

INTERDISCIPLINARY BUSINESS WITH ENGINEERING STUDIES (IBE)

The Merits of a Multidisciplinary Education in Business and Engineering

Throughout the twentieth and twenty-first centuries, many of the most profound business leaders began with an engineering background. Thomas Edison is perhaps the most notable American engineer and businessman of the time. Fellow leader Henry Ford became an engineer with the Edison Illuminating Company, which was owned by Thomas Edison. The thirty-first President of the United States, Herbert Hoover, had a background in mining engineering. Jimmy Carter, the thirty-ninth President of the United States, had started a degree in nuclear engineering at the Georgia Institute of Technology before attending the United States Naval Academy. The common thread held by all of these renowned business leaders was their background in engineering.

Today, 20 percent of Fortune 500 CEOs have a degree in engineering. Engineers are detail-oriented and analytical. They are meticulous. They have realistic outlooks on situations and do not add fluff. They are problem-solvers and innovators. These are all traits that lead to a competitive advantage over other industry professionals. Understanding the realm of business, however, is what transforms engineers into successful business leaders.

Stephen Covey, author of the popular book *The Seven Habits of Highly Effective People*, says that there are four essential imperatives required of leaders: they must inspire trust, clarify purpose, align systems, and unleash potential. Engineers are intrinsically effective in clarifying purpose and system arrangement. According to Covey, the other two aspects of inspiring trust and unleashing potential can be learned, potentially through management training.

Most engineering students are ambitious. Attaining a degree in engineering is no easy task. But for those who aspire to become engineers as well as business leaders, consider pursuing a degree in Interdisciplinary Business with Engineering Studies, or IBE for short.

Penn State Behrend's Black School of Business and the School of Engineering have created this collaboration of disciplines. Graduates of this program are very sought after by employers. IBE pairs fundamental engineering skills with business knowledge to create unique, well-rounded and dynamic individuals who are uniquely prepared to succeed in technical business applications upon graduation. The major is exclusively offered within the Penn State system at Penn State Behrend, and is growing quickly. If you possess the aforementioned traits, you should consider pursuing a degree in IBE.

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Message Interdisciplinary Programs Chair Diane Parente

“The Interdisciplinary Business with Engineering Studies degree prepares graduates to work on the business side of a technical company. The major has grown from 7 graduates in 2011 to 29 in 2015. Students are typically placed in either an engineering or business leadership rotation, or in positions that span functional boundaries. IBE graduates are ‘IN DEMAND.’”



PENNSTATE



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College

RAPHAEL BRETZ '13

B.S. in Interdisciplinary Business with Engineering Studies with focus in Operations and Supply Chain Management, minor in Management Information Systems



I began my undergraduate study as a Mechanical Engineering major. After a year in the ME program, I realized it wasn't for me. While I really like numbers, I consider myself more of a people person. Like many college students, I was not sure what I wanted to do for the rest of my life. I reached out to my advisor, Dr. Diane Parente, professor of management, to discuss my options. That's when I first learned about the IBE program. Only one IBE class had graduated when I joined the major and all seven of those graduates had jobs.

The program was fun and challenging and it opened many doors for me. I had a chance to study and interact with both business and engineering students, thus giving me a better perspective of what I should take away from my education. The major also gave me a strong base that I could build on and pursue potential jobs in many different areas within a company. There are five

options within the IBE major: Accounting and Finance, Quality Control, Operations and Supply Chain Management, Technical Sales, and Product Design and Manufacturing. The track that best suited my interests was Operations and Supply Chain Management. If I could have foreseen the future, I would have chosen Technical Sales, but such is life. You cannot control all aspects and variables that are thrown at you.

That said, with this major, you are certainly better prepared to deal with those unknowns. With an addition of only four or five classes, I was also eligible for a minor in MIS. The minor allowed me to get a certificate in SAP, which happens to be the ERP software my current company uses. The MIS minor was related to the major and helped me build my college portfolio. It opened a whole new area in which I could search for jobs.

Through the career fair, I obtained three job interviews and I received job offers from all three of them. They were extremely interested in IBE to the point that I was able to explain the whole major structure and purpose while establishing my value to their company in the process.

I am now a sales engineer in the Reaction Process Machinery division at Krauss Maffei, the world's leading manufacturer of plastics machinery. The IBE major allowed me to be a person who understands. I am not only capable of learning about any market or industry, but I'm also capable of understanding the engineering value behind the product offering. With IBE, I have been able to gain each of those knowledge areas by integrating them.

