

## **Experiential Learning, Action Research, and Metacognitive Reflection in the Senior Capstone**

**Charles Feldhaus, John Buckwalter, and Elizabeth Wager  
Indiana University Purdue University Indianapolis**

### **Experiential and Integrative Learning and Connections to the Capstone Experience**

Science, technology, engineering and math (STEM) degree programs have for many years used a capstone course as the culminating experience for graduating seniors. Traditionally, this course requires teams of students to come together and address real world problems by synthesizing data and creating real world solutions based on a research design. Often the capstone course requires seniors to identify a problem, plan an approach, propose creative solutions, analyze the solutions, produce or implement the solutions, and communicate them internally or externally (Hotaling, Burks Fasse, Bost, Hermann, and Forest, 2012). Designing a research based capstone has value, especially for STEM students who will progress to graduate programs and follow a more traditional academic track to the STEM professoriate. However, not all STEM students will complete this traditional track.

As universities attempt to respond to the growing call for creating “work ready” students in a booming economy, the concept of capstone experiences is being rethought. Experiential learning, including work based internships and co-ops, is fast becoming an alternative to the more traditional capstone experience in STEM degree programs. According to a recent report by Alan Grose for the National Institute for Learning Outcomes Assessment, there is growing evidence that internships are among the most beneficial out-of-classroom learning experiences available to students (Grose, 2017). According to Kuh (2008), because of their strong positive association with increased engagement in other academically purposeful activities and improved outcomes in areas such as persistence, internships are designated as High-Impact Practices (HIPs), especially for students attending urban and minority serving institutions. In a recent national survey, the Gallup-Purdue Index found that college graduates are almost twice as likely to be engaged at work and demonstrate increased ability to flourish across multiple areas of well-being if they reported having a job or internship in which they applied what they were learning in the classroom (Gallup, 2015). In terms of those who hire university prepared students, it is clear they value work experience and internships as well. Nearly 90% of chief academic officers reported that work experience and/or internships were effective as an enhancement to traditional classroom academic work (Inside Higher Ed and Gallup, 2017).

As a result of the need for high quality assessment of student learning and the expectation from accrediting bodies for programs to show what students know and are able to do, more recently universities have adopted the integrative learning model for assessment of student outcomes. According to Budwig and Jessen-Marshall (2018), integrative learning for the college student comprises 1) the useful blending of knowledge and skills from different disciplinary areas, 2) putting theory into practice, 3) considering multiple perspectives to advance collaborative problem solving, 4) adapting the skills learned in one situation to problems encountered in another, 5) reflecting upon connections made over time among academic, co-curricular, and pre-professional experiences, and 6) integration of skills with learning in disciplinary or interdisciplinary settings across the curriculum.

As part of integrative learning, both signature assignments and signature work should be considered crucial. According to Egan, Kneas, and Reder (2018), the first step for academic programs is to define what they expect students to do as integrative learners before beginning assessment activities to measure integrative learning outcomes. Research by Grose (2017) indicates that internships, usually connected to experiential learning, defy assessment at the level of individual student learning outcomes. Many things contribute to this including the fact that often there is no attempt made to integrate learning outcomes of internships with those in the classroom. Of course internships are often unscripted experiences in which learning is emergent and is unique to each learner in each situation (Grose, 2017). In addition, on many campuses, the management of internships is highly decentralized, there is no common vocabulary for articulating how internships fit into student careers, and most assessment of internships is a long way from capturing their full potential as learning activities (Grose, 2017).

To make the connection between academic learning and workplace learning, universities are creating signature assignments and signature work using integrative learning rubrics. Signature assignments define short term, faculty assigned learning activities that demonstrate integration of learning within the context of a course. Signature assignments are often used as stepping stones for a student to be prepared to engage and succeed in capstone courses or signature work (Furco and Moely, 2012). Signature work meets several criteria including: 1) student agency and independence for choice of topic, independent work with guidance and mentoring/coaching from faculty, staff or community partners, 2) integrative work that requires students to draw on and apply skills and knowledge they have developed across many disciplines and courses, 3) large, complex and unscripted problems that students identify, and, 4) reflection on learning (Kinzie, 2018).

### **Organizational Context and the Implementation of Integrative Learning**

During the 2015-16 academic year, the department of Technology Leadership and Communication (TLC) in the School of Engineering and Technology (ET) at Indiana University Purdue University Indianapolis (IUPUI) began the process of an academic program review.

Academic program reviews are an important part of improving the campus units and are facilitated by the IUPUI Office of Planning and Institutional Improvement. The TLC self-study was intended to provide external reviewers from the University of Houston, Pepperdine University, and Ivy Tech Community College with background information about the department and provide an evaluation of strengths and areas for improvement. An institutional context for the university, the school and the department is found below.

