



INCORPORATING GUIDED AND OPEN INQUIRY INTO THE CTE CLASSROOM

By Jennifer Schwartz

FORMAL EDUCATION HAS EXPERIENCED MAJOR CHANGES IN THE LAST CENTURY

(National Research Council, 2000). Currently the United States education system is being scrutinized and the expectations of educators are dramatically shifting (Fletcher, Lasonen, & Hernandez, 2014; National Research Council, 2000), particularly in terms of the lack of students who

are workforce or postsecondary education ready. Those students not able to connect education and the potential for a satisfying career are more likely to be disengaged in the classroom, have a lack of motivation, and may eventually drop out of school (Loera, Nakamoto, Youn, & Rueda, 2013). For many districts, career and technical education (CTE) provides a solution to this problem.

Preparing Students for the Future

Career and technical education (CTE) has experienced a transformation in recent decades in recognition of low student work readiness and preparedness for further education (Fletcher, Lasonen, & Hernandez, 2014). More recently, administrators have implemented more relevant and meaningful curriculum with the

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intention of making students both career and college ready (Loera, Nakamoto, Youn, & Rueda, 2013). However, CTE instructors must determine the most effective way to prepare their students for this next step in life, whether that step is postsecondary education or a transition directly into the workforce. Unfortunately, it appears the next generation is not being adequately prepared with the necessary skills needed to accomplish this and additional curriculum delivery methods should be considered in order to adequately prepare the future of our workforce.

Research indicates that engaging students in advanced inquiry practices, such as posing questions, predicting outcomes, conducting observations and drawing conclusions, contributes to effective learning, motivation, critical thinking, communication, and an increased interest in content (Banchi & Bell, 2008; McLaughlin & McFadden, 2014). However, many of the current activities within the CTE setting focus on structured inquiry, which consists predominantly of a step-by-step approach resulting in a predetermined outcome. Through the application of higher-level guided and open inquiry within the classroom, teachers have the opportunity to provide students with more engaging, rigorous and relevant learning experiences. Through the implementation of guided and open inquiry, educators can ready their students for the rigor of postsecondary education and effectively prepare them for the workforce.

Rigor and Relevance

Current CTE instruction delivery practices include the curriculum integration of CTE and academic content, with the goal of connecting academic studies to real-world applications. While the curriculum integration approach sounds appealing in theory, the varied terminology, which is often interchanged within curriculum integration literature, can be confusing. Literature associated with curriculum integration places emphasis on rigor and relevance, but the idea and implementation of rigor and relevance are subjective. The instructor that delivers curriculum through true rigorous instruction attempts to engage and educate students through lessons and learning experiences that are not only academically challenging, but are also intellectually and personally challenging (Bell, 2014; Fletcher, Lasonen, & Hernandez, 2014). Contrary to some educators' beliefs, a rigorous curriculum does not entail the traditional education methods of memorization and recall, nor is it comprised of a demanding workload that culminates in a difficult test, but rather encourages students to think deeper and question their assumptions (Del Rosso, 2015). True rigor encompasses such skills as interpreting, analyzing, making connections, using sources to support an argument, and critical thinking (Del Rosso, 2015; Fletcher, Lasonen, & Hernandez, 2014). True rigor also embodies academic relevance (Fletcher, Lasonen, & Hernandez, 2014).

Material that is academically relevant focuses on the challenges and their practical solutions that students may be faced with today or in the future (Bell, 2014). Fortunately, there are educators that understand the importance of relevance and how to deliver meaningful, real-world instruction (Del Rosso, 2015; Fletcher, Lasonen, & Hernandez, 2014). However, there are others that abandon relevant real-world engagement and deliver instruction with the mentality of “knowledge for knowledge's sake” (Del Rosso, 2015). Also, there are those who choose to follow some combination of the above, but do not appear to be truly grasping the relevance behind relevant instruction.

