and exercises that students can do to enhance their learning of web topics. In addition to a web development simulated environment, W3Schools also offers environments for programming languages, including Python, PHP, jQuery, and Java.

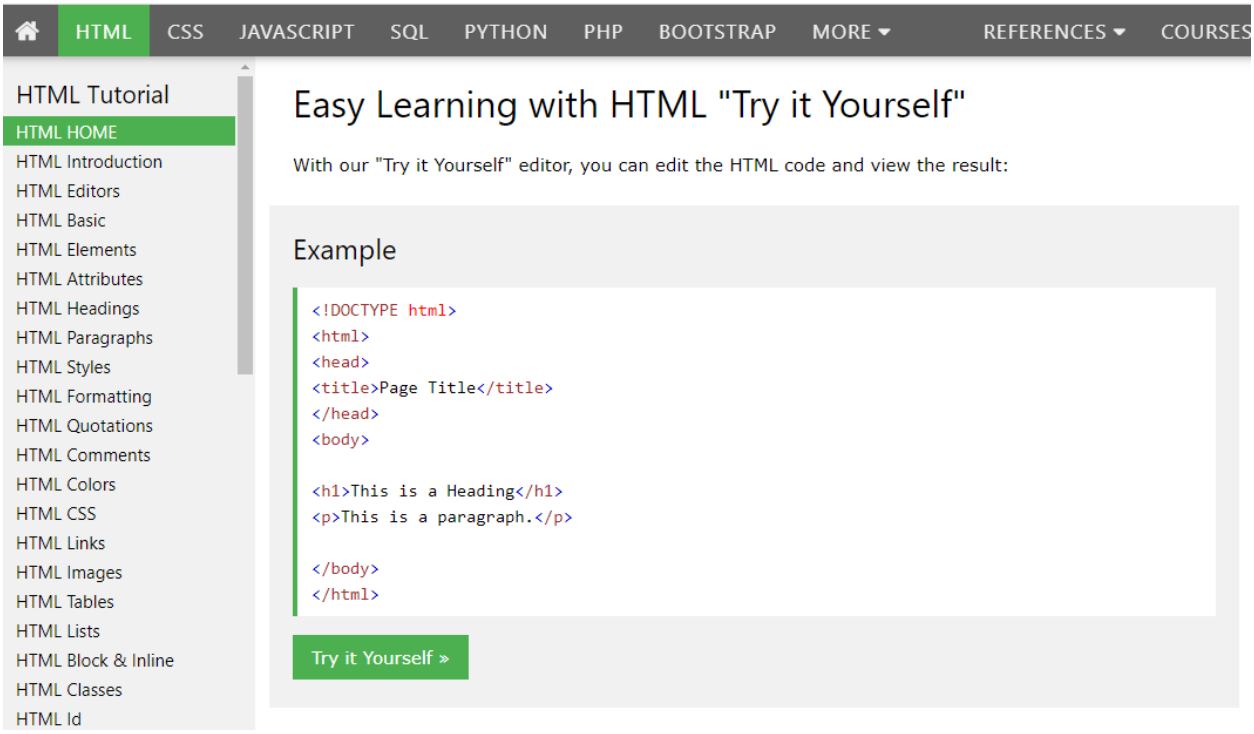

Figure 7 W3Schools code page

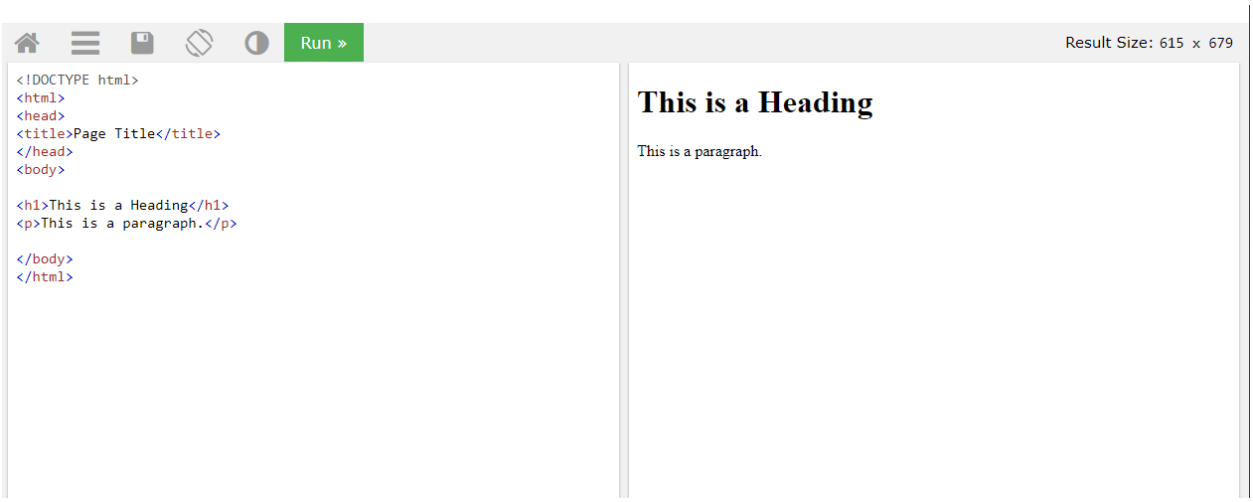

Figure 8 W3Schools results

OracleLive is a web-based Oracle platform that allows students to create, populate and query databases. Students can write their SQL directly into the web page