Teaching Tip
Cultivating and Nurturing Undergraduate IS Research

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ABSTRACT

Assurance of student motivation and retention is a central challenge for Information Systems faculty. A promising means of stimulating interest in the Information Systems major and in subsequent graduate degree programs is undergraduate Information Systems research. Undergraduate Information Systems research allows students to engage more deeply with questions pertaining to Information Systems development and use, and it advances students' cognitive and intellectual growth above and beyond what can be achieved with traditional classroom activities. As such, undergraduate Information Systems research is a high impact learning experience. Yet, this advanced form of student engagement with Information Systems material remains in its infancy; teaching tips are lacking that promote it and provide guidance on how to mentor undergraduate Information Systems researchers. Using Bloom's taxonomy of cognitive skills and Malachowski's stages of mentoring framework, the present teaching tip emphasizes the continued need of cultivating and nurturing undergraduate Information Systems research, and it provides guidance for Information Systems faculty on how to mentor undergraduate Information Systems researchers.

Keywords: Student research, Mentoring, Creativity, Enrollment

1. INTRODUCTION

Laura Smith, a motivated undergraduate student who majors in IS and has long considered going to graduate school after her undergraduate studies, is becoming more and more disappointed with her learning process. Most of her IS courses require her simply to read various textbooks and to regurgitate the textbook knowledge in straightforward exams consisting mainly of multiple choice and short answer questions that require little or no creativity on her part. Furthermore, she finds the textbook knowledge rather outdated when compared to the IS research articles available to her through her library (she reads an MISQE article every once in a while). As a result of the disappointment with her learning, she discourages her younger friends from majoring in IS, and she no longer considers going to graduate school. Is there anything that we as IS faculty can do to counteract this unfortunate reality in many schools?

This vignette illustrates a common problem in many schools and Information Systems (IS) departments: the disheartenment and lack of interest of undergraduate students in the IS major and field (Granger et al., 2007). While much has been written on this topic (e.g., Bullen et al., 2009; Dick et al., 2007; Koch and Kayworth, 2007), the reality remains that students show little interest in IS, let alone in IS graduate programs (Burns et al., 2014). One promising solution to this problem lies in undergraduate IS research, which could stimulate interest in the IS major and discipline above and beyond what can be achieved with traditional classroom activities (Mustafa, 2004). In line with this notion, prior research proposed a framework that IS students can use in their undergraduate research efforts to improve their writing skills and the quality of their written reports (Mustafa, 2004). In doing so, such research has made a strong contribution to undergraduate writing. Yet, undergraduate IS research remains a rare activity at most schools. This point holds particularly true for scientific undergraduate IS research that is presentable at major international and national conferences instead of disappearing in the file drawers of IS faculty. Hence, the question remains of how IS faculty can encourage and nurture undergraduate IS research in general, and scientific undergraduate IS research in particular.

While IS faculty can assume several different roles to cultivate and nurture undergraduate research (e.g., the role of a co-worker, supervisor, role model, manager, or mentor), the most comprehensive and impactful one is the role of a mentor (Malachowski, 1996). Mentoring guides students' academic and personal development and, thus, extends well beyond purely scientific guidance to help students overcome the challenges of undergraduate life (Reilly, 1992). As such, mentoring helps students with various aspects related to their careers and personal lives. These aspects include enhanced creativity, which holds particular promise to move undergraduate IS research from rather simplistic evaluation and review tasks to "research on the edge" that is presentable at major academic conferences (Reilly, 1992). Accordingly, effective mentoring holds the promise to encourage and nurture undergraduate IS research in general, and scientific undergraduate IS research in particular. As a result, effective mentoring could stimulate further interest in the IS major and discipline (as well as in IS graduate programs because the students would be better prepared for them and more confident in their own skills). However, guidance is lacking for IS faculty on how to mentor undergraduate researchers effectively and enhance their creativity. *Hence, the objective of the present teaching tip is to provide such guidance*.