IUPUI can trace its roots back to 1891, when Indiana University offered classes in Indianapolis for the very first time. In the decades that followed, both IU and Purdue proved themselves dedicated to providing higher education opportunities in Indianapolis, offering programs in the liberal arts, medicine, and more. However, the two universities operated independently until mayor Richard Lugar called for "a great state university in Indianapolis" in 1968. As a result, Indiana University and Purdue University merged their many programs and schools to create Indiana University Purdue University Indianapolis in 1969. Since then, IUPUI has grown as an independent institution becoming Indiana's premier urban research university.

IUPUI has two colleges and 18 schools that confer degrees through Indiana University (IU) and Purdue University (PU) in over 250 programs from both universities. The vast majority of the degrees are from IU, but programs in the School of Engineering and Technology and the School of Science grant degrees from PU. The IU schools on this campus include: Art & Design, Business, Dentistry, Education, Graduate School, Health and Rehabilitation Sciences, Informatics and Computing, Law, Liberal Arts, Medicine, Nursing, Philanthropy, Physical Education and Tourism Management, Public & Environmental Affairs, Public Health, and Social Work. The two colleges at IUPUI are the University College and the Honors College. The student population is made up of approximately 22,000 undergraduate students, and 8,100 graduate and professional students.

There are over 3,000 faculty and 4,000 support staff employed at IUPUI. The faculty is becoming more diverse as 29% identify as minorities and 43% are female. The operating budget for the University is about \$1.2 billion annually. Researchers on the Indianapolis campus were awarded 1,747 research grants and just over \$336 million dollars in 2012-2013. The 2015 freshman class welcomed 5,446 students with an average SAT score of 1013. About 88% of all IUPUI students are from Indiana with 56% being female and 44% being male, and 17% are students of color.

The Purdue School of Engineering and Technology (ET) was formed in 1972 and is the successor to Purdue University programs that began in Indianapolis in 1940. The first Purdue University courses in the city were defense training courses sponsored by the U.S. Office of Education. After World War II, the curriculum was changed from a certificate to a diploma program. Three technical-institute programs were established: drafting and mechanical technology, electrical technology, and supervision and production technology. Ten students

graduated at the first commencement in 1947. Freshman engineering courses were added in 1948; the Bachelor of Science in Engineering degree was first offered in 1969.

ET houses three engineering departments including Biomedical Engineering, Electrical and Computer Engineering, and Mechanical and Energy Engineering. There are four technology departments including Computer Information and Graphics Technology, Engineering Technology, Music and Arts Technology, and Technology Leadership and Communication. There were 147 faculty, 55 staff and 3,122 students as of fall 2015. ET has the largest international population of students at IUPUI. The school offers 18 undergraduate degree programs, six master's degree programs, and four doctoral programs. All engineering programs are ABET accredited, and many individual degree programs have attained program-specific accreditation. E&T has seven research centers with partners in medicine, informatics, law, education, and dentistry.

ET is a national leader, especially in Engineering Technology degree programs. Nationally, ET ranks 3<sup>rd</sup> in number of Engineering Technology B.S. degrees awarded from 2004-2013. The school ranks 2<sup>nd</sup> in Engineering Technology degrees awarded to women during the 2004-2013 time period. In terms of overall enrollment in engineering and technology schools nationally, ET ranks 4<sup>th</sup>.

The Department of Technology Leadership and Communication (TLC) was formed on July 1, 2012, as a result of a realignment of technology programs in E&T. TLC houses undergraduate programs in both Organizational Leadership (OLS) and Technical Communication (TCM). Additionally, Master of Science in Technology students may select a focus area in Organizational Leadership or pursue the new graduate certificate in Human Resource Development. In total, TLC offers and supports coursework for the following two bachelor's degrees, five certificate programs, graduate programs, and minor (hyperlinks are provided to all UGRD programs offered or co-offered through the TLC Department):

- Bachelor of Science in Organizational Leadership
- Bachelor of Science in Technical Communication
- Master of Science in Technology (OLS Focus Area)
- Certificate in Human Resource Management (UGRD)
- Certificate in International Leadership (UGRD)
- Certificate in Leadership Studies (UGRD)
- Certificate in Technical Communication (UGRD)
- Certificate in Sustainable Technology (UDRD)/Co-curricular with ENT Department
- Certificate in Human Resource Development (GRAD)
- Honors Minor in Leadership (UGRD)