or upload scripts to be executed by Oracle (Figure 9). Instructors can use this simulated environment for database classes to introduce students to Oracle without concerns with students having access to Oracle.

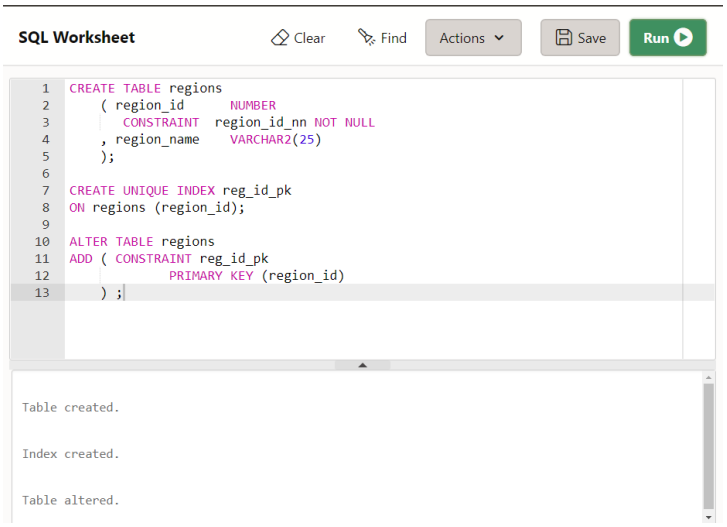

Figure 9 OracleLive

Another alternative for introductory database classes is the integrated learning environment offered by zyBooks (Figure 10). zyBooks allows instructors to adopt their product, zyLabs that allows students to execute SQL statements in a mySQL virtual environment.

