Article
Page 2

References
Page 11

Author
Mohammad Moin Uddin
Ph.D., P.E.
Associate Professor in the
Department of Engineering,
Engineering Technology, and Surveying
at East Tennessee State University

JTMAE

The Journal of Technology, Management, and Applied Engineering

Best Practices in Advising Engineering Technology Students for Retention and Persistence to Graduation

Keywords:
Advising Strategies; Advising Model; Engineering Technology; Retention; Persistence to graduation

SUBMITTED FOR *PEER – REFEREED*

Dr. Mohammad Moin Uddin is an Associate Professor in the Department of Engineering, Engineering Technology, and Surveying at East Tennessee State University. Currently he serves as the Director of TTU-ETSU Joint Engineering Program. He has diverse research interests focusing on highway construction quality assurance, rural community engagement for transportation planning, road user cost, sustainable design and construction for knowledge-based decision making, and engineering technology education. He has been awarded grants from National Science Foundation, Tennessee Department of Transportation, DENSO and ASEE and several other organizations. Dr. Uddin earned a Ph.D. in Civil Engineering from the University of Kentucky.

Best Practices in Advising Engineering Technology Students for Retention and Persistence to Graduation

Abstract

According to the ASEE publication Engineering by the Numbers, student retention and persistence to graduation are ongoing problems for engineering and engineering technology (ET) programs around the country. It is a well-established fact that the quality of interaction between a student and a concerned individual on campus, often through academic advising, is a key contributor to college retention. Over the years, academic advisors have developed effective advising strategies that research shows have positively impacted students' retention and their persistence to graduation. In this study, a national survey was conducted among academic advisors of ET programs in the USA. Results show that for ET students, retention and persistence to graduation are improved by personalized and caring advising, being proactive, keeping students focused on their plan of study, actively listening to students' complaints and concerns, acting on those concerns, and believing in the student. On the other hand, being passive, ignoring students' issues, embarrassing them on their academic struggles and limited knowledge about the curriculum and departmental procedures and practices are found to be the least effective. Overall, this study contributes to ET body of knowledge by providing ET academic advisors a set of best practices for student success. The findings of the study will also benefit ET faculty members, who directly or indirectly advise students, by sharpening their advising practices.

Introduction

Among the different services and support that a university can offer to students, academic advising is found to be one of the best ways to assist the personal, intellectual, and social development of students. Advising as a service to students connects students' academic and personal worlds; therefore, advising cultivates their holistic development. Well advised students are (a) more likely to enroll, (b) less likely to take classes that do not contribute towards graduation, (c) more likely to enjoy college, (d) more likely to balance study, work and personal life, (e) more apt to persist to graduation (Khalil and Williamson 2014). The process of academic advising is important to institutions of higher education and the role of the academic advisor is critical to student retention and student satisfaction with the institution (CAS 2018; Mosher 2017; O'Banion 2016; Thompson, et al. 2007; Hester 2008; Corts, et al. 2000; Gerdes and Mallinckrodt 1994). Academic advisors are the group of professionals in a department/college/university whose main responsibilities are to connect student with the university, establish goals and educational plans, and assist students through graduation and career plans.

Academic Advisors in Engineering Technology (ET) programs play a major role by providing students timely and accurate information to cultivate connections, success, and advancement in engineering excellence. Besides academic planning, advisors help students with career goals, choice of major, field of specialization, degree requirements, general education requirements, academic policies and procedures, student petitions, and even provide support when students are in academic difficulty (Hagen 2008). Many ET programs also utilize faculty as advisors and they perform most of the services provided by an academic advisor.

National data shows that approximately 60% of students leave engineering during their first-year (Marcus 2012; Chen 2013). An ASEE publication reported that in 2015 overall four-year engineering graduation rate was 33% compared to 29% in 2006, which shows poor retention and persistence to gradation among engineering programs (ASEE 2017). Geisinger and Raman (2013) conducted a meta-analysis to understand student attrition in engineering majors and identified six contributing factors. Ranked 2 to 6 were poor academic success (low grades), lack of self-efficacy and self-confidence (poor high school preparation, inadequate math preparation), change in interest and career goals, race, and gender. Ranked 1 for high attrition in engineering was "inadequate advising and lack of faculty guidance"

(Geisinger and Raman 2013, p. 4). Several other studies have also identified that poor advising/guidance was one of the reasons they leave engineering and/or engineering technology programs and do not earn degrees (Cairncross, et al. 2015; Meyer 2014; Marra, et al. 2012). On the other hand, Bogue, et al.(2007) found that students who persisted in engineering credited academic support, faculty guidance, advising, personal encouragement and attention from faculty as factors for their success. Academic advising is an essential contributor to the success and persistence of students. While the organization and delivery of academic advising reflects an institution's culture, values, and practices, academic advisors translate and directly influence personal, institutional, and societal success through their advising methods, strategies and practices.