During the first three years as a department, TLC focused a majority of its resources on new course development and activities to support two newly approved programs (the B.S. in TCM

and the HRD Graduate Certificate). Changes in campus-level leadership during the summer of 2015 resulted in a shift in departmental roles, responsibilities, and priorities. In August 2015, a new Interim Chair was appointed. The first challenge was to address overlapping areas of responsibility and develop clear priorities for the 2015-16 year of transition. Administrative, advising, and curricular support for the nine academic programs were aligned under three departmental program director roles and shifts in other responsibilities provided the necessary resources to achieve a list of specific 2015-16 goals. The vision, mission, and values of the department were formalized and are included below:

### ***Vision***

TLC contextualizes the Purdue School of Engineering and Technology *Vision* statement as follows:

The Department of Technology Leadership and Communication will be a recognized leader in providing organizational leadership, technical communication, and related capabilities through teaching and learning, research and creative activities, and civic engagement by leveraging its urban location and STEM (Science, Technology, Engineering, and Math) academic context.

### ***Mission***

TLC contextualizes the Purdue School of Engineering and Technology *Mission* statement as follows:

The Department of Technology Leadership and Communication serves the Purdue School of Engineering and Technology, the IUPUI Campus, and the Central Indiana community and beyond by providing a high-quality learning environment informed through the discovery and dissemination of organizational leadership, technical communication, and related capabilities via teaching and learning, research and creative activities, and civic engagement.

### ***Values***

TLC affirms its commitment to the following *Values* espoused in the Purdue School of Engineering and Technology Strategic Plan:

- *Excellence:* Academic excellence is our top priority. We pursue excellence in learning, teaching, research and creative activities, and civic engagement as the highest indicators of successful achievement.
- *Competition:* Competition enhances innovation. We strive to compete at the highest levels in the pursuit of extramural support for our students, as well as for our research and creative activities.
- *Collaboration:* We promote teamwork and partnerships for solving problems and disseminating and transferring knowledge, thus multiplying our accomplishments.
- *Diversity:* We value diversity in all of its forms in our research, curricula, and pedagogy and in our faculty, staff, and student composition.
- *Leadership:* We encourage and reward effective leadership at every level within TLC.
- *Location:* We are fortunate to be located in the vibrant city of Indianapolis and we strive to capitalize on the urban setting to address the challenges of a global society.
- *Professionalism:* We foster and reward high standards of collegiality and integrity.
- *Responsiveness:* We are committed to community and professional service to meet the needs of our stakeholders.
- *Improvement:* We strive to continuously improve the implementation of our mission through efficient assessment and evaluation processes.

- *Identity:* We take pride in the Purdue University and Indiana University affiliations, while striving to advance the IUPUI campus identity, image, and reputation.

Following the adoption of the TLC Strategic Plan, the department developed annual priorities to ensure proper allocation and focus of human, fiscal, and other resources to the broader mission and goals set forth in the plan. As part of the strategic priorities, the external review, and input from external stakeholders including representatives from business and industry, it was decided that a new course based on experiential and integrative learning should be developed.

### **Developing an Experiential Learning Capstone Based on Integrative Learning Principles**

Each senior within the Organizational Leadership (OL) degree program must take a senior capstone course in research. Students may choose from quantitative or qualitative research approaches and design a research study by illuminating a problem, preparing a detailed review of the literature connected to the identified problem, design a research methodology including a purpose statement, central research question, research sub-questions, data collection techniques, and data analysis techniques. As a result of recommendations from the external review and a thorough examination of the literature surrounding integrative learning and internships, it was decided that a course for students who had little work experience and needed an internship, or students who were currently working within an organization and were provided an opportunity for advancement, was needed as an option within the curriculum. Because of the applied nature of this integrative learning internship course, it was also decided that signature work and assignments would be created and embedded in the course.

Pre-requisites for the course were as follows: completion of TCM 32000: Technical Writing in Science and Industry with a grade of B or better, cumulative GPA of 3.0, an existing internship within an organization or an existing position within an organization and opportunity for advancement, signed employer agreement, and willingness to be visited by OL faculty at least 3 times per semester. The course description was developed by OL faculty and is below:

*This course is the OLS Senior Capstone Project, which represents the culmination of work for the baccalaureate degree in Organizational Leadership and Supervision (OLS). The Senior Capstone Project represents one of the final deliverables that a student will develop as an OLS major. As such, students are strongly encouraged to allocate sufficient time for editing, rewriting, and/or proofreading the final documents. Students are expected to both submit and present at a poster session, a professionally-developed, final research report that demonstrates their seriousness of purpose as a senior-level, college-educated student of leadership.*

