Using Current Photonics Students to Recruit New Students

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Dan Hull, Gary Beasley, Greg Kepner and Dorian McIntire

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PREFACE

Photonics associate degree programs at two-year colleges across the nation must all acquire robust enrollments to assure their continued existence—and to produce an adequate technician workforce for the U.S. photonics industry. Increased enrollments and more completers strengthen such programs, which in turn benefits deserving students who are interested in pursuing very rewarding careers in an interesting and dynamic field.

The purpose of this monograph is to propose a plan and describe a strategy for developing and maintaining strong, effective student recruitment to support program enrollment. The monograph presents the need and rationale for focused student recruitment, strategies for using current students as program recruiters, and the benefits these students acquire by serving as recruiters. Specifically, recruiting new students helps current students gain "soft skills" that employers value in new employees, including skills in team building, leadership, planning, scheduling, evaluating, data collecting, and record keeping. The closing sections of the document provide information about proven resources and recruitment events.

We hope this document will spark interest in using students as recruiters among faculty members who desperately need this help. Comments and suggestions are welcome and will be considered if and when a revision is called for.

Daniel Hull, PI
OP-TEC
January 2017

BACKGROUND

The inadequate supply of new, highly qualified photonics technicians has created a workforce deficit for U.S. employers that threatens to limit their research, development, and productivity. Companies, institutions, and agencies working in photonics are being forced to hire or transfer technicians who have little or no knowledge and skills in optics, electro-optics, or lasers and train them on the job. This strategy has provided limited relief, but the technician deficit remains and requires a more substantial remedy.

Studies conducted over the last decade have consistently shown that more than eight hundred new photonics technicians are needed in our country each year.[1,2] The thirty-five U.S. colleges with associate degree photonics technician education programs are producing fewer than 350 completers annually.[3] New national initiatives, such as Integrated Photonics, require even more technicians and will only compound the deficit. [4]

This supply shortage can be relieved in four ways:

- Retrain employed technicians in the knowledge and skills of photonics.
  Current efforts to retrain employed technicians are severely constrained by the cost of on-site courses, the limited time that working technicians have for additional training, and geographical constraints that limit the accessibility of qualified colleges.
- Increase the number of two-year colleges that offer associate degree photonics technician programs.
  More than twenty additional colleges are considering or planning to initiate new photonics courses in the next three years, but it will take three to four years for these new programs to increase the number of completers.
- Infuse photonics courses as specialty courses into related technical programs where photonics is an enabling technology.
  Colleges are also considering infusing optics and photonics courses into existing technician programs, such as manufacturing, instrumentation, and mechatronics.
- Increase student enrollment in existing photonics programs.
  Increased student enrollment is by far the most effective and rapid method of increasing the supply of photonics technicians. It also ensures that existing photonics programs will not be closed due to low enrollment. Over the last nine years, OP-TEC has restored seven programs that had been closed due to low enrollment. Nevertheless, two current programs are currently planning to close due to low enrollment.

STUDENT RECRUITMENT PRACTICES

Over the last eight years, OP-TEC has supported student recruitment at colleges that teach photonics by identifying and creating student recruitment tools, providing financial support for dedicated recruiters, and networking student recruiters in sixteen photonics programs to share best practices. Most colleges with dedicated student recruiters have increased their enrollment in photonics programs substantially. Recruitment materials and strategies are discussed later in this monograph.

Typically, colleges have relied on photonics faculty and general college outreach departments to identify high school students and adults who are good candidates for becoming photonics technicians and to encourage them to enroll in photonics programs. However, although photonics professors should be committed to student recruitment, most have very limited time and resources to use for this purpose. Ideally, their responsibility would be limited to directing the recruitment effort and planning recruitment events.

Dedicated student recruiters (hired and used specifically for this purpose) significantly affect student enrollment and growth in photonics programs. These recruiters ease the added burden of recruitment on faculty members. When possible, selected dedicated recruiters can be younger than professors and so nearer to the ages of the potential recruits. In 2008, Indian River State College (IRSC) faced very low enrollments in its laser/optics program. Using a sub-grant from OP-TEC, IRSC hired a twenty-three-year-old woman with a marketing background and no knowledge of photonics to be its dedicated student recruiter. She received two days of orientation to the field of photonics and was directed and incentivized to recruit students from nearby high schools. Hiring this dedicated, part-time recruiter paid off: in less than two years, enrollment in IRSC's photonics program reached maximum capacity.[5]

Based on the success of IRSC's strategies, OP-TEC has continued to support dedicated student recruiters in its partner colleges and by offering targeted student recruitment grants to other colleges with photonics programs. Recruitment efforts have focused on students in nearby high schools, adults in the community who are looking for better employment opportunities, students enrolled at the college who have not yet declared a major, and returning veterans. Consideration is also given to special outreach programs to recruit women and minorities. As a result of these recruiting efforts, most of these colleges have increased their photonics enrollments 20-40 percent. Some colleges have realized much higher gains.

Recruitment strategies include high school visits and presentations, community events, laser workshops or career days at the colleges, media announcements, distribution of print materials showing photonics applications and career information, exhibits with demonstrations of laser and optical phenomena, and postings in social media. (Details on recruitment strategies are presented later in this monograph.)

In the future, OP-TEC will not be able to award student recruitment grants. And most photonics colleges cannot afford to pay or justify paying full-time or part-time employees specifically for this purpose. However, some colleges are using their present students to assist or lead in student recruitment. Using current students to plan and conduct recruitment tasks and events has resulted in cost savings to the college, as well as more effective relations

with potential student recruits. The following sections describe the use of current photonics students to conduct most of the department's recruitment efforts.