In (1) promoting the idea of undergraduate IS research and (2) providing guidance to IS faculty on the mentoring aspect of their education responsibilities, this teaching tip makes important contributions to information systems education (see Section 3.1). First of all, it contributes to information systems education by ensuring that IS students are more interested in learning about information systems topics and that they achieve improved learning outcomes. Secondly, this teaching tip contributes to the careers of IS faculty by helping them be better mentors and generate more and better research papers (with *valuable, respectable* help from their students). Finally, it contributes to institutions and the IS field by improving enrollment numbers because active, experiential learning (i.e., learning-by-doing) stimulates substantial student interest and is an important element in IS education (Abrahams and Singh, 2010).

This teaching tip proceeds as follows. The next section presents the teaching practice we recommend. More specifically, since we are particularly interested in stimulating higher order learning outcomes (in the form of scientific undergraduate IS research "on the edge" that is presentable at major conferences), the next section, first, identifies the cognitive skills that need to be developed in the pursuit of such learning outcomes. More specifically, using Bloom's taxonomy of cognitive skills, the section finds that creativity is the highest-order cognitive skill and that creativity should be enhanced in order to cultivate and nurture scientific undergraduate IS research. The section also finds that the creative process that scientific undergraduate IS research entails can be enhanced considerably through effective mentoring. The section, then, concludes that effective mentoring is an essential element in the process of fostering scientific undergraduate IS research because it enhances student creativity (i.e., effective mentoring yields presentable undergraduate IS research via enhanced creativity). Finally, using Malachowski's stages of mentoring framework and our own experience, the section offers tips regarding the form that mentoring should take to enhance creativity and nurture scientific undergraduate IS research. Thereafter, the teaching tip discusses its contributions to the primary IS constituents (IS students, faculty, and institutions) and the lessons we learned from applying Malachowski's stages of mentoring framework. Subsequently, the tip elaborates on student reactions to the mentoring approach and initial evidence of learning. The tip ends with concluding thoughts.

2. THE RECOMMENDED TEACHING PRACTICE: NURTURING UNDERGRADUATE IS RESEARCH BY ENHANCING CREATIVITY THROUGH EFFECTIVE MENTORING

2.1 The Role of Creativity in Undergraduate IS Research

While undergraduate IS research is, generally, a useful endeavor with many benefits for students, faculty, and institutions (Mustafa, 2004), such research can yield even greater benefits when it is conducted at the edge of a scientific domain so that it is presentable at major international and national conferences. This notion begs the question of what cognitive skills we as IS faculty need to develop and nurture in our undergraduates to encourage advanced research activities, which require the generation of new knowledge. Since the generation of new knowledge is likely to require the most refined cognitive skills (Anderson et al., 2001), we need to identify the cognitive skills that can be classified as the highest-order ones.

According to Bloom's taxonomy of cognitive skills, peoples' cognitive capabilities can be organized in a hierarchy (Anderson et al., 2001; Bloom, 1994). The most basic cognitive skill is the ability to remember a concept, followed by the basic understanding of the concept, the ability to apply it to a problem, conduct analyses, and evaluate the concept. On the top of the hierarchy is the ability to create, which is, thus, the highest-order cognitive skill (Anderson et al., 2001; Krathwohl, 2002). The taxonomy further specifies that creativity enables people to engage in *formal hypothesizing* and in *constructing new ideas* (Anderson et al., 2001). Accordingly, creativity is the principal skill to develop and nurture in IS students so as to cultivate scientific undergraduate IS research (given that *formal hypotheses and new ideas* are the principal components of scientific research).

2.2 Encouraging Creativity and Undergraduate IS Research through Effective Mentoring

Consistent with leading scholars on creativity (e.g., Amabile, 1998), we define creativity in scientific undergraduate IS research as the process of creating new ideas that are original, appropriate, and useful, in that they can lead to conference papers that influence subsequent research (papers following the positivist research tradition might include formal hypotheses).