The senior capstone project I completed was a unique experience that added profound value to my education. I worked with two other IBE students to do an industry and market analysis of a piece of new technology. After the industry analysis, we recognized a need for our product and then performed the appropriate research needed to prove or disprove why the product would or would not fit in that industry. We presented the company with a plan to bring the product to market within their corporation. We applied engineering and design concepts as well as business concepts such as industry analysis and firm analysis. We also prepared a sales plan, marketing approach, supply chain design, and financial justification.

The IBE program was essential in helping me start my career. I have been able to apply most, if not all, of the concepts I learned at the Black School of Business to my job and my life.

“The IBE major allowed me to be a person who understands. I am not only capable of learning about any market or industry, but I'm also capable of understanding the engineering value behind the product offering.”

Lam Thanh Nguyen

Interdisciplinary Business with Engineering Studies



What is your future position?

I have accepted a position as Import and Export Specialist at Logistics Plus in Erie.

What is your competitive advantage?

I feel that I shine in a teamwork environment. Networking is also one of my stronger skills.

Do you have any advice for current students?

It's never too early to start networking. If you want to find a job when you complete your degree, you've got to know people in the industry in which you want to work.

“Take the opportunity to explore your options and interests. Get involved in something that can help you grow academically and personally.”

Katie Carone

Interdisciplinary Business with Engineering Studies and Accounting



What is your future position?

I accepted a position in the Verizon Leadership and Development Program as an affiliate engineer in network engineering. While in this program, I will relocate and change job positions annually for three years, working for both the wireless and wireline sides of the company. I will have the opportunity to strengthen my technical, business, and leadership skills to eventually be eligible for placement as a manager upon the program's completion.

During my first rotation assignment, I will be working as a wireless traffic engineer. Some of my duties will be to monitor performance and identify problems on the region's towers, determine whether a tower is robust enough to handle the area's demand, forecast the future capacity of the area's network to suggest appropriate improvements, and even plan mobile fleets for special events like concerts and sporting events when coverage is heavily demanded.

What is your competitive advantage?

I feel that I have an advantage over my competition because I have a strong foundation in both business and engineering from the IBE major. A lot of employers today appreciate people who have technical skills but can also use their business knowledge to aid in planning and decision-making. I also think that obtaining a dual major in Accounting has made me a well-rounded candidate and has allowed me to demonstrate professionally valuable qualities, such as a strong work ethic and time management skills.

My role as a Resident Assistant at Behrend has also given me an edge over my competition. Many of the interviewers that I spoke with understood the leadership and interpersonal skills that are developed through an RA position. I think that having experience with these things appealed to Verizon. They saw that these skills could be easily transferred and strengthened in my future positions in the VLDP.

Do you have any advice for current students?

Take the opportunity to explore your options and interests. Get involved in something that can help you grow academically and personally. Employers will want to know about experiences you have that differentiate you from your peers. A lot of times, these experiences aren't reflected in your GPA but they can give employers insight into who you are. And, of course, stay determined and great things will come your way!

Garret Dutkiewicz

IBE and Management Information Systems major



Where did you begin your search for an internship?

I began my search for a position this summer by going to the websites of companies I wanted to work for and looking at their open positions. This was completely unsuccessful because most of the start dates were for the fall. I then switched to applying specifically to “leadership” or “trainee” programs and searched the Nittany Lion Career Network, which was much more helpful.

What qualities were you looking for?

I applied to any position that I felt that I could do. Once I interviewed and interacted or experienced a company’s in-depth presentations, I decided whether or not I would be a good fit.

What do you think really helped you stand out in your interviews/resume?

I was able to fill my résumé with a lot of relevant work experiences from large well-known companies (Bayer and GE). During my interviews, I made sure to bring up the fact that I played sports and worked different jobs throughout high school and my first year of college. I think this showed that I was a go-getter and have a history of being a hard worker.

A broad educational base. I was able to stand out because of the many different skills I acquired from my studies in Interdisciplinary Business with Engineering Studies, Management Information Systems, Operations and Supply Chain Management, and Technical Sales.

Has social networking, such as LinkedIn, helped you at all? If so, how has it helped?

LinkedIn has helped me get a couple interviews but I do not find it extremely useful in finding an entry level/leadership position. However, I feel that once I am able to build a broader base of connections and gain more work experience, LinkedIn will become more useful. I would definitely suggest building and maintaining an account for future purposes.

What is your advice for current IBE students looking for a job?