*This capstone course is designed to be integrative in nature and will use overlap from previous coursework and signature work from internship experiences to demonstrate multiple leadership connections and competencies.*

- *Synthesize and integrate cumulative knowledge;*
- *Apply learning and create new knowledge;*

- *Work independently, bringing their own ideas to their work;*
- *Present the results of the capstone work to an audience;*
- *Meet rigorous professional and disciplinary standards;*
- *Reflect on personal and professional development.*

Course goals and objectives are as follows:

*Upon completion of this course, students shall be able to:*

1. *Identify a research topic germane to the discipline of organizational leadership;*
2. *Describe the research problem and why the topic they have chosen to research is significant;*
3. *Identify the basic characteristics of action research and key differences between qualitative and quantitative approaches;*
4. *Critically assess published research studies in fields that inform the research topic they have identified;*
5. *Develop a working knowledge of the basic steps in designing and conducting an research study in a STEM field;*
6. *Design and conduct effective data collection and data analysis for an action research study;*
7. *Critically analyze results from data collection and analysis and interpret findings;*
8. *Present reasoned conclusions and recommendations based on the data collection and analysis performed and the results of the research study;*
9. *Create a written report and poster to disseminate data collection, data analysis, findings, conclusions and recommendations to an interested audience;*
10. *Complete a bi-weekly metacognitive mini theme that compares and contrasts previous ideas regarding leadership prior to your foundational coursework in OLS 491000.*
11. *Use APA format throughout the research process for all assignments, the final report, and the poster session.*

### ***Signature work and assignments***

Relying on research by Furco and Moely (2012), input from the TLC Industrial Advisory Board, and the American Association of Colleges, and Universities LEAP Challenge (2015) signature work and assignments were created for OLS 49100. A thorough analysis of the recently revised Bachelor of Science in Organizational Leadership program learning outcomes (see appendix A) was conducted. The eleven program learning outcomes are what every OL graduate should know and be able to do upon graduation. Metacognitive reflection exercises were developed that required students to integrate knowledge, skills, abilities, and dispositions from previous academic and workplace experiences to demonstrate mastery of the eleven student outcomes, which all students in OLS 49100 were provided. Below is an example of a metacognitive reflection:

***Describe your communication with supervisor or colleagues.*** *This includes who your main point of contact is, how duties are assigned and how you go about figuring out exactly what you are responsible to do, and how the overall communication dynamic is at the company. Lastly, have you communicated any concerns or questions to your supervisor? Are you advocating for yourself?*

**Examine your experience** (learning goal: Better understand communication dynamics). What forms of communication do I use/colleagues use at my company? Are there daily morning staff meetings? Is all communication done via email or in-person? Is the overall vibe very collaborative or more of a work alone environment? Which of these forms of communication is the most effective for you?

**Articulate learning** (about communication dynamics). Please use the sentence prompts in quotations to start each of your responses.

"I learned that..." (Which ways of communication work best for you? Is there a time you wish you would have used that form of communication more effectively? Explain clearly so someone not in the experience could understand it)

"I learned this when..." (Connect how the learning has value both in terms of the situation and in broader terms, such as with other organizations, communities, activities, professional goals, etc.)

"In light of this learning..." (Set specific and accessible goals, consider benefits and challenges in fulfilling them, tie back to learning goal of better understanding communication dynamics)

After significant discussion and examination of research, a signature assignment for the internship capstone was developed. Students in the integrative internship capstone are required to complete an action research project using the organization in which they are interning or working. Internship supervisor's work closely with the student and a university representative to develop the action research project, and often, there is a return on investment for the employer. For purposes of this course, action research is defined as any systematic inquiry conducted by organizational employees, organizational leaders, or other stakeholders within the organizational environment, to gather data, analyze that data, and make informed decisions based on the research. Research by Mills (2011) informed this definition.

Following best practice research about signature work, the action research assignment must ensure that the student intern has agency and independence, and this is done as a result of the intern, their supervisor, and the university representative working together to agree on an action research project. The integrative nature of the action research project is assured because students have completed metacognitive reflection on the eleven student outcomes prior to developing the action research project and they must specifically delineate which of the student outcomes are addressed by the action research project they complete. Further, students identify an initial big, complex, and unscripted problem/issue within the organization that requires action research to solve or make decisions on. Finally, students will reflect on the learning that took place as a result of the action research project conducted at the organization where they work/intern.