This paper examines effective strategies used by academic advisors in ET programs. A questionnaire was developed by the author and completed by ET advisors to understand best practices that results in better students' retention and persistence to graduation for ET students. It was anticipated that the results of the investigation would lead to a set of empirically-based recommendations to create a more effective academic advising system at colleges and universities that offer ET programs.

Purpose of the Study

Academic advising, when purposefully planned, plays an important role in supporting students' academic success (Vianden and Barlow 2015; Pascarella and Terenzini 2005). Effective retention programs reflect university administrators' understanding that academic advising underpins student success (Drake, 2011; Tinto 1993, 1999). Kuh, et al. (2005) also affirm the role of academic advising in supporting students. They suggested that "advising is viewed as a way to connect students to the campus and help them feel that someone is looking out for them" (p. 214). This connection reflects an institutional commitment to the student and his or her education, which Tinto also finds essential to effective retention programs. Academic advisors keep students interested and engaged in academics by building a successful rapport with them. A sense of care bridges trust, which allows students to feel comfortable in an academic setting and hence, they tend to be motivated to follow through and progress to graduation with degrees in engineering (Hutson, Bloom and He 2009).

Good advising helps students match the university's resources to their needs and goals so that they get the maximum benefit from their college experience and, at graduation, are prepared for life after college (NACADA, 2003). Bean (2005) explained that well-planned academic advising affects students' desire to persist and graduate. He mentioned "Good advising should link a student's academic capabilities with his or her choice of courses and major, access to learning resources, and a belief that the academic pathway a student is traveling will lead to employment after college. Advising should be done well so students recognize their abilities and make informed choices" (p. 215). Additionally, good advising helps students integrate academically and socially by creating positive experiences that increase satisfaction with being a student at a given institution, confidence in one's ability, academic competence, and one's understanding about educational, career, and life goals (Kuh 2008).

Advising tools, techniques, models and approaches used by ET advisors vary widely. Whether from an advisor, faculty member, or peer, ET students regularly receive advising which may vary from program to program or school or school. Various new and innovative advising approaches, such as appreciative advising, proactive (intrusive advising), peer advising, or group advising, were introduced and adopted by many ET advisors. Other approaches use targeted advising models to focus on lower and upper level students. ET advisors also use numerous tools and technology for communication and record keeping.

An ET advisor may be aware of different advising options, but still may not know the strategies and practices that are more effective for ET students and ET programs. Specially advising strategies and practices that influence ET students' retention and persistence to graduation is not well understood and/or documented. This study was designed to shed light on two research questions

1. What are the current roles, responsibilities and practices of ET academic advisors?
2. What are academic advising strategies and practices that contribute to the success of ET students especially looking at their retention and graduation rates?

Survey Design

Several data collection methods were evaluated: face-to-face interviews, phone interviews, and online surveys. Even though each of these methods have their own advantages and disadvantages, the online survey was deemed more reasonable since it can provide wider exposure with limited resources. For the online survey, a questionnaire was created (provided in the appendix). Questions for the survey were created through extensive literature review and direct collaboration with the academic advisors in the authors' department. National Academic Advising Association's resource webpage and its journal provided a plethora of information about advising excellence. These helped shape the survey structure (NACADA, 2018).

The questionnaire has three sections. The first section requested basic background information of the advisor including the type of training and education the advisor received related to advising. The questions in the second section are tied to the first research question, which is focused on advisor's duties and responsibilities. These include how many student and what kind of students (traditional, non-traditional, transfer, etc.) the advisor advises, how often the advisor meets with the student and types of services provided, tools and technology used by the advisor, and other duties they have besides advising. The third section is designed to answer the second research question, which is solely focused on advising practices and strategies used by advisor with ET students. All the questions in this section were open-ended and requested information about: advising models that the advisor used for ET students, effective advising strategies for at-risk freshmen vs. upper-class ET students, the least effective vs. the best advising strategies for retention and persistence to graduation for ET students, and suggestions specifically for ET faculty advisors.

Study Methodology

In order to identify advising best practices for ET programs, a systematic method was followed, which is described below:

Step 1: A questionnaire survey was created.