The development of creativity needs close guidance and support (Amabile, 2003; Amabile and Khaire, 2008). This notion is in line with our own experience. To stimulate creativity in our undergraduate IS researchers, we engaged in several mentoring activities. We asked open-ended, thought-provoking questions, demonstrated openness to our students' ideas, recommended practitioner papers (published in, for example, MIS Quarterly Executive, California Management Review, Harvard Business Review, Sloan Management Review) and book chapters, had regular meetings to help the students refine their ideas, used technological tools like blogs and online forums to stay connected to our students, put our undergraduate researchers in contact with domain experts (experts on technostress in our case), and we helped our student researchers cope with the challenges and stressors of undergraduate life by giving them control over their progress and showing them how to navigate those stressors. Regarding the latter, consistent with Karasek (1979) we gave them control over the objectives of their research (i.e., criteria control), over the procedures used in carrying out their research (i.e., method control), and over the scheduling of the various research activities (i.e., schedule control), and we gave them examples from former students that had successfully navigated various challenges and stressors of undergraduate life.

In our experience, this mix of mentoring activities was very effective in stimulating the creativity of our undergraduate IS researchers. They were more imaginative, had more ideas, had more refined ideas, asked more questions, were more committed, and became more critical of their own work. This finding was not surprising since the organizational behavior as well as the industrial and organizational psychology literature has long recognized that mentoring, tailored to specific students, improves their creativity (e.g., Amabile, 2003; Mumford and Gustafson, 1988; Sosik and Godshalk, 2000).

At the same time as mentoring improves creativity, it is also a key element in eliciting quality undergraduate research (Malachowski, 1996). We learned from our own experience that the mentoring activities described above improved the quality of our students' research; our students' research ideas became more interesting and more refined. For example, the students became able to express their own ideas more clearly, conduct literature reviews such that the reviews surfaced more refined syntheses, apply theoretical frameworks to their research problems with greater accuracy, and be more precise in their creation of formal hypotheses. Thus, as we engaged in more mentoring, we had to do less of the research by ourselves.

In summary, mentoring enhances creativity, and it improves the quality of undergraduate IS research. Creativity, in turn, further improves the quality of undergraduate IS research. Applying Baron and Kenny's (1986) causal steps approach to this conceptualization (i.e., Mentoring -> Creativity [Path a], Mentoring -> Quality of Undergraduate IS Research [Path c], and Creativity -> Quality of Undergraduate IS Research [Path b]) indicates that *creativity is an intervening factor* in the process by which mentoring-related impacts on undergraduate IS research unfold (see Figure 1). The question remains of how mentoring can be done effectively.

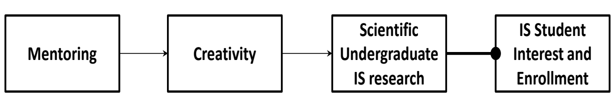

Figure 1. Process model showing how mentoring can increase student interest and enrollment in IS by stimulating scientific undergraduate IS research through enhanced creativity.

2.3 How to Mentor Effectively – A Literature-Based Framework

According to Malachowski's (1996) stages of mentoring framework, effective mentoring of undergraduate students follows four stages: initiation of the mentoring relationship between faculty and student, cultivation of the mentoring relationship, transformation of the relationship, and, finally, separation of faculty mentor and student.

In the initiation stage, the faculty drives the mentoring relationship by selecting students as undergraduate researchers, providing initial guidance, teaching students the basics of research, and providing a background and objectives for their work. Further, the mentor establishes initial trust by making the mentees feel welcome and valued, emphasizes the importance of commitment to the mentoring relationship, and manages the students' expectations by setting them neither too low and uninspiring nor too high and unattainable (Malachowski, 1996). Once the relationship is established, the cultivation stage begins. This stage involves more interaction from the students and more specific goal setting.

Furthermore, aided by the trust that has already been developed, the mentor demonstrates more empathy and interest in students' lives. A mentor who finds ways of demonstrating such interest will build a stronger foundation for effective mentoring. To demonstrate this interest effectively while keeping the professor-student relationship on a professional basis, the mentor can show the students that s/he understands them, appreciates them, and recognizes their unique skills, interests, needs, and personalities (e.g., individual differences in drivers of motivation; some students might be motivated by time pressure and stress, while others are motivated by care and patience). More specific ways of demonstrating interest in students as individuals include, for example, discovering students' personal interests and incorporating them into academics (e.g., letting the students choose a research topic that interests them rather than the mentor), noticing individual accomplishments and important events in students' lives (e.g., making the dean's list, birthdays), and interacting with students as individuals (e.g., being sensitive to their individual life circumstances, such as the death of a family member) (Marzano et al., 2005).