A sample of the action research assignment is below:

### **Introduction of the Topic**

*The form of the introduction will vary with the nature of the proposed project. It is important to remember that this is the sole chance to establish a frame of reference in the reader's mind. Appropriate introductions are brief and designed to establish the context and need for a study. There is no "right way" to write an introduction. There are, however, several possible ways to craft an introduction that will accomplish its intended goal. One common method is to identify the problem in specific terms. This approach creates an overall frame of reference that makes it much easier for the reader to focus on the more detailed portions of the research. The Introduction and Topic should be supported by some citations or quotations from experts in the field and set the stage for the research problem and significance.*



**Research Problem**

*If there is no "problem" then there is no need to conduct research. It is important to provide the reader with a succinct issue or problem germane to the topic you have identified in the section titled Introduction and Topic. There is no section of a proposal that gives beginning proposal writers more challenges than the "Statement of the Problem" section. Too often early drafts present either a restatement of the introduction, a detailed description of the methods to be used, or a suggested solution. None of these are appropriate statements of the problem. A problem is something that is wrong. Therefore, the statement of the problem is merely a brief description of what is wrong, written in specific enough terms that the reader can see the problem. One test of the quality of a problem statement is always, "Could the problem be recognized if the statement were being read for the first time?" It is important to provide support for the fact that this issue is a problem by using citations and/or quotations from experts in the field.*

**Significance of the Problem**

*Once the problem has been stated, the significance of the problem must be established. The significance section should be drafted in a manner that removes any question of the importance of the proposed study. Generally, this section should "sell" the project as being worthy of doing in the business/industry and/or academic/disciplinary context. One of the effective methods of strengthening this section is to highlight key citations and/or quotations from expert sources that indicate that the problem is real and that things may be better if it were investigated.*

**Research Design**

*A specific discussion of the action research method being used and why this research method is appropriate for this study should be included in this section. Include citations/quotations from experts in the field of research methodology that you have chosen to support your study design. As part of this section on research design, students should include an appropriate purpose statement with research questions and/or hypotheses.*

**Data Collection**

*All procedures to be used in the proposed study should be defined. Define and discuss the population, sampling frame and sampling method. All sources of data collection must be clearly identified whether those sources are human or archival data. Discuss the specific data collection methods to be used for your study. Depending on the nature of your study make sure to specifically state the type of data you will collect.*

**Data Analysis**

*All data analysis techniques must be discussed in this section. Specific procedures for each step of the data analysis should be described and all software packages used to aid in the data analysis process should be identified. Validity and reliability measures for instrumentation and/or methods used to collect data should be discussed.*

**Findings, Results, Presentation, and Interpretation**

*In this section, the findings and results of the project are reported and discussed. When reporting findings and results, simply report factual information. This might be test scores, changes observed in lab performance, results of statistical analysis that prove or disprove a null hypothesis, content analysis of data analyzed, discussion of a perceived phenomenon, etc. All tables, graphs, charts, etc. should be included in this section to help illustrate analysis, results, and/or findings and these tables, graphs, and charts must be APA format. Researchers should present the findings and results based on the research questions and sub-questions, or on the research hypotheses they have created and use these as sub-headers.*

*Students are reminded that the OLS 49100 research project is the capstone of the undergraduate degree program. Regardless of the data analysis outcomes of the project, it is a success. Often there is a preconceived notion on behalf of student researchers of what the results should be. What is important is what the results*

really are. Important information can be obtained from any project, even if the results are not what were expected.

### **Conclusions and Recommendations**

*Based on the findings obtained, conclusions can now be drawn. Such conclusions must always be interpreted and considered within the context established by the study's delimitations and limitations. Additionally, it is often useful to link the conclusions to key findings from the literature review. The conclusions form the basis for the final evaluation of the project. Once the conclusions are drawn and the effect of the study determined, final recommendations for further work and or research may be made. It is imperative to work with the intern supervision and the TLC faculty representative regarding the conclusions and recommendations section so that everybody who has had access to the study is informed.*

*Finally, it is important to describe the limitations of the study and recommend additional research that could be performed. For instance, in the case of the leadership lab activities, it might be interesting to design a study that compares the intervention delivered face to face and online to see if there is a difference. It might be interesting to perform a study comparing performance by males vs. females, young vs. old, native English speakers vs. non-native English speakers, etc.*

A rubric was developed for each element of the signature assignment and that can be found in Appendix B. Integrative learning principles were used to create the rubrics for each section of the action research project.

