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Adopting Scholarship of Teaching and Learning (SoTL) Principles in a Cybersecurity Program

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With cybersecurity becoming an essential need in today's world alongside the growing trend of higher education in adopting and implementing cybersecurity programs at their institutions, principles of the Scholarship of Teaching and Learning (SoTL) must be utilized to help faculty grasp student learning and how to further enhance their programs. At Murray State University's Telecommunication Systems Management (TSM) program, we have implemented SoTL by focusing on the inquiry of student learning, grounding in context, abiding by sound methodology, partnering with students, and making our findings appropriately public. By applying these SoTL principles in the TSM cybersecurity track,faculty have been able to guide their inquiries about student learning and to help evaluate what assignments, curriculum, and activities are enriching the learning experience. Additionally, they have been able to ensure that the cybersecurity content remains updated and relevant. Understanding student learning in a cybersecurity program is critical because the field of cybersecurity is always changing and advancing, which requires the curriculum and assignments to be updated or changed at the same pace. Utilizing the principles of SoTL has enabled the faculty in the TSM program to accomplish this important goal.

Introduction

In the field of cybersecurity, it is critical to understand theory and have practical knowledge, typically gained through hands-on experience. To further embrace Scholarship of Teaching and Learning(SoTL) concepts—inquiry of student learning, grounding in context, abiding by sound methodology, partnering with students, and making our findings appropriately public--faculty at Murray State University utilize the practice-oriented model that Keith Trigwell and Suzanne Shale (2004) proposed. We use the components of knowledge, practice, and outcome to adopt SoTL into cybersecurity courses. This model helps faculty master their knowledge in cybersecurity by understanding the discipline, context, and different methods of teaching and learning cybersecurity concepts. Having this knowledge aids the faculty in being able to disseminate information to students in a way that they can understand, and it allows for the creation of an environment where students feel comfortable and can be successful in their educational endeavors. The component

of practice allows for more development and reflection on the concepts to obtain a firm grasp on the different pedagogical ways to teach the students. This pedagogical method allows faculty to produce the different outcomes and to improve student learning based on them. The final component of outcomes focuses on what the students learned and whether all the resources they needed to learn were available, as well as how satisfied the instructor was with the course.

Program Context

Both students and faculty can benefit from Scholarship of Teaching and Learning practices. The faculty will be able to ascertain feedback from the students in a constructive way that allows them to improve the course for future students, and to keep up with current cybersecurity practices. Students can benefit from this practice by learning how to give feedback and utilize resources that are given to them, the most beneficial of which is learning how to research. For these reasons, using a practice-oriented model to practice SoTL principles is critical in having a strong cybersecurity course and program.

Practice-Oriented Model Overview

The goal of the Trigwell and Shale's (2004) model is to promote the notion of scholarship as activity, consider pedagogic resonance, and assume learning is a partnership. Within this model, Trigwell and Shale include three interrelated components: knowledge, practice, and outcomes. These components help describe scholarship and can be further defined by the elements listed in their circle, as shown in 'Figure 1 - Practice-Oriented Model for SoTL.' Each of the elements described in the components of the model have appeared in other models of scholarship of teaching. Within the knowledge component, the teachers' prior experience of discipline knowledge, knowledge of teaching and learning, and of the context constitute pedagogic content knowledge (Shulman, 1987). Trigwell and Shale also noted that there are variations in teaching and learning that are referred to as dimensions of scholarship. The knowledge component can be divided into experience-based and research-based knowledge, according to Kreber and Cranton (2000). However, Weston and McAlpine's (2001) framework model debates experience and research-based knowledge.
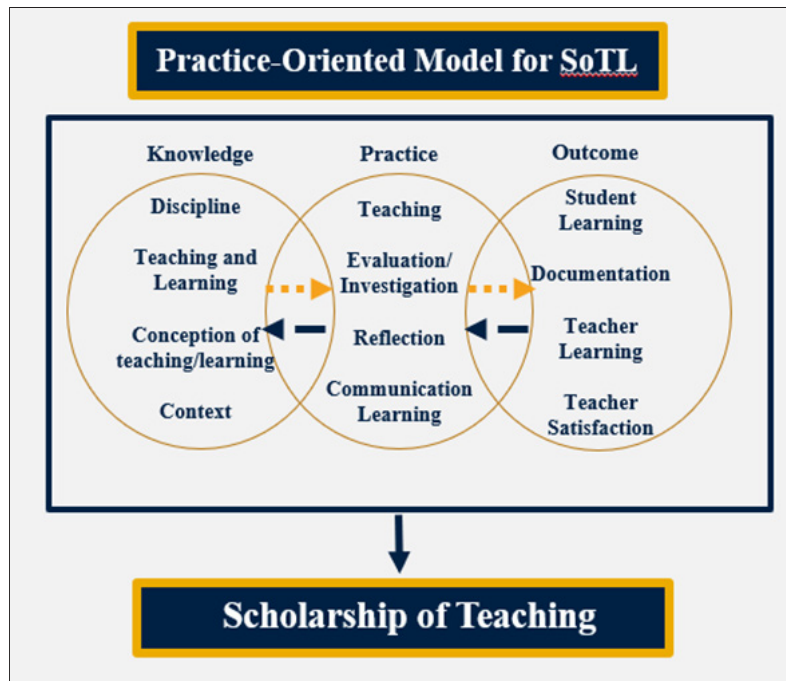
Figure 1. Practice-Oriented Model for SoTL