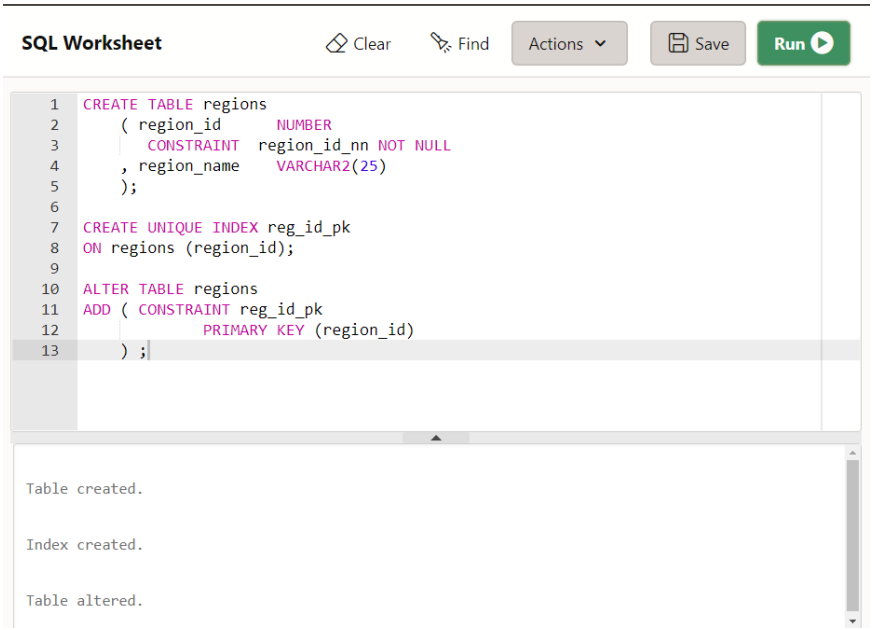

Figure 10 zyLabs

Conclusion

Whether MIS faculty use online simulation environments from the textbook publishers as the foundations of their courses, or they use the freely available online tools to complement their existing teaching methods, MIS students can benefit from the experiential learning, especially with the effects of the COVID-19 pandemic keeping them out of the classrooms.

Unfortunately, because of the development costs, time commitment needed to build the environment, and the available of content experts, simulated environments are rarely built into available courseware. Until textbook publishers start seeing profitability from their existing products, it is unlikely that new online environments will be developed. However, this is starting to change as more and more textbook publishers are starting to see the advantages of using simulated environment. The effects of Covid-19 will add additional motivation for more simulated software environments to be developed to accommodate the lack of time students are able to use school resources. Until more publisher simulated environments are available there is a wealth of simulated environments that can be used via free websites. (There are also many paid services that can be used). All of these options can benefit MIS education, especially during the Covid-19 pandemic. Ultimately, it is up to MIS faculty to adopt these products into their classroom.

REFERENCES

Aldrich, C. (2002). *The Learning Frontier: Words of advice from the computer-gaming industry*. Online Learning, 5(1), 34-37.

Bosman, Kelli (2002). Simulation-based e-learning .Syracuse University.

Coman, C., Laurent, G., Meses, L, Stanciu, C., and Bularca, MC. (2020). Online Teaching and Learning in Higher Education during the Coronavirus Pandemis: Students' Perspective. Sustainability, 12(4), 10367, https://doi.org/10.3390/su122410367.

Hara, N., & Kling, R. (2000). Student distress in a web-based distance education course. Information, Communication & Society, 3(4), 557-579.

Hasan, N. and N Khan (2020). Online Teaching-Learning During Covid-19 Pandemic: Students' Perspective. The Online Journal of Distance Education and E-Learning, 8(4), 202-213.

Kaufman, D., and L. Sauve. (2010). Educational Gameplay and Simulation Environments: Case Studies and Lessons Learned. Information Science Publishing.

Kolb, D. (1984). Experiential learning: Experience as the source of learning and development. Englewood Cliffs, NJ: Prentice-Hall.

Luse, A. and J. Rursch (2021). Using a virtual lab network testbed to facilitate real-world hands-on learning in a networking course. British Journal of Educational Technology. https://doi.org/10.1111/bjet.13070

Pal, N. (2007), A Closer Look at Business Education: Action Learning, The Aspen Institute, Center for Business Education, September 2007, available at http://www.beyondgreypinstripes.org/pdf/ActionLearningCasePlace.pdf

Raghavan, K., Desai, M., and P.V. Rajkumar.(2020). Multi-step Operations Strategic Framework for Ransomware Protection. SAM Advanced Management Journal. 85(4). p. 16 – 24.

Raghavan, K., Desai, M., and P.V. Rajkumar. (2017) Managing Cybersecurity and e-Commerce Risks in Small Businesses. Journal of Management Science and Business Intelligence, 2(1), p. 9-15.

Shute, V.J. (2007). Tensions, Trends, tools, and technologies: Time for an educational sea change. In C.A. Dwer (Ed.), The future of assessment: Shaping teaching and learning (pp. 139-187). Mahway, NJ: Lawrence Erlbaum.

United Nations (2020). Education during COVID-19 and beyond. Retrieved on April 16, 2021 from https://www.un.org/sites/un2.un.org/files/sg_policy_brief_covid-19_and_education_august_2020.pdf

Yusuf, N., Al-Banawi, N. (2013). The Impact of Changing Technology: The Case of E-Learning. Contemporary Issues Educational Research., Volume 6, 173-180.