### ***Lessons Learned***

At the time of this writing, OLS 49100 has only been offered once during the Fall of 2018. As data on student learning and outcomes become available, all stakeholders including students in the class, employers, faculty and other stakeholders will determine what worked, what needs improvement, and what needs to be changed moving forward. In terms of development of this integrative capstone internship course, there are lessons that were learned. A synopsis is below:

1. It is important to ensure that a thorough review of the literature on integrative learning, internships, and capstone projects is completed. While there are numerous studies on all three of these areas separately, research on the intersection of these three areas is thin. As universities embrace the creation of a culture of integrative learning and signature work, especially urban universities like IUPUI, a body of knowledge will be developed that will prove invaluable to those who adopt that culture.
2. Signature work and assignments are not easy to design. There is not a "one size fits all" for signature assignments and faculty must be willing to change during a semester if things are not working for the student or the employer. This flexibility is necessary to have experiential capstone experiences succeed. Each organization is a living, breathing organism that changes constantly. Faculty who lead experiential, integrative capstone experiences must realize this and be willing to facilitate a positive experience regardless of the circumstances.
3. It is imperative that there is a constant presence of university faculty at the employer's worksite. Building relationships with intern supervisors and other stakeholders at the

organizations who have agreed to work with interns and be an integral part of the capstone experience is essential. More importantly, it is crucial that faculty facilitate relationships between interns and supervisors and build confidence that an integrative capstone experience is good for both students and employers. A faculty “champion” is essential to making this work. Adjunct faculty or staff should not be encouraged to lead this type of initiative.

4. It is important to understand that integrative capstone experiences that use internships are not unique to STEM fields. Schools of engineering and technology have been doing internships and co-ops for years, however, too often these experiences are not tied to student learning, prior coursework, and the needs of the employer. As this realization is manifested, STEM degree programs may very well lead the way in terms of integrative, capstone experiences because of our long history with learning in context and working with employers.

Clearly, there is much more research to complete regarding experiential, integrative, capstone internship experiences. Taking the first step of creating signature work and assignments, evaluating the capstone experience using feedback from all stakeholders involved, and being willing to continue to build on the successes of the program will bode well for departments that embrace these types of initiatives.

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### **Biographical Information**

Charles R. Feldhaus, Ed.D. is chair of the Department of Technology Leadership and Communication and Professor of Organizational Leadership and Supervision in the Purdue School of Engineering and Technology at Indiana University Purdue University Indianapolis. He spent 20 years as a P-12 educator, principal and district office administrator before receiving his doctorate in Educational Administration from the University of Louisville in 1999. Undergraduate work was completed at the University of Southwestern Louisiana in 1979 and an MS in Secondary Education was awarded in 1985 from Indiana University. Research interests include leadership in STEM education, STEM workforce development and leadership, STEM teacher preparation, STEM discipline-based educational research, organizational behavior and change, organizational innovation, and organizational ethics.

John K. Buckwalter M.S. is a research associate at IUPUI's Stem Education and Innovation Research Institute. (SEIRI) John spent 27 years in K-12 as a classroom teacher, dean and principal. His transition to teacher education at IUPUI began with teaching STEM Technology educators in their final methodology courses as well as the Woodrow Wilson teacher education Induction Support Director. Over the last six years John has taught the capstone Action Research class for IUPUI's Woodrow Wilson STEM teacher education Master's Program. His B.A. is in Industrial Technology Education from Ball State University and his M.S. is in Secondary Education from Indiana University. Research interests include best practices in STEM education specifically as it relates to discouraged learners as well as Career Technical Education and the teacher training support that is needed in that field.

Elizabeth K. Wager, M.A. is a lecturer and Undergraduate Program Director for Organizational Leadership in the Purdue School of Engineering and Technology at Indiana University Purdue University Indianapolis (IUPUI). As a traditional student, she attended the University of Illinois (Champaign - Urbana) and returned to college 20 years later to complete her bachelor's degree and M.A. in Organizational Communication at IUPUI. Over the past 13 years, she has contributed to campus priorities and scholarship of teaching and learning related to first year experiences, assessment of prior learning, supporting adult and veteran students, academic advising and student success, self-leadership, and peer mentoring.