The mentor also encourages the students to think of the projects as their own projects (e.g., emphasizing that the student chose the topic and emphasizing the student's author role). Regular communication takes place through written and oral reports (Malachowski, 1996). Next, in the transformation stage, the students require less guidance and can work more autonomously. The students can take their own decisions and can manage their own objectives. The mentor engages more in supervision and provides feedback. In this stage, the students are more collaborators than mentees. As such, the undergraduates might even present their research at conferences at this stage. Finally, in the separation stage, the mentor relies on the students to take over the projects. The students might even begin new research projects on their own and serve as mentors for other students (Malachowski, 1996).

2.4 Our Own Mentoring Experience Based on the Framework

To inspire the creation of scientific undergraduate IS research that would be presentable at major conferences, we followed Malachowski's (1996) framework. We hoped that this approach would enable our students and us to have a conference contribution ready for submission in Stage 3 (i.e., the transformation stage). We recruited undergraduate IS researchers by relying on their course grades (GPA of at least 3.25), recommendation letters from other faculty and industry, as well as their commitment to extracurricular activities. Through initial face-to-face meetings, we provided initial guidance to our students in the form of general rules for the mentoring relationship. We began these meetings by asking our students what they were hoping to attain from participating in the mentoring program. Further, we established some rules related to the frequency and duration of face-to-face meetings. We also established initial rules related to the venue for meetings and whether ad-hoc or last minute meetings were possible. Perhaps most importantly, in these initial meetings we ensured that the students felt welcome and valued in an effort to establish initial trust along with a creative work climate. Further, we gave them a few classes on the basics of research, such as approaches to problem identification and solving, and we asked them to assimilate Mustafa's (2004) framework for effective student writing. Also in this early stage, we set realistic objectives, taking into account that the mentoring relationships were lasting for only one semester. The objectives included what written documents the students were expected to submit and when. We made sure that we were transparent at all times regarding the difficulties inherent in scientific research and idea development so as to reinforce trust. We made sure that we always kept our promises, and we asked our students to be equally committed.

Once the mentoring relationship was fully established, we provided more details to the students regarding the written documents that we expected them to produce. We provided details regarding document content, structure, and length. We also provided further details on the final outcomes we expected the students to achieve, particularly regarding the conference and the specific track they would submit their papers to. Additionally, we emailed detailed instructions to them on project milestones and the general procedures to follow (please see the Appendix). Also, we inquired about potential stressors in the students' lives, such as the role conflict arising from the competing demands of the project and other duties. The students regularly reported anxiety and stress regarding their projects, their undergraduate lives, and regarding their future careers. We offered advice to help them cope with those stressors. For example, we indicated to them that it was entirely normal for undergraduate students in IS at the time to experience difficulties in their searches for internships and jobs as business or systems analysts. Given these stressors in our students' lives, we met with each student once a week and regularly repeated the important message "remember, this is your project, you drive the process and you are responsible for the final outcome." These regular meetings helped them cope better with the role conflict they experienced, among other problems. As a result, they were more creative. To further stimulate their creativity and make sure that they developed interesting and well thought-out ideas that would lead to good conference papers, we engaged in the activities presented in Section 2.2 (e.g., we recommended interesting MISQE papers to them and asked related open-ended questions). These *creativity-enhancing activities constituted a central piece* of our mentoring efforts; we devoted much attention to them.

At some point during the mentoring relationship, we noticed that our students required less guidance and were able to develop their ideas more on their own. They had also become able to identify relevant articles on their own and to use them to enrich and direct their own ideas. *They had become even more creative*. We limited ourselves to giving feedback regarding their progress, encouraging them to continue in the direction they were going and to think deeper about the conceptual rigor of the research models they proposed. We also gave them more leeway regarding the *what* and the *when* of the documents they produced. At the end of the mentoring relationship, we debriefed our students, thanked them for their hard work, and submitted the papers to major conferences.