Student Recruitment at Central Carolina Community College

Gary Beasley

Background

The laser and photonics technology (LPT) program at Central Carolina Community College (CCCC) is a two-year, five-semester, associate degree program. Upon completion of the program, students earn a certificate in electronics engineering technology in addition to an associate of science in laser and photonics technology. During the student's first year in the CCCC LPT program, core classes are mostly in electronics engineering technology and teach students how to use and control electrical energy. During the second year, core classes are mostly photonics technology and teach students how to use and control light and lasers. The program began in 1987. Typical class sizes for first-year students ranged from twenty to twenty-five until shortly after the turn of the century.

When the telecommunications industry restructured in 2000, job opportunities for graduates diminished. This caused student recruitment to become more difficult, resulting in low enrollments of new students. At this same time, there was a change in LPT program instructors, which resulted in fewer recruitment efforts by both the departing instructor and the new instructor. In the fall of 2001, enrollment in the LPT program dropped to a low of seven first-year students. Enrollment continued to drop until a major recruitment effort was implemented and the focus of the program shifted its focus from fiber telecommunications, a field with decreasing job opportunities, to the higher-job-growth area of photonics.

The focus of the new photonics program emphasized laser technology, including high-energy lasers, which were being used in many fields other than fiber-optics telecommunications. The new program focus attracted multiple job offers for students upon graduation. With new student recruitment efforts and the rise in multiple job offers upon graduation, new student enrollment in the LPT program increased rapidly. Typical class sizes for first-year students grew to twenty to twenty-five. However, student recruitment required an enormous effort by the LPT instructor.

CCCC is situated in a relatively low-population region of North Carolina, which meant that recruitment had to take place over a wide geographic area, making it especially challenging. CCCC has campuses in three connected North Carolina counties, all of which are relatively low in population, with cities and towns of between two thousand and ten thousand residents. Chatham County, Lee County, and Harnett counties each have two small to medium-size high schools. Counties adjoining the CCCC service area have larger populations and their own community colleges. Because the CCCC LPT program is unique in North Carolina, the LPT program can recruit throughout the state, but recruitment efforts in this large geographical area require an excessive time commitment from the LPT instructor.

Recruitment Opportunities

A. High school visits. All high schools in the CCCC service area are visited each semester. A school visit is scheduled for an entire day, with meetings every class period that feature a presentation to the students about the CCCC LPT program, including broad career opportunities and relatively high starting salaries. A single presentation with a question and answer period consumes an entire class period. These presentations are targeted to technology, science, and advanced math classes containing fifteen to thirty students. They also demonstrate photonics using a laser system and/or a laser light show. If the LPT instructor is conducting this visit, a second-year LPT student may participate in the presentation, demonstrations, and Q & A.

B. Career fairs. All career fairs in the CCCC service area are attended by high school, middle school, and elementary school students and teachers. Student outreach activities include distribution of laser program handouts and photonics equipment demonstrations, including a laser light show. Second-year LPT students frequently help with the demonstrations and answer questions.

C. Laser workshops. The college offers several different photonics workshops each year. Second-year LPT students provide lab demonstrations and answer questions. These workshops include:

- Saturday workshop for middle school students. This three-hour workshop is offered for students and parents each semester. The agenda includes a talk about photonics phenomena, equipment, applications, demonstrations, and a high-powered laser lab tour. Recently the event has included a hands-on experience with each student performing photonics labs using a new LASER-TEC photonics educational kit.[6]
- Summer middle/high school camps. These two-week photonics workshops include lectures, demonstrations, hands-on labs, and lab tours.
- K–12 STEM teachers program. Offered once each semester and lasting six to seven hours, this program includes a technical presentation, demonstrations, and high-powered laser lab tours.
- North Carolina CTE conferences. Offered once each summer and fall, these conferences feature two half-day workshops that include a presentation, demonstrations, and high-powered laser lab tours.

D. Veteran Events. In all recruitment activities sponsored by the CCCC Dedicated Department for Veteran Recruitment, the LPT program prepares an exhibit, distributes program information and answers questions posed by the veterans attending.

E. Eighth grade campus tours. All eighth graders in the county visit each CCCC campus and tour each program. Due to the nature of the program and the interests of the students, the LPT program receives extra time for presentations and laser demonstrations. Each group visits the LPT program for fifteen to twenty-five minutes. Second-year LPT students provide presentations, lab demonstrations, and

Q&A sessions for the visiting teachers and students. The LPT program also hosts displays at other CCCC campuses on the dates of their eighth grade campus tours.

F. News articles and announcements. Opportunities are available to create CCCC LPT program awareness through the news media. Articles in local newspapers are also posted on the CCCC website. These articles include stories about LPT student field trips (usually four per year), photonics company recruitment visits, and individual student-related success stories, such as receiving rewarding job offers, speaking at a national photonics conference, winning an award, or participating in SPIE student chapter events. Local radio and television stations also broadcast programs about the LPT program.
G. Hosted tours of the program. These are offered for any group visiting the CCCC campus.
H. The SPIE student chapter at CCCC conducts public awareness events, including guest lectures and campus laser lab tours. The CCCC marketing department helps advertise these events.

Use of Current Students for Recruitment

Whenever possible, second-year LPT students are included in recruiting events. This is especially true for all workshops. When LPT students are involved in the workshops, they are paid a small amount, usually $25 to $50