Apply to every position that fits your educational background. It always feels good to know someone is interested in you when you get asked to interview. Also, it is really hard to know the real demands of a position just from reading the job posting.

Use Penn State’s amazing Networking Services (Nittany Lion Career Network and the ACPC Internship and Career Fair). I got nearly all of my interviews from applying to positions on the Nittany Lion Career Network. I would also highly suggest going to University Park for their career fairs, too. They have major-specific career fairs in addition to large all-major fairs.

Choose quality internships/co-ops. Having this experience is of great help in being invited to interview and an even bigger aid when answering questions during the interview.

Be confident.

“Choose quality internships/co-ops. Having this experience is of great help in being invited to interview and an even bigger aid when answering questions during the interview.”

Madelynn Leigh Monte

Interdisciplinary Business with Engineering Studies



What is your position?

Intern in the Packaging Technology Department at Krones AG

How did you get your internship?

Dr. Parente is working with Penn State Behrend to create a Student Exchange Program between Behrend and the University of Applied Sciences Rosenheim in Rosenheim, Germany. With this in mind, a few professors at the university in Rosenheim helped me find a company in the area that was in need of an intern.

What is your typical workday?

My workdays were quite similar to workdays in the U.S. One main difference was the company's use of flex time. All employees had the option to work any hours that they wanted during the week, as long as they completed thirty hours of work. As a result, the office was pretty empty on a Friday afternoon. Another big difference was that it was completely normal to have a beer or two with lunch!

How was the culture different?

The work culture was more relaxed than it is here, which surprised me.

Most of the employees wore jeans and a T-shirt every day. Other than minor differences like that, the work itself and the work ethic were very similar to the United States.

What did you like the most?

I loved being exposed to the different culture and lifestyle in Germany. The entire time I was overseas was a learning experience, and a very fun experience, too! I got to do a lot of traveling on the weekends. I went to many places within Germany, as well as Austria and the Netherlands.

What is your biggest takeaway?

While I learned a lot about German culture during my internship, I also learned a lot about myself. The process of getting to Germany as well as staying there by myself, not knowing anyone, and not knowing the area was very intimidating. Once I was there and got settled, it was one of the best times of my life! I could not be happier that I decided to pursue that internship.

What is your advice for current IBE students?

If you have an opportunity to study abroad or do an international internship, take it! It really is a once-in-a-lifetime opportunity, and it is a great chance to not only learn not about other places and cultures, but about yourself too!

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Krones AG, Germany

Amyelia Payne

Interdisciplinary Business with Engineering Studies and International Business



What is your position?

Aerospace Sustaining Engineering Student Intern at LORD Corporation

How did you obtain the internship?

As a student studying Interdisciplinary Business with Engineering Studies, I was invited by Dr. Diane Parente and Dr. Greg Dillon to attend an Advanced Manufacturing Forum at University Park during the fall of 2014. This forum is an annual event hosted at University Park where a select group of industry professionals, professors, and students gather to engage in progressive discussion and presentations regarding advancements in manufacturing technology and practices. The theme for this year's forum was lean manufacturing and sustainability. Four different companies were invited to the event to discuss and share their strategy for lean implementation, including LORD.

Not only was this was an amazing opportunity to learn more about sustainability and lean manufacturing (two of my interests), but as one of the few students there, I was also given a great opportunity to network with the attending industry professionals. At the culmination of the forum, I was incredibly impressed with the innovation, leadership, and focus that LORD demonstrated within the industry. Shortly after the forum, I applied to LORD for an internship position and was interviewed and hired as an intern. Prior to applying, I reached out to the representative from LORD who attended the forum to express my interest in lean manufacturing and gather any insight he may have on the topic.

“Do not be afraid to fail. Failure is something to learn from, not something to fear.”

What did you learn outside of class?

As a student and an employee, I love learning new things. At LORD, I learn something new every single day. Aside from academics and work-related knowledge, however, this internship has taught me the im-

portance of soft skills. The most important aspect of working for a large company is to develop quality relationships with those you work with. It is very easy to become caught up in the everyday hustle of corporate America, which is why it is crucial to recognize the value of interpersonal skills and how to utilize them.

What is your advice for current students?

Do not be afraid to fail. Failure is something to learn from, not something to fear. If you want to become the best person you can, be ambitious, take risks, and be willing to leave your comfort zone. If you fail, learn from your mistakes and ask questions along the way. I have learned that many people love to share their knowledge with others, so make sure you utilize all of the resources available to you.