The National Research Council (2000) advises that the learning environment should be centered on four foundations: learner, knowledge, assessment and community. In a learner-centered environment, students should ideally bring prior knowledge and interest of a subject matter to the table. However, learner-centered environments do not give students all the knowledge and skills that are necessary to function in the real world. To function, students need knowledge of course content to support planning and strategic thinking. In a knowledge-centered environment, focus is placed on information and activities that will help students develop their understanding of the course content. Following knowledge, the third learning environment foundation is as-

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assessment, which is an opportunity for the instructor to provide feedback to the student. Through consistent summative and formative assessment, a student's thinking and understanding is gauged. The last, and perhaps the most important learning foundation is community. In a community-centered learning environment, the community consists of the instructor and students within the classroom. In this type of learning environment, the learning that takes place from one student to another, the ability to make mistakes and learn from them, and the continuous attempt to improve are central. There are many modes to deliver these foundations of education, but one manner in which to deliver quality instruction through relevant and rigorous means and encompass each of these foundations of learning is through the implementation of inquiry-based education.

Levels of Inquiry

Consider the levels, which include confirmation, structured, guided and open inquiry (Banchi & Bell, 2008). Confirmation inquiry is useful for reinforcing previously covered material. With this form of inquiry, the student is posed a question and given the procedure to arrive at the predetermined outcome. With structured inquiry, the instructor determines the question and methods, but students are asked to generate an explanation based on their investigations. While confirmation and structured inquiry are considered to be lower level, they are important in the development of the student's ability. As the student's comfort level with the inquiry process increases the student is more receptive to conducting higher levels of inquiry.

The third level, guided inquiry encourages the instructor to provide the students with a question, after which the students are then responsible for making predictions, designing the procedure, conducting the experiment and generating an explanation based on their investigations. Open inquiry, the fourth and highest level of inquiry (Banchi & Bell, 2008; Martin-Hansen, 2002), directs students to pose questions, make predictions, design an experiment and share their results. This form of inquiry encompasses higher-level thinking and has students working directly with the content (Martin-Hansen, 2002).

Advanced Inquiry

Advanced inquiry encourages students to think deeper and question their assumptions. Skills such as interpreting, analyzing, making connections, using sources to support an argument, and critical thinking are encompassed (Banchi & Bell, 2008; Martin-Hansen, 2002). Furthermore, through each level of inquiry, summative and formative assessments can be made, and each student's thinking and understanding can be gauged. Higher-level inquiry implemented in conjunction with group work and collaboration also provides students with an opportunity to sharpen their soft skills, particularly interpersonal skills, the ability to work as a team member, communicate effectively and demonstrate maturity.

All students should be given the opportunity to experience varied inquiry levels within a single CTE course of study. For example, during the laboratory procedures unit in a veterinary assisting classroom, students could be asked to perform a packed cell volume (PCV) laboratory test with a given blood sample. The procedure for completing a PCV exemplifies confirmation inquiry: The student is posed a question and given the procedure to arrive at a predetermined outcome. Structured inquiry could be implemented easily within this same unit lesson, where students might be asked what would occur if air was introduced into the testing equipment while placing their blood sample into the PCV tube. In this example the methods are again determined by the instructor, but the instructor asks students to generate an explanation based on their investigations.

Again, within this same unit, guided or open inquiry: Why did the blood sample yield its specific results (e.g., why is the liquid portion of their blood sample clear, hemolyzed, icteric or lipemic after its centrifugation)? If the instructor asks the question, thus leaving the students responsible for making predictions, designing the procedure, conduct the experiment and generating an explanation based on their investigations — this would be considered guided inquiry. If the students posed the question and completed the inquiry practices, the same example would represent open inquiry.

Conclusion

There are many levels of inquiry, and students do not necessarily need to design and implement their own investigations to be practicing inquiry. However, as students are exposed to the various types and levels, their abilities, understanding and comfort will mature (Banchi & Bell, 2008). If inquiry is implemented as a foundational method for the delivery of learning, consistent practice and a variation in the complexity of levels presented are needed to develop a deeper understanding of the course content (Banchi & Bell, 2008).

Ideas and expectations of education are shifting, and these shifting ideas should be incorporated into the CTE classroom. Students come into the classroom with prior knowledge and formative ideas based on their previous education and culture. The educator expands on this knowledge to facilitate learning in a fun and engaging manner. Through higher-level inquiry-based education, students are

engaged and educated through lessons and learning experiences that are academically, intellectually and personally challenging. Higher-level inquiry encourages students to think deeper and question their assumptions, which is a key skill that appears to be lacking in our current workforce. ■

Jennifer Schwartz is a veterinary assistant instructor at East Valley Institute of Technology (EVIT) in Mesa, Arizona. Email her at jschwartz@evit.com.

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