## Appendix A

<b>Bachelor of Science in Organizational Leadership (OLS) Program Learning Outcomes</b>		
<i>Upon successful completion of the Bachelor of Science in Organizational Leadership and Supervision, students will be able to:</i>		
1.	Implement strategies for personal, professional, and organizational success. (OLS 10000 and OLS 48700)	<b>*Problem Solver</b> - (thinks critically, collaborates, analyzes, synthesizes and evaluates, and perseveres).
2.	Illustrate ways human behaviors influence organizational culture and success. (OLS 25200 and OLS 32700)	<b>*Community Contributor</b> – (builds community, respectfully engages own and other cultures, behaves ethically, anticipates consequences).
3.	Differentiate responsibilities of supervisors, managers and leaders. (OLS 25200 and OLS 48700)	<b>*Communicator</b> – (evaluates information, listens actively, builds relationships, conveys ideas effectively)
4.	Identify how ethical issues influence organizational activities and decisions. (OLS 26300; OLS 27400; OLS 38300 & OLS 48700)	<b>*Innovator</b> – (investigates, creates/designs, confronts challenges, makes decisions). <b>Community Contributor</b> - (builds community, respectfully engages own and other cultures, behaves ethically, anticipates consequences).
5.	Distinguish ways diverse workplace contexts affect organizational behavior and leadership. (OLS 252; OLS 27400; OLS 38300 and OLS 32700)	<b>*Community Contributor</b> – (builds community, respectfully engages own and other cultures, behaves ethically, anticipates consequences).
6.	Apply project management techniques to the completion of organizational initiatives. (OLS 37100 and OLS 38500)	<b>*Problem Solver</b> - (thinks critically, collaborates, analyzes, synthesizes and evaluates, and perseveres).
7.	Employ best practices for human resource management in organizations. (OLS 27400 and OLS 38300)	<b>*Problem Solver</b> - (thinks critically, collaborates, analyzes, synthesizes and evaluates, and perseveres). <b>Communicator</b> – (evaluates information, listens actively, builds relationships, conveys ideas effectively). <b>Innovator</b> – (investigates, creates/designs, confronts challenges, makes decisions). <b>Community Contributor</b> - (builds community, respectfully engages own and other cultures, behaves ethically, anticipates consequences).
8.	Apply quality, project, and change management principles for continuous improvement. (OLS 38500; OLS 37100 and OLS 48700)	<b>*Problem Solver</b> - (thinks critically, collaborates, analyzes, synthesizes and evaluates, and perseveres). <b>Innovator</b> – (investigates, creates/designs, confronts challenges, makes decisions).
9.	Interpret how leadership theories, styles, and processes impact organizations. (OLS 25200; OLS 27400 and OLS 39000)	<b>*Innovator</b> – (investigates, creates/designs, confronts challenges, makes decisions).
10.	Apply techniques for effective communication in a variety of workplace contexts. (OLS 10000; OLS 32700; OLS 49000 and TCM 32000)	<b>*Communicator</b> – (evaluates information, listens actively, builds relationships, conveys ideas effectively).
11.	Design research studies to identify a problem, define a research purpose, create a research question or hypothesis, collect, analyze and interpret that data, and arrive at reasoned conclusions to influence organizational decision making. (OLS 49000 and OLS 491000)	<b>*Problem Solver</b> - (thinks critically, collaborates, analyzes, synthesizes and evaluates, and perseveres). <b>Innovator</b> – (investigates, creates/designs, confronts challenges, makes decisions).

## Appendix B

### Introduction of the Topic and Research Problem

<input checked="" type="checkbox"/>	<i>Points</i>	<i>Performance Level</i>	<i>Description of Performance Expectations</i>
	<b>2</b>	<i>Exceeds Expectations</i>	<ul style="list-style-type: none"> <li>Topic is explicitly identified and supported by preliminary research literature performed by experts in the field; research problem is precisely and succinctly stated and supported by preliminary research literature; sub-problems are identified; limitations of the problem are explained; terms are clearly defined; and the researcher's interests, assumptions, and/or biases are made explicit to the reader. Student intern has worked closely with the supervisor and university representative to develop the topic and research problem.</li> </ul>
	<b>1</b>	<i>Meets Expectations</i>	<ul style="list-style-type: none"> <li>Topic is explicitly identified; research problem is clearly stated; scope of the problem is explained; and terms are clearly defined and all is supported by research literature. Student intern has worked with the supervisor and university representative to develop the topic and research problem.</li> </ul>
	<b>0</b>	<i>Needs Improvement</i>	<ul style="list-style-type: none"> <li>Research problem is too vague, unfocused, or obscured; hypotheses or questions are not well developed; no research literature supports the topic or problem, and/or the problem is too complex or too simple for a senior level research project. Student intern has not worked closely with the supervisor and university representative to develop the topic and research problem.</li> </ul>

### Significance of the Problem

<input checked="" type="checkbox"/>	<i>Points</i>	<i>Performance Level</i>	<i>Description of Performance Expectations</i>
	<b>2</b>	<i>Exceeds Expectations</i>	<ul style="list-style-type: none"> <li>Reasons for undertaking the study are made explicit to the reader; practical value of the topic to present or potential leadership issues are explained; the case is made for expending resources (time, materials, effort, money, etc.) to solve the problem, and entire significance is supported by research literature</li> </ul>
	<b>1</b>	<i>Meets Expectations</i>	<ul style="list-style-type: none"> <li>The topic is significant to present or potential leadership issues ; the significance of the topic is made clear to the reader; a general rationale is provided for solving the problem, and key areas of the significance are supported by the research literature.</li> </ul>
	<b>0</b>	<i>Needs Improvement</i>	<ul style="list-style-type: none"> <li>Topic is unimportant to present or potential leaders; and/or a weak case is made for studying the topic; and there is no support from research literature.</li> </ul>