Another very important piece of advice for current students is to make sure that you are networking as much as possible. Introduce yourself to professors, coworkers, classmates, and peers. Many of our professors have industry experience and are able to connect with potential employers, so keep that in mind while you are taking classes. The more exposure you gain as a student, the better chances you have at landing your dream job!

Business and Engineering Partnership: Where we are today

The Business and Engineering Partnership was established in 2000 with grant funds from GE. The initiative began with a very small team of business and engineering faculty. From there, the group quickly expanded to more than ten business faculty and more than ten engineering faculty. A team of two engineering faculty, Dr. Ralph Ford and Dr. Rob Weissbach, and one business faculty member, Ms. Jana Goodrich, began a class in Product Realization.

Penn State Behrend hosted a small “best practices” conference, inviting other collegiate business and engineering programs to visit and discuss various programs. Those attending included PSU – University Park (entrepreneurship minor for engineering), the University of Illinois at Urbana-Champaign (minor), Clarkson University (business and engineering major), and Auburn University (minor and joint projects). At the conference, our peers suggested we look at other possibilities for creating partnership programs. So, at their suggestion, we explored creating a major.

We formed a research team composed of Mr. Ken Fisher (Professor Emeritus of Engineering), Mr. Mike Lobaugh (Lecturer in Engineering), and Dr. Diane Parente (Program Chair for Interdisciplinary Programs and Breene Professor of Management). We formed a second team for curriculum development (later split into a major and a minor group). Twenty-five faculty members participated. The initial program received excellent support from the School of Engineering Directors (then Dr. Richard Progelhof and Dr. Robert Simoneau), the School of Business Director (then Dr. John Magenau), and former Chancellor, Dr. Jack Burke. Current Directors of the two schools, Dr. Ralph Ford (SOE) and Dr. Balaji Rajagopalan (BSOB) have not only continued but enhanced support for the partnership.

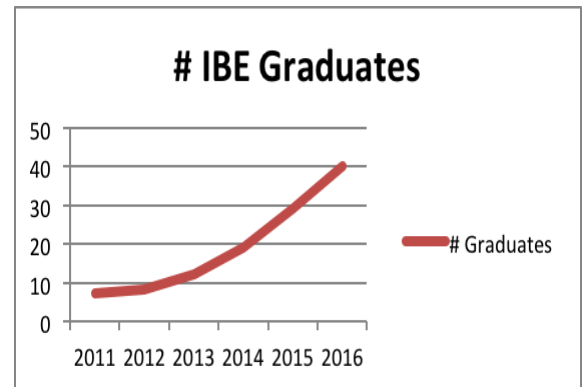
Where we are today—fifteen years later:

- Numerous journal articles and conference papers have been published and presented.
- Based on research regarding the needs of engineering graduates, a class in Project Management for Engineers was developed. Approximately 200 engineering students take the class each year.
- Two minors were developed—Operations and Supply Chain Management and Technical Sales. Nearly 200 minors in OSCM and approximately 60 in TS have been awarded.
- The Board of Trustees approved a major in Interdisciplinary Business with Engineering Studies in July 2008.
- Penn State Behrend is now the academic home for the Master’s in Manufacturing Management formerly offered by University Park’s College of Engineering and Smeal College of Business. The School of Engineering in collaboration with the Black School of Business is responsible for this graduate program. The first class will graduate in May 2016.
- A chapter of the National Organization of Business and Engineering (NOBE) was established in 2013. Behrend students have attained offices in the national organization.

We’d like to thank everyone who supported the Business and Engineering initiative from its inception in 2000.

Status of the BS in Interdisciplinary Business with Engineering Studies

The ongoing collaboration between the Black School of Business and the School of Engineering has proved to be a phenomenal partnership. As shown in the graph below, the IBE program, initially approved in 2008, is growing. Initially approved in July 2008, the m. Students come in as freshmen and also as transfers or change in major. Those who begin the program in their freshman year will graduate in four years. Students who have transferred into the major later in their studies may need an extra semester to graduate as an IBE major. For the purpose of identifying the growth in the major, we use the calendar year in which the students graduate. In other words, students graduating in May or December of 2015 will have the capstone in the Fall 2014 or Spring 2015 semesters concluding with the presentation at the Fasenmyer Conference. The chart below shows the growth through the first five graduating classes. The number of 2016 graduates projected is nearly five times the number in the first graduating class..