3. DISCUSSION

3.1 Contributions to Information Systems Education

In our experience, the mentoring relationship with our students had many benefits for the students and for us as IS faculty. Concerning the benefits for our students, we noticed that they showed an improvement in their ability to put IS classroom concepts into practice. We also noticed an improvement in their creativity and critical thinking skills, in their problem-solving skills, and in their communication skills, particularly regarding IS concepts. Further, the students showed an increased connection to the IS department and to the institution overall. They became more engaged in their IS classes and in the university's student chapter of the Association for Information Systems (AIS). We were particularly satisfied with the latter contribution of our mentoring activities to the IS education at our institution since we had long been looking for ways to get our undergraduate IS students more engaged in the AIS student chapter. Overall, the benefits for students we observed were consistent with those reported in other disciplines (e.g., Hunter et al., 2007; Ishiyama, 2002; Kardash, 2000; Karukstis and Elgren, 2007; Kuh et al., 2010). Further, they were consistent with the view that an active, experiential learning experience is an important element in IS education (Abrahams and Singh, 2010; Whisenand and Dunphy, 2010).

We also observed some benefits for ourselves. We felt more successful in our roles as university professors by influencing our students' careers more directly and attracting them into more academic settings. Furthermore, we got to know our students better, including their concerns about the IS department at our school, their concerns about the job market for IS graduates, and their concerns about joining an IS graduate program. This knowledge helped us improve our classroom teaching by tailoring our courses more specifically to our students. Additionally, the largely positive experiences we had with our undergraduate IS researchers helped us renew our enthusiasm for working with undergraduates. We also obtained recognition from our colleagues and the dean for our mentoring efforts. Regarding scholarly outcomes, the mentoring activity helped us remain current in the IS field. Furthermore, we had academic achievements in the form of presentable conference papers.

3.2 Lessons Learned

While we generally had very good experiences with our use of the mentoring framework discussed above and with the enhancements in student creativity that it yielded, we also had to learn an important lesson: we would have benefitted from a longer timeline. Since the mentoring relationships we had with our students lasted for only one semester, there was substantial time pressure and the students could not develop as fine-grained a skill-set as we had hoped. Further, we were not able to submit the produced papers to the conferences in Stage 3 of the mentoring relationship but only at the very end. Hence, we will ensure in the future to maintain mentoring relationships with our undergraduate IS researchers for a full academic year (excluding the summer). This approach will allow our undergraduate IS researchers to develop better skills and to produce papers that are even closer to being presentable at major conferences.

3.3 Student Reactions and Evidence of Learning

We have maintained mentoring relationships in two semesters with two different students (i.e., each mentoring relationship involved one student and lasted for one semester). Student responses to the mentoring relationships and outcomes were generally positive and included:

- "I learned more about IS in this one semester than in my previous two,"
- "This was such an enriching experience, thank you so much" and
- "I never thought that "I" could advance science, I am so proud."

What is more, after each of the two semesters the research was submitted to a conference, and both submissions were accepted for presentation and publication in the corresponding conference proceedings. One paper was presented at the *Americas Conference on Information Systems* (*AMCIS*) and the other one at the *Annual Conference of the Southern Association for Information Systems* (*SAIS*). Future work could lend further support to the teaching tip presented here by following students for at least five years after the separation stage and by analyzing, in greater detail, the developments in student GPAs, their engagement in the AIS, their enrollment in IS graduate programs, and their career opportunities. Further, future work could transform the process model proposed here (Figure 1) into a variance model to test whether mentoring explains a significant amount of variance in (1) scientific undergraduate IS research (e.g., number of conference papers presented per undergraduate IS student prior to graduation) as well as in (2) enrollment numbers in IS programs. Moreover, future work can test whether these relationships are mediated by student creativity so that creativity explains how and why mentoring improves scientific undergraduate IS research along with enrollment numbers.

Overall, two undergraduate students were involved in the IS research program described here, each student over the course of one semester, resulting in two different conference papers. We believe that the kind of student work described here should, generally, culminate in conference papers, giving students the opportunity to enrich their overall experience by presenting their research at a conference and obtaining valuable feedback. Yet, the presentation of student research at conferences might not always be feasible; other measures of success for the IS research program include, but are not limited to, improvements in student GPAs, increased enrollment in the AIS student chapters as well as in IS graduate programs, and awards earned.

4. CONCLUSION

Generally, there are few activities that could engage IS faculty with their students at a greater level than undergraduate IS research. This notion holds particularly true for scientific research that is presentable at major academic conferences, such as *AMCIS*. Scientific undergraduate IS research benefits both students and faculty in a number of ways, promoting currency in the discipline, intellectual growth, and student/faculty relationships. Ultimately, scientific undergraduate IS research benefits IS institutions through greater interest in IS courses, in IS graduate programs, and in the AIS student chapters. With this teaching tip, we hope to have stimulated interest in closely mentoring undergraduate IS students like Laura Smith (from our opening vignette) so that they can appreciate IS education to a greater extent.

5. ACKNOWLEDGEMENTS

We are grateful for the helpful comments we received from Edith Salazar Robles on earlier versions of the paper. We are also grateful for the many helpful comments advanced by the review panel that have helped us construct a stronger manuscript.

6. REFERENCES

Abrahams, A. S. & Singh, T. (2010). An Active, Reflective Learning Cycle for E-Commerce Classes: Learning about E-Commerce by Doing and Teaching. *Journal of Information Systems Education*, 21(4), 383-390.

Amabile, T. M. (1998). How to Kill Creativity. *Harvard Business Review*, *76*(5), 76-87.

Amabile, T. M. (2003). Five Questions about how Leaders Influence Creativity. *Harvard Management Update*, 8(12), 3-3.

Amabile T. M. & Khaire, M. (2008). Creativity and the Role of Leader. *Harvard Business Review*, 86(10), 100-109.

Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., Raths, J., & Wittrock, M. C. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives (Complete edition).* White Plains, NY: Longman.

Baron, R. M. & Kenny, D. A. (1986). The Moderator–Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1182.

Bloom, B. S. (1994). Reflections on the Development and Use of the Taxonomy. *Yearbook: National Society for the Study of Education, 92*(2), 1-8.

Bullen, C. V., Abraham, T., Gallagher, K., Simon, J. C., & Zwieg, P. (2009). IT Workforce Trends: Implications for Curriculum and Hiring. *Communications of the Association for Information Systems*, 24(1), 9.

Burns, T. J., Gao, Y., Sherman, C., Vengerov, A., & Klein, S. (2014). Investigating a 21st Century Paradox: As the Demand for Technology Jobs Increases Why are Fewer Students Majoring in Information Systems? *Information Systems Education Journal*, 12(4), 4-16.

Dick, G., Granger, M., Jacobson, C., & Van Slyke, C. (2007). Where Have all the Students Gone? Strategies for Tackling Falling Enrollments. *AMCIS 2007 Proceedings,* Paper 334, Keystone, CO, August 10-12.

Granger, M. J., Dick, G., Luftman, J., Van Slyke, C., & Watson, R. T. (2007). Information Systems Enrollments: Can they be Increased? *Communications of the Association for Information Systems*, 20(1), Article 41.

Hunter, A., Laursen, S. L., & Seymour, E. (2007). Becoming a Scientist: The Role of Undergraduate Research in Students' Cognitive, Personal, and Professional Development. *Science Education*, 91(1), 36-74.

Ishiyama, J. (2002). Does Early Participation in Undergraduate Research Benefit Social Science and Humanities Students? *College Student Journal*, 36(3), 381-387.

Karasek, R. A. (1979). Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign. *Administrative Science Quarterly*, 24(2), 285-308.

Kardash, C. M. (2000). Evaluation of Undergraduate Research Experience: Perceptions of Undergraduate Interns and their Faculty Mentors. *Journal of Educational Psychology*, 92(1), 191-201.

Karukstis, K. K. & Elgren, T. E. (2007). *Developing and Sustaining a Research-Supportive Curriculum: A Compendium of Successful Practices.* Washington, DC: Council on Undergraduate Research.

Koch, H. & Kayworth, T. (2007). Using Information Systems Theory to Increase IS Enrollment. *AMCIS 2007 Proceedings,* Paper 444, Keystone, CO, August 10-12.

Krathwohl, D. R. (2002). A Revision of Bloom's Taxonomy: An Overview. *Theory into Practice*, 41(4), 212-218.

Kuh, G. D., Kinzie, J., Schuh, J. H., & Whitt, E. J. (2010). *Student Success in College: Creating Conditions that Matter.* Hoboken, NJ: John Wiley & Sons.

Malachowski, M. (1996). The Mentoring Role in Undergraduate Research Projects. *Council on Undergraduate Research Quarterly*, 12, 91-94.

Marzano, R. J., Gaddy, B. B., Foseid, M. C., Foseid, M. P., & Marzano, J. S. (2005). *A Handbook for Classroom Management that Works*. Alexandria, VA: Association for Supervision and Curriculum Development.

Mumford, M. D. & Gustafson, S. B. (1988). Creativity Syndrome: Integration, Application, and Innovation. *Psychological Bulletin*, 103(1), 27-43.

Mustafa, Y. (2004). A Systematic Framework for Conducting Research Projects in Undergraduate Courses. *Journal of Information Systems Education*, 15(1), 35-40.

Reilly, J. M. (1992). *Mentorship: The Essential Guide for Schools and Business*, ERIC, Great Potential Press, Inc.: Tucson, AZ.

Sosik, J. J. & Godshalk, V. M. (2000). Leadership Styles, Mentoring Functions Received, and Job-Related Stress: A Conceptual Model and Preliminary Study. *Journal of Organizational Behavior*, 21(4), 365-390

Whisenand, T. G. & Dunphy, S. M. (2010). Accelerating Student Learning of Technology Terms: The Crossword Puzzle Exercise. *Journal of Information Systems Education*, 21(2), 141-148.

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APPENDIX

Instructions for project milestones given to students

Procedure to follow: here are the milestones for your research project
Please communicate with me regularly before or after these milestones, so that we can make sure together that your research project will be done successfully and you will get the most out of your research efforts:

<u>Preparation Phase</u>

- Identify a topic within the information systems domain that interests you (e.g., individual interactions with technologies, organizational impacts of technologies, software projects, electronic commerce, online auctions, etc.)
- Review the pertinent information systems literature to identify and define a specific research problem within the domain of your choosing
- Develop a rationale for conducting your study, including relevant support for its scientific and practical importance
- Think of a tentative title for your study, helping you clarify your study objectives and scope and remain focused on those
- Create a tentative outline for your study
- Begin your paper by writing the introduction and state your research hypotheses

<u>Data Collection and Analysis Phase</u>

- Collect and analyze your data if applicable
  - Decide:
    - from whom data will be collected,
    - what kinds of data will be collected (e.g., quantitative or qualitative),
    - the sources of the data to be collected (e.g., archival vs. primary data, survey, interviews, experiments)
    - the duration of your data collection effort,
    - and the analytical tools you will use to analyze your data.
  - Collect your data in accordance with your decisions
  - Analyze your data to generate the results of your study

<u>Writing Phase</u>

- Write the first draft of your complete paper
  - Decide on the conference at which you want to present your work
  - Paper length between 5 and 15 pages depending on the conference
  - Try to express logic through figures
  - Try to add unique dimensions to each table (e.g., what is missing in past research, what has been well-researched in past studies?)
  - Be sure to use references and avoid plagiarism
  - Write a discussion that's implied in your findings and avoid repeating the front end of your paper or stretching your results
- Revise your first draft
- Revise your revision of the first draft
- Prepare the table of content, the list of tables, and the list of figures
- Write the abstract
- Finalize the title of your work.

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ISSN 1055-3096