### The Research Design, Data Collection, and Data Analysis

<input checked="" type="checkbox"/>	<i>Points</i>	<i>Performance Level</i>	<i>Description of Performance Expectations</i>
	<b>2</b>	<i>Exceeds Expectations</i>	<ul style="list-style-type: none"> <li>A succinct, clear, concise, one-sentence Purpose Statement, Research Question, or Research Hypothesis is developed and included. The research method(s) for investigating the research problem are appropriate, given the topic and the resources available to the student; validity and/or reliability issues associated with data are clearly identified; ethical issues are clearly explained; sources of data are precisely identified; and the method(s) to collect data are clearly outlined, including strengths and limitations of sources. Data analysis techniques are discussed and specific references to the method of data analysis for the study are delineated. Appropriate headers and sub-headers are included and an APA works cited page is formatted properly.</li> </ul>
	<b>1</b>	<i>Meets Expectations</i>	<ul style="list-style-type: none"> <li>A Purpose Statement, Research Question, or Research Hypothesis is developed and included. The method(s) for investigating the research problem are appropriate; the sources of data are identified; and the method(s) of collecting data are explained. Data analysis techniques are discussed and specific references to the method of data analysis for the study are delineated. Appropriate headers and sub-headers are included and an APA works cited page is formatted properly for the most part.</li> </ul>
	<b>0</b>	<i>Needs Improvement</i>	<ul style="list-style-type: none"> <li>The method(s) for investigating the research problem are too vague; and/or the data necessary to investigate the topic are either unavailable or too difficult to obtain. Data analysis techniques are not discussed and there are not specific references to the method of data analysis for the study. Appropriate headers and sub-headers are not included and an APA works cited page is not formatted properly.</li> </ul>

## Findings, Presentation, and Interpretation

<input checked="" type="checkbox"/>	<i>Points</i>	<i>Performance Level</i>	<i>Description of Performance Expectations</i>
	<b>2</b>	<i>Exceeds Expectations</i>	<ul style="list-style-type: none"> <li>Data analyses are appropriate to the research design; findings and results are logically organized and clearly explained to the reader; findings and results are presented based on their explicit association to the research problem and sub-problems; tables and figures are appropriately and effectively presented and used to convey meanings; and interpretations are clearly derived from the data obtained. Appropriate headers and sub-headers are included and an APA works cited page is formatted properly.</li> </ul>
	<b>1</b>	<i>Meets</i>	<ul style="list-style-type: none"> <li>Data analyses are appropriate to the research design; general results of the data are presented based on the research problem; and general interpretations of the data are explained.</li> </ul>

		<i>Expectations</i>	Appropriate headers and sub-headers are included and an APA works cited page is formatted properly for the most part.
	<b>0</b>	<i>Needs Improvement</i>	<ul style="list-style-type: none"> <li>Data analyses are unclear, inappropriate, and/or incomplete; results are not appropriately tied to the research problem; and/or factually flawed interpretations are presented. Appropriate headers and sub-headers are not included and an APA works cited page is not formatted properly.</li> </ul>

Conclusions and Recommendations

<input checked="" type="checkbox"/>	<i>Points</i>	<i>Performance Level</i>	<i>Description of Performance Expectations</i>
	<b>2</b>	<i>Exceeds Expectations</i>	<ul style="list-style-type: none"> <li>Specific conclusions from the results are identified; implications and limitations of the study are clearly explained; and specific and feasible recommendations for public policy, leadership practice, and/or future research are articulated. Appropriate headers and sub-headers are included and an APA works cited page is formatted properly.</li> </ul>
	<b>1</b>	<i>Meets Expectations</i>	<ul style="list-style-type: none"> <li>Sound conclusions were drawn based on the results; general implications are identified; and appropriate recommendations are made in relation to the conclusions. Appropriate headers and sub-headers are included and an APA works cited page is formatted properly for the most part.</li> </ul>
	<b>0</b>	<i>Needs Improvement</i>	<ul style="list-style-type: none"> <li>Unjustified conclusions and/or faulty recommendations made. Appropriate headers and sub-headers are not included and an APA works cited page is not formatted properly.</li> </ul>