Step 2: An Institutional Research Board (IRB) proposal was submitted and was approved to conduct the survey.

Step 3: A pilot test was run among three advisors in the author's department to validate the survey

Step 4: A national ET academic advisor contact list was created by identifying ET programs using ASEE online profiles for ET program and the Engineering Technology Division listserv database and then visiting individual university and department websites. Only advisors who advise ET students were included on the list. ET Faculty advisors were not included in the contact list.

Step 5: The survey was distributed using the survey platform REDCAP, which is a secured surveying tool available at the authors' university.

Step 6: An invitation to complete the survey was sent to the ET academic advisor contact list. The survey was kept open for three months and three reminders were sent to remind ET advisors to complete the survey.

Data Collection and Analysis

Once a survey was received it was checked for completeness. If a survey was incomplete the author followed up with the advisor to complete the survey. At the end a total of 32 complete surveys (representing 32 departments/programs) were received with a response rate of 21%. All participating advisors were from public universities with student population of from more than 7000 to 35000. Figure 1 shows the distribution of participating advisors among US regions. Most participants were from universities in the southern states of the US. Since most of questions in the survey were open ended questions, qualitative responses were compiled for analysis. The author read and re-read advisors' responses to identify patterns of ideas and concepts. Analysis revealed a set of best advising practices that are utilized

by most ET advisors that were effective toward retention and persistence to graduation among ET students. Below a summary of survey findings amalgamated from all the advisors are explained.

Figure 1: Distribution of Participating Advisors among US Regions
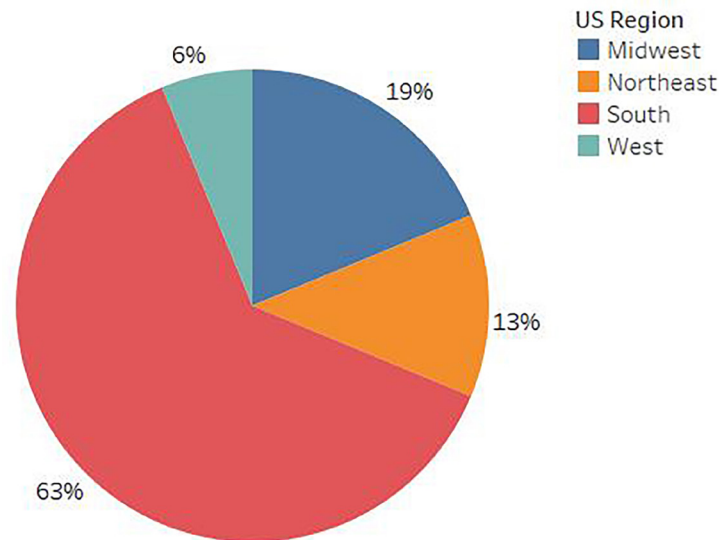
Basic Demographic Information of the Advisors

The survey participants were 27 females and five males with an average of eight years of experience in advising. They all have bachelor's degrees and 25% of the advisors have advanced degrees (master's degree). Some of these advisors worked in multiple institutions before their current positions. All of the advisors have received training on advising provided by their respective institutions. Advisors mentioned that they regularly attend conferences organized by NACADA, TASSR, FYEE and various professional development activities.

Advisors' Responsibilities

An ET advisor's primary responsibility is to help students with their course schedules and support them toward graduation. According to the survey, each ET advisor advises an average of 280 students in each academic year. Typically, they advise all traditional, non-traditional, and transfer students in ET majors. About 54% of advisors mentioned that they also advise undecided/undeclared ET students. ET students are required to meet with the advisor at least once a semester for course advising and progress. However, the survey showed that some students with questions and concerns met multiple times during a semester. ET advisors also met with students on probation multiple times during a semester. In addition to advising, many ET advisors hold other responsibilities, such as: teaching courses, recruitment, orientation, graduation paperwork, serving in university committees, and other related duties. ET advisors use a wide variety of tools for advising purposes. Some of the most commonly used advising tools are: MyAdvisor, DegreeWorks, Banner System, Boilerconnect, Peoplesoft, Starfish, TechConnect, and Course map. Some of these student-success platforms combine predictive analytics with communication and workflow tools to help support, retain and graduate students.