Next, the practice component was built around the scholarly activities of evaluation/investigation, communication, and reflection (Kreber & Cranton, 2000; Trigwell et al., 2000; Weston & McAlpine, 2001). The practice component in the model also includes collaborative engagement in learning together and learning through the act of teaching. One of the essential elements of the practice-oriented model is the act of teaching. In the model, the act of teaching is the center, which can be seen in 'Figure 1 Practice-oriented Model for SoTL.' In this component, one of the most critical elements is communication, which is essential because that is how experience and knowledge are passed between the students and teacher. Communication also allows for transparency of both the learning process and how knowledge is passed on in the outcomes. The outcomes component is another important piece to the practice-oriented model for scholarship of teaching. The outcome component includes the following elements: student learning, documentation, teacher learning, and teacher satisfaction. The outcome component results from teachers' and students' collaborative efforts, including both students' and teachers' learning. Documentation in the outcome component can include results of course outline, course materials, course evaluation and investigation results. Some of these documents can result in teacher satisfaction, which is another element of the outcome component.

Within the practice-oriented model there are three distinct levels of teaching—excellent teaching, expert teaching, and scholarship of teaching—each of which

are described by Kreber (2002b). The excellent teaching level is comprised of the upper elements found in the practice-oriented model of all three components. An excellent teacher will have advanced content knowledge of their area of expertise as well as know the pedagogy of teaching. Excellent teachers will also be able to engage students to make sure they are effectively learning the content and can adapt to help the student succeed. For the expert level of teaching, the faculty adopt a scholarly approach of practicing their pedagogy through teaching systems. Also, faculty strengthen their teaching skills using literature, their investigations of pedagogy, and the feedback from students and peers. Teachers that are at the scholarship of teaching level are masters of their craft and want to communicate their knowledge and how they are learning this knowledge. The scholarship of teaching is the last phase because it is the method of making the teacher's knowledge public, which is gained through practice and is pedagogically sound. The scholarship of teaching encompasses the previous levels of both excellent teaching and expert teaching. Understanding how the practice-oriented model is made and how all the components are assembled is critical in knowing how it supports the scholarship of teaching.

Discussion

Overall, applying the practice-oriented model for SoTL has helped faculty master cybersecurity concepts while adapting material to make superior courses for students. These adaptations are based on student feedback and the communication students provide in class, while covering the following concepts. The first concept is a better understanding of the benefits of the assignment. Students sometimes do not understand the purpose of the assessment and question the values placed on the assignments. One method that can be used to help elaborate on the benefit of an assignment is to include a video explaining the assignment and how it relates to real world cybersecurity concepts that they will encounter in the industry. The second concept is that often, students need multiple explanations of a cybersecurity concept. An example of one of these concepts is the different types of access control. One way of addressing this is to provide students with alternative explanations that can be found on YouTube. Sometimes another perspective and explanation may help students grasp the concepts better; however, it is important that the explanation is clear and useful to the students. The next concept is making sure that the extra material is useful. Obtaining students' feedback on which extra course material was beneficial, and how it helped them gain better insight into a concept, is critical in making sure the course material is refined and to the point. Another concept that helps with the

scholarship of teaching is to make sure the course has the needed documentation to be successful. In the field of cybersecurity, having good documentation is critical. The success of students in their jobs depends largely on their ability to go through documentation, evaluate them for accuracy, and review their relevance in an ever-changing cybersecurity field. Using documentation rather than step-by-step guides teaches students to use the document to research assignments to be successful. The last concept that can help faculty with SoTL is learning what the students enjoyed and found to be useful and fun in the course. Making enjoyable assessments helps in creating a desire within students to learn the concepts, and creates an environment where success in their educational endeavors is a positive achievement. This type of feedback from the outcome component of the practice-oriented model enriches the learning experience for both the students and faculty.

Conclusion

In conclusion, the cybersecurity field is always in a constant state of flux, and it's crucial that faculty continue to educate themselves and master new content to continue their scholarship of teaching and learning. By applying the practice-oriented model, faculty are enabled to use this content to expand the educational experience for students and enable them to master cybersecurity content. Scholarship of teaching is critical in developing a strong undergraduate cybersecurity program that teaches students how to engage, research, and communicate their knowledge in cybersecurity, particularly when students are going into a high-demand field that requires diverse thought and critical thinking. These attributes are highly sought in the cybersecurity workforce, and with the current deficit in cybersecurity professionals, students must succeed in their education, enter the professional world, and meet these demands.

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