The number of incoming students is high and we should see continued growth. Approximately 50 percent of the students enter as freshmen. The remainder of the students in the program transferred into it. .

The program requires that students take a core slate of business courses and a broad array of engineering courses. IBE majors are required to take engineering math, physics, and chemistry. Students also choose a focus area in which they can find their first job. All of these courses will allow students to learn skills along the way, including accounting/finance, quality control, operations and supply chain, technical sales, and product design and manufacture. Depending on their focus area, for just a few extra classes, students can earn a concurrent degree in Finance or Project and Supply Chain Management. Many students who begin in Mechanical Engineering Technology take an extra course or two and earn their Associate of Science in Mechanical Engineering Technology. These dual programs are easily completed in four years, depending on when the students entered the IBE major.

The capstone class continues to provide a tremendous experience for students. Each team works with a company to develop a product or process concept. The concept is called corporate entrepreneurship or intrapreneurship. They develop a full plan to bring the product to market within the structure of the firm. The students do an industry, external, and internal analysis. They do market analysis, segmentation, sales strategy and planning, pricing and product valuation, channel and supply chain design, and financial analysis, including calculating the financial return on the new product. From the engineering side, they conduct concept generation, selection and development, product architecture, design for manufacture, cost, and environment as well as prototyping, and develop final cost estimates and specifications. Then, the students develop the plan for integrating into the firm's current manufacturing operations or identify requirements for new capabilities. Finally, the students come together to present the entire report to the company and deliver an oral presentation at the annual Fasenmyer Conference.

To date, students have completed twenty-four projects with ten companies. The current class has nine teams working with six firms, including the Department of Defense and Eriez. Dr. Greg Dillon, Associate Director for Research, School of Engineering, co-teaches the class with Dr. Diane Parente, Program Chair of Interdisciplinary Programs in the Black School of Business.

Internships are not required in the program. However, the culture in the major is such that about 90-95 percent of the students will have at least one internship experience. Internships have included placement in Germany and China, as well as many U.S. firms. Following graduation, placement to date has been 100 percent. Most students have jobs with good salaries within six months of graduation. Firms who hire IBE graduates include United Technologies, General Electric, FMC Technologies, LORD Corporation, Westinghouse, Exxon, British Petroleum, and Verizon Wireless, just to name a few.

The primary way students (and parents) learn about IBE is by speaking with current and former IBE students. The selling point of this major to companies (and also parents) is: "Wouldn't you like it if your plant accountant or financial analyst actually understood the production process?" Once companies understand the major as a combination of business and engineering principles, they are usually "all in."

What is NOBE?

The National Organization for Business and Engineering (NOBE) started in 2006 when a student involved with the Society for Business Management and Engineering at the University of Illinois had an idea to make the group a national organization. The group reached out to other schools and in 2007, NOBE was created.



NOBE, is a national society that unites students interested in both business and engineering. New chapters of NOBE are added every year as more universities learn about the organization. There are chapters located throughout North America, and more added every year. The goal of NOBE is to cultivate professional and business skills in its members.

The Penn State Behrend Chapter of NOBE was founded in the spring of 2013. The organization offers many opportunities for members to participate

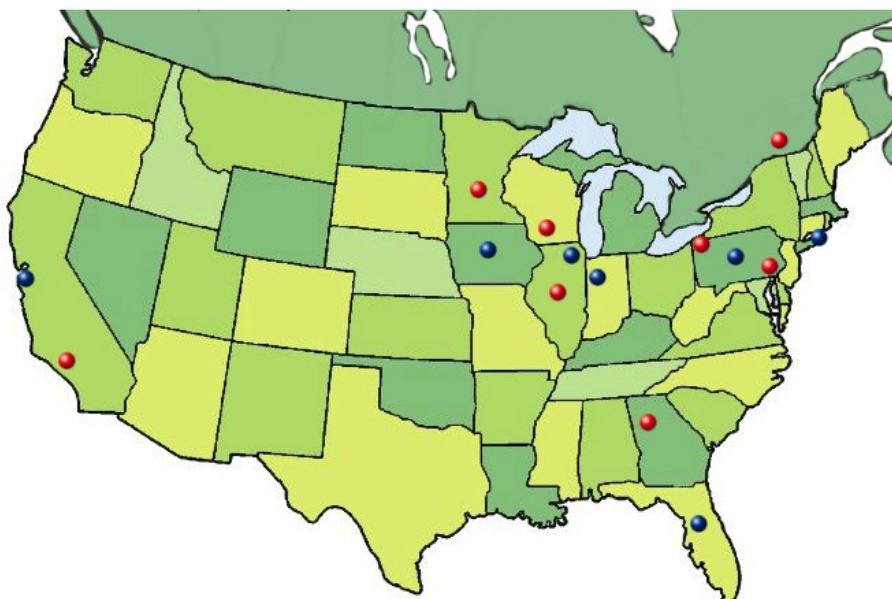
in corporate interactions. Behrend’s NOBE chapter continues to grow steadily and organizers would like to encourage more students to attend events and meetings