Advising Methods/Models used for Engineering Technology Students

Strong academic advising has been found to be a key contributor to student persistence (Center for Public Education, 2012). A key step in delivering upon a commitment to student success includes purposeful advising practices. Various advising strategies exist, each of which has its own proponents. The survey asked advisors if they use any specific advising model or method when advising ET students. Advisors mentioned that they employ mixed methods depending on the student and the situation. Advising methods that they found most effective for ET students were appreciative advising and proac-

tive/intrusive advising (Figure 2). Appreciative advising is the intentional collaborative practice of asking positive, open-ended questions that help students optimize their educational experiences and achieve their dreams, goals, and potentials (Bloom, Hutson and He 2008). Appreciative advising emerged from an article written by Jennifer L Bloom and Nancy Archer Martin titled "Incorporating Appreciative Inquiry into Academic Advising" that appeared in the online academic advising journal at Penn State, The Mentor (Bloom and Martin 2002). The Appreciative advising framework is a six-phase model that advisors can use in their work to help students realize and achieve their greatest hopes and dreams.

Figure 2: Advising methods/models used by advisor for Engineering Technology students
Drake, Jordan and Miller (2013) described these six phases as (Figure 3):
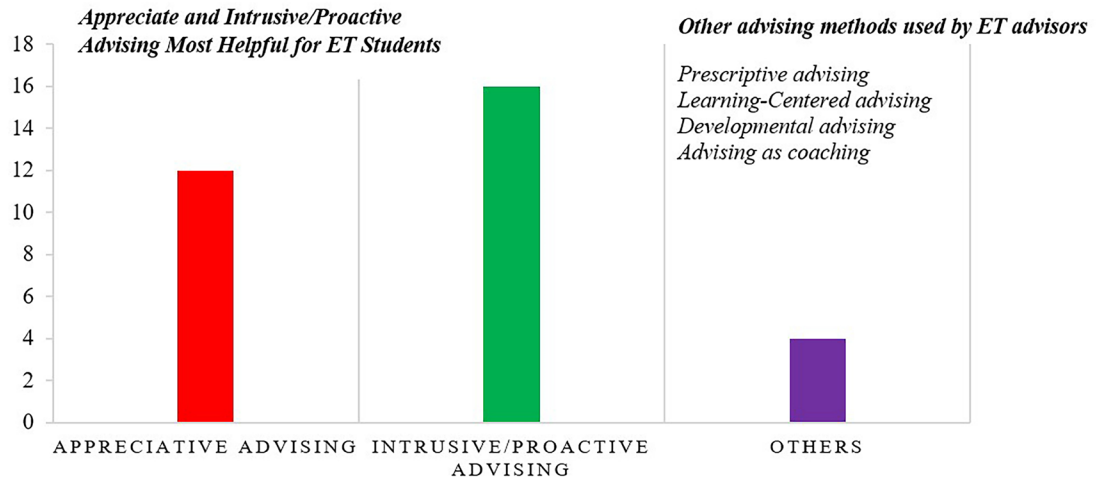
1. Disarm: Make a positive first impression with students, build rapport, and create a safe, welcoming space.

2. Discover: Ask positive open-ended questions that help advisers learn about students' strengths, skills, and abilities.

3. Dream: Inquire about students' hopes and dreams for their futures.

4. Design: Co-create a plan for making students' dreams a reality.

5. Deliver: Students' deliver on the plan created during the Design phase and the advisor is available to encourage and support students.

6. Don't Settle: Advisors and students need to set their own internal bars of expectations high.

ET advisors who utilized appreciative advising with ET students discovered that co-constructing a plan with the student, identifying learning strategies (e.g. pair with a tutor), identifying potential resources (e.g. discussing with professors teaching other courses), and creating follow-up plans encouraged ET students to develop self-efficacy.

Figure 3. Appreciate Advising Model
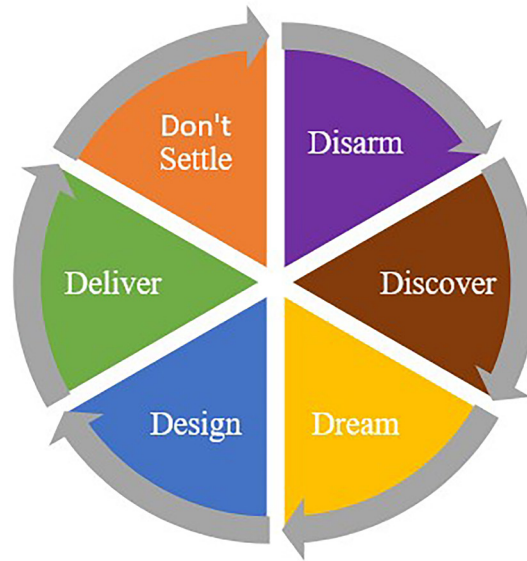
The proactive/intrusive advising model is based on the idea that some students, especially freshmen and at-risk students, will not take the initiative in resolving their academic concerns and issues, and so need the intrusive assistance of assigned advisors. The word "intrusive," as coined in Walter Earl's 1987 article, "Intrusive Advising for Freshmen," is used to describe this model of advising as "action oriented by involving and motivating students to seek help when needed" (Earl 1988). Often times such proactive contact between the student and academic advisor helps to develop a caring relationship that leads to increased academic motivation and persistence (Heisserer and Parette 2002). The proactive/intrusive model combines elements of prescriptive advising models (the student listening and following the advice of an advisor) and developmental advising models (relationship focused to assist students with goal setting, decision making, problem solving, creating self-awareness, and other areas to promote academic success), creating a holistic approach that meets a student's total needs. Rather than being reactive and late, proactive advising sought to blend the practices of advising and counseling into a form of student intervention that allows advisors to provide students information before they request or realize they need it. Proactive strategies, such as academic alerts, enable advisors to help students while they still have time and options to improve grades.

Proactive advising is based on three approaches taken from advising research (Earl 1988, p. 1):

1. Academic advisor can be trained to identify students who need assistance.

2. Students respond positively to direct contact regarding potential academic problems and academic advisors offer resources for help.

3. Students who do not initially feel they fit with the institution learn success strategies and skills to help them find their places.

The survey showed that ET advisors who often utilized this approach found it more personal than the professional approach. They felt proactive advising incorporates intervention strategies that allow the advisor to become an active part of the student's life, which, in turn, helps the student to stay motivated. ET advisors mentioned that this student-advisor relationship became not just a "registration process" but engaged students in the whole academic process (e.g., career exploration, personal development, study strategies, etc.), thus building connectedness to the institution, and ultimately increasing retention rates.

Freshmen versus Upper Class Advising Strategies

Among the different groups of students on a university campus, freshmen students experience most vulnerability as they transition to university life. Many freshmen students display characteristics such as "low academic self-concept, under-prepared, unrealistic grade and career expectations, unfocused career objectives, extrinsic motivation, external locus of control, low self-efficacy, and inadequate study skills for college success, a belief that learning is memorizing, and a history of passive learning" (Ender 2000). As a result, sometimes they make poor choices or decisions that have a negative impact on their academics. Advising strategies for such at-risk freshmen students should be different than those for upper-class students who already know the system and often know exactly where they are at and what is left for them to finish their education. Establishing a rapport with freshmen and at-risk students is critical to their success. An academic advisor can play a pivotal role by establishing and maintaining a relationship with these students that is ongoing, purposeful, planned and supportive. As this relationship develops, it encourages students to make better decisions and gain independence as they achieve educational, career, and personal goals through the use of the full range of institutional and community resources. This has been echoed in the survey, as ET advisors used distinct strategies for freshmen and at-risk students vs. upper-class junior and senior students. On the survey one advisor mentioned that

> We talk particularly to our freshmen students about resiliency. We try to remind the students that their courses are hard, will be challenging, and to not let this discourage them if they struggle. We try to normalize failure and struggle in college and emphasize resiliency and the importance of continuing to try and seeking out the resources available to succeed. For at risk students, we're a bit more hands on in our approach. Reaching out more frequently, touching base every few weeks for check ins and seeing how they are progressing. We have excellent resources through an academic support center where we often refer at risk students for more in depth help with study strategies, time management, motivation, and tutoring for math/science courses as well.

Table 1. Advising Strategies for ET Freshmen & At-Risk vs Upper Class Students [from open-ended survey questions]

	Freshmen and At-Risk Students	**Upper Class students**
Focus	Student's development of self-confidence and their ability to make sound decisions	Combination of academic and career advising
Advising Approach	Proactive/Intrusive	Appreciative
Strategies	• Provide more personal attention, • Build collaborative relationships, • provide curriculum intensive advising • Help them gain a sense of belonging and that they matter	• Provide support on planning, setting goals, exploring career options • Direct students to career services and other resources • Provide information about graduate school if interested

For the advisors in this survey, for junior and senior students, advising is a combination of academic and career advising. ET advisors spent a lot of time talking about life after graduation, looking at job postings, and helping students to strategize on using course projects, electives, minors, etc., to better market them to employers. Advisors also talked about graduate school if the student was interested.