There is a national conference held at a university every year. At this conference, the national board is elected and various speakers with diverse experiences share their

knowledge. There are also social events to allow students to interact and get to know each other. Each chapter must have a representative present to be considered an official chapter. So, this conference provides a great opportunity for members and officers to network.

Behrend’s NOBE group offers different activities throughout the year. Recently, they visited FMC Technologies and toured their facilities. There are also social events to allow the students to interact and practice networking skills.

Map of Location of Current NOBE Chapters



Meet the Student Officers of NOBE

NOBE is comprised of a five-member executive board — a president, vice president external, vice president internal, finance director, marketing director, and technology director. The following is an inside look at the current executive board and their roles.



President – Marley Good, a junior majoring in IBE, serves as president of the Penn State Behrend chapter of NOBE. Marley has done an internship with Westinghouse for the past two summers. The president is instrumental in managing and organizing the executive board and overseeing all meetings and events.

Vice President External – Matthew Nicol, a junior majoring in Project and Supply Chain Management, serves as the vice president external at NOBE. In addition, he is involved in ROTC and serves on the Senate Board



for the Student Government Association. The vice president external is responsible for creating new partnerships with corporations as well as maintaining existing partnerships.



Vice President Internal - Alayna Steele, a senior majoring in IBE, is the vice president internal of the Behrend chapter of NOBE. Alayna has done an internship with Citadel Plastics and Chapman Construction. The vice presi-

dent internal manages campus events and collaborates with other Behrend organizations, clubs, and faculty members.



Finance Director – Patrick Kress, a sophomore majoring in Finance, is the finance director of NOBE. He is also doing an internship with FMC Technologies and serves as the finance chair for the SGA. This position takes care of the club's financial accounts, manages fundraising and membership fees, and serves as chapter manager for the NOBE National Stock Market Game.

Marketing Director – Mitch Kaltenbaugh, a senior majoring in Mechanical Engineering, is the marketing director for Behrend's chapter of NOBE. Mitch has completed internships with CMI Energy and Swanson Systems, Inc. The marketing director works with the board in advertising NOBE events and manages all social events



Technology Director – Aaron Peters, a sophomore majoring in Mechanical Engineering, is the technology director for NOBE. He is a member of Behrend's cross country and track, too. The technology director is responsible for overseeing the NOBE chapter website and our social media presence.

Don't forget to like us on Facebook at <https://www.facebook.com/NOBEPSB/>

A Note from NOBE National:

My name is Sara Victor and I am a senior IBE major here at Penn State Behrend. In 2013, I founded and became president of the Penn State Behrend chapter of the NOBE. This past year, I served as vice president on the National Board, and committed to chapter maintenance and expansion. We are excited to announce the addition of three new chapters: Penn State University Park, New York University and San Jose State University!

For the 2015-2016 academic year, I have moved into a new role as the vice president for outreach. My central focus will be expanding NOBE throughout the country. I am always looking for new university connections, so if you know someone who would be interested in hearing more about NOBE, please feel free to contact me at vpoutreach@nobenational.org. I would also like to congratulate Alayna Steele, a senior IBE major at Penn State Behrend, on her new position on the National Board as vice president internal. She will be managing communication between chapters and the National Board.



Stay tuned for upcoming events!

GET INVOLVED

Students: Attending just one (or 10) club event(s) per semester can change your course and perceptions for a lifetime. Previous event attendees have used the knowledge they gained from one conversation to earn their first interview, get their first job, change their concept of a specific job, or open their eyes to a world of possibilities. Take a deep breath, and walk through the door. You are welcome here.

Alumni and Friends: Your time, experiences, insights, and perspectives are valuable—perhaps more valuable than you know. We want to know what impacted your career, your perspectives, and your life. Tell us through the Black School of Business Facebook page, the newly-created (and growing) Black School of Business LinkedIn group, or by emailing Ariana Gloeckner, newsletter coordinator, at azg5486@psu.edu

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