Best Advising Strategies for ET Students for Retention and Persistence to Graduation

The ET advisors identified five unique advising strategies that worked better for retention and graduation of ET students. These strategies are described below:

1. Personalized advising: Many ET advisors believe that personalized advising by the same advisor appears to work well for ET students. When an advisor takes time to talk with students, shows that s/he cares about the student, connects with them as a person, and believes in them,

students in turn become more interested in their education and stick around.

2. Being proactive is key: While some students will reach out to their advisor when concerns or questions arise, the students most at risk will not. This tends to be true for freshmen and re-entry students who either do not understand the process and procedures to get timely and adequate help or are unwilling to admit that they are struggling. Proactively identifying these students and checking on progress, getting to the bottom of their struggles, and connecting them with available on campus resources can go a long way to retain these students in the program. Advising technology and data analytics makes it possible to do everything from tracking first-generation students' progress to triggering alerts when students miss classes. Analytics can make it easier to drive at-risk students to services or other supports before it's too late.

3. Providing support in normalizing academic challenges: Many freshmen and at-risk students may not be familiar with the feeling of having to put in a lot of effort in their college work, so this is a change for them when they start college. In this situation, getting students physically in front of you (not email) to talk about their progress in courses and honest conversations about what distractions they may be dealing with and/or what issues they may be facing outside of class is important. The more students can open up to the advisor, the better the advisor can help students by offering solutions, options and resources.

4. Keeping them motivated with career prospects: Be the champion of student success. Regularly complimenting students (in email, in person) on their accomplishments boost students' self-confidence and resiliency. Advisors mentioned complimenting students on getting GPA above 3.0, getting off of probation, getting through a class a student was worried about, making the Dean's List or Semester Honors, etc. helped students motivated to success. Advisors believed that showing students how the classes they take have real-world applications and how the curriculum prepares them for many career opportunities help students to be persistent in the program and make them resilient toward graduation.

5. Keeping them involved with advising: Early semester progress reports on grades and attendance, Midterm grades, semester campaigns targeted at students near graduation thresholds, and mandatory advising each semester all assist in both retention and graduation because the students must see their advisor a few times per year. Also, giving students a task to bring to their advising meetings gets them involved and can facilitate other questions about the program. One advisor noted: "for instance my email to students tells them to look at courses for the next semester and come with a proposed schedule in hand".

Advisors' Recommendations for ET Faculty Advisors
Many ET programs require faculty members to advise students besides teaching. Therefore, it will be beneficial for ET faculty members to partner with advisors and learn the art of advising. The survey asked the advisors to provide suggestions for ET faculty advisors so that they can be more effective in advising.

The following are the suggestions provided by the advisors:

1. ET faculty advisors should take time to find out what is really going on with a student. A faculty advisor should be proactive and support students with difficult issues. Skipping class is a symptom of the real problem. Intentional contact with students with the goal of developing a caring and beneficial relationship typically leads to increased academic motivation and persistence. One advisor mentioned, "Not all students are alike. Some need very little advising and do well. Others need more guidance throughout their tenure as students. Have a tool available to indicate this with clarity. Show that you care about them. Be patient. Be friendly. Be flexible. We are training people to become engineering technologists. Help them cross the finish line".

2. Understand that what is intuitive to faculty is new to students. When ET students face academic challenges, sometimes they are hesitant to visit the faculty as they see it as a failure on them. They may not see the relevance or meaning in the content or courses they have to take. Ex-

plaining it to them in a way that relates understanding is the key to build a supportive relationship. They are not questioning your knowledge or authority, but rather seeking information and guidance. Getting to know the students as much as possible besides just "how are classes going" is the gateway to having more open and honest conversations about their progress in school.

3. It is beneficial to ET faculty advisors to understand as much as possible about all programs and the department as a whole. Faculty advisors also should be knowledgeable about courses, curriculum, policies, strategies, and departmental procedures. They should also be aware of any changes to the program and relay that information to students as soon as possible.

Conclusion

Effective academic advising is crucial to the long-term success of students in ET disciplines. The academic advisor is the liaison or link between the students and the university. It is believed that the success of a university is based on the success of its graduates. Given the demand for future engineering technologists in the United States, it is vital that the retention rate and interest in pursuing ET disciplines are increased. Academic advising can make a huge difference in the lives and persistence to graduation for ET students. Academic advisors can intervene with students who are considering dropping out and assist them with developing a success plan that could "right the ship," providing a platform for the student to stay in school and excel and feel positive about him/herself.

This paper summarizes results of a national survey of ET advisors to learn the best methods of advising ET students. The paper describes the key characteristics of ET advisors, their roles and responsibilities, computer tools used for advising, commonly used successful ET advising models, and effective advising strategies that help ET students' retention and persistence toward graduation. The overall contribution of this study to the ET body of knowledge is that it provides ET academic advisors a set of best practices for ET student success. The findings of the study will also benefit ET faculty members, who directly or indirectly advise students, by sharpening their advising practices. There are several limitations of the study. The qualitative nature of the survey responses may have some subjective and/or analysis bias. Another key limitation of the study is that the results are summarized based on a limited sample size (32) and a larger sample would provide more confidence on the findings. However, studies focusing on retention in engineering and other disciplines have similar findings which validate the results of this study.

The literature suggests that early intervention of academic advising is critical. Therefore, it is paramount that freshman ET students are greeted with a trained advisor as soon as they step foot on the campus. This will help them make the adjustment to a new environment which is filled with many first-time experiences. Many students who go to college need to learn how to make good academic decisions, as good academic preparation alone does not always predict academic success. Academic advisors have a great opportunity to intervene, provide guidance, and build a trusting relationship which can ultimately contribute to ET students' retention and graduation.

References:

ASEE. 2017. Engineering by the Numbers: ASEE Retention and Time-to-Graduation Benchmarks for Undergraduate Engineering Schools, Departments and Programs. Washington, DC: American Society for Engineering Education.

Bean, J. 2005. Nine themes of college student retention . In A. Seidman (Ed.), College student retention: Formula for student success. Westport, CT: Praeger.

Bloom, J. L., B. L. Hutson, and Y. He. 2008. The appreciative advising revolution. Stipes: Champaign, IL.

Bloom, J., and N. Martin. 2002. "Incorporating Appreciative Inquiry into Academic Advising." The Mentor: An Academic Advising Journal.

Bogue, B, R. Marra, D. Shen, and K. Rodgers. 2007. "Those that leave: Assessing why students leave engineering." Proceedings of the 37th ASEE/IEEE Frontiers in Education Conference. Honolulu, HI.

Cairncross, Caitlin, Tammy VanDeGrift, Sharon Jones, and Lindsay Chelton. 2015. "Best Practices for Advising At-Risk First-Year Engineering Students." 7th First Year Engineering Experience (FYEE) Conference. Roanoke, VA.

CAS. 2018. "Academic Advising Programs: CAS Contextual Statement." http://standards.cas.edu/getpdf.cfm?PDF=E864D2C4-D655-8F74-2E647CDECD29B7D0.

Chen, X. 2013. STEM Attrition: College Students' Paths Into and Out of STEM Fields (NCES 2014-001). Washington, DC: National Center for Education Statistics, Institute of Education Sciences,U.S. Department of Education.

Corts, D.P., J.W. Lounsbury, R.A. Saudargas, and H.E. Tatum. 2000. "Assessing undergraduate satisfaction with an academic department: A method and case study." College Student Journal 399-409.

Drake, Jayne K. July/August 2011. "The role of academic advising in student retention and persistence." ABOUTCAMPUS 8-12.

Drake, Jayne K., Peggy Jordan, and Marsha Miller. 2013. Academic Advising Approaches: Strategies That Teach Students to Make the Most of College. San Fransisco, CA: Jossey-Bass.

Earl, W.R. 1988. "Intrusive advising of freshmen in academic difficulty." NACADA Journal 27-33.

Ender, S. C. & Wilkie, C. J. 2000. Advising students with special needs. In V. N. Gordon & W. R. Habley (Eds.), Academic advising: A comprehensive handbook. San Francisco, CA: Jossey-Bass.

Geisinger, Brandi N., and Raj Raman. 2013. "Why They Leave: Understanding Student Attrition from Engineering Majors." International Journal of Engineering Education 914–925.

Gerdes, H., and B. Mallinckrodt. 1994. "Emotional, social, and academic adjustment of college students: A longitudinal study of retention." Journal of Counseling & Development 281-288.

Habley, W.R. 2004. The Status of Academic Advising: Findings from the ACT Sixth National Survey. (Monograph No. 10). Manhattan, KS: NACADA.

Hagen, P. L., & Jordan, P. 2008. Theoretical foundations of academic advising. In V. N. Gordon, W. R. Habley, & T. J. Grites (Eds.), Academic advising: A comprehensive handbook. San Francisco, CA: Jossey-Bass.

Heisserer, D. L., and P. Parette. 2002. "Advising at-risk students in college and university settings." College Student Journal 69-84.

Hester, E.J. 2008. "Student evaluations of advising: Moving beyond the mean." College Teaching 35-38.

Hutson, B. L., J. L. Bloom, and Y. He. 2009. "Reflection in advising." Academic Advising Today 12.

Khalil, Adeel, and Jessica Williamson. 2014. "Role of Academic Advisors in the Success of Engineering Students." Universal Journal of Educational Research 73-79.

Kuh, G. D. 2008. High-impact educational practices: What they are, who has access to them, and why they matter. Washington, DC: Association of American Colleges and.

Kuh, G. D., J. Kinzie, J. H., Schuh, and E. J. (Eds.). Whitt. 2005. Student success in college: Creating conditions that matter. San Francisco, CA: Jossey-Bass.

Marcus, J. 2012. Old school: four-hundred years of resistance to change", in Wildavsky, B., Kelly, A. and Carey, K. (Eds), Reinventing Higher Education: The Promise of Innovation. Cambridge, MA: Harvard Education Press.

Marra, R., K. Rodgers, D. Shen, and B. Bogue. 2012. "Leaving engineering: A multi-year single institution study." Journal of Engineering Education 6-27.

Meyer, M. and Marx, S. 2014. " Engineering dropouts: A qualitative examination of why undergraduates leave engineering." Journal of Engineering Education 525-548.

Mosher, Gretchen A. 2017. "Professional Advisers in Engineering and Technology Undergraduate Programs: Opportunities and Challenges." The Journal of Technology Studies 26-35.

Museus, Samuel D., and Joanna N. Ravello. 2010. "Characteristics of Academic Advising That Contribute to Racial and Ethnic Minority Student Success at Predomin antly White Institutions." NACADA Journal 47-58.

NACADA. 2018. NACADA Resources. Accessed December 21, 2018. https://www.nacada.ksu.edu/Resources.aspx.

—. 2003. Paper presented to the Task force on defining academic advising. Retrieved from NACADA Clearinghouse of Academic Advising Resources website.

O'Banion, T. 2016. "Academic advising on steroids." Community College Week. http://ccweek.com/article-5059-academic-advising-on-steroids.html.

Pascarella, E. T., and P. T. Terenzini. 2005. How college affects students (Vol.2): A third decade of research. San Francisco: Jossey-Bass.

Robbins, R. 2013. Implications of advising load. In Carlstrom, A., 2011 national survey of academic advising. (Monograph No. 25). . Manhattan, KS: National Academic Advising Association.

Thompson, D.E., B. Orr, C Thompson, and K. Grover. 2007. "Examining students' perceptions of their first-semester experience at a major land-grant institution." College Student Journal 640-648.

Vianden, Jörg, and Patrick J. Barlow. 2015. "Strengthen the Bond: Relationships Between Academic Advising Quality and Undergraduate Student Loyalty." NACADA Journal 15-27.

Appendix: Survey Instrument
Engineering Technology Advising Best Practices for Students' Retention and Persistence to Graduation

Section 01:

Name
_____
Institution and Department
_____
Email
_____
Gender
_____
How many years have you served as an academic advisor?
_____
Please tell me a little about yourself, highlighting how you became an academic advisor and describing the type of training or education you received to help you advise students
_____

Section 02:

Approximately how many students do you advise? Describe the student you advise (check all that apply) Approximately how many and what kind of students (i.e. traditional, non-traditional (age 22 and older), transfer, undecided, undeclared, majors) do you advise?
_____
Traditional (18-22 years of age)
_____
Non-Traditional (older than 22 years)
_____
Transfer
_____
Undecided/Undeclared Others
_____
Please tell us how often you meet with the student, average advising session, and whether increased student-advisor contact has any impact on student retention
_____
Besides advising, what other duties or responsibilities do you have?
_____
What tools and technology do you use to support advising? Please describe their effectiveness
_____

Section 03:

Describe the model or method of advising (such as appreciative, intrusive) you use for Engineering Technology students. Please describe their effectiveness
_____
Describe your advising strategies for Freshmen and at-risk students?
_____
Describe your advising strategies for upper class (Junior and senior) students?
_____
Based on your experience please describe advising strategies that helped retention and persistence to graduate for Engineering Technology students.
_____
Based on your experience please describe least effective advising strategies for Engineering Technology students.
_____
What suggestions would you make to Engineering Technology faculty so that they can be more effective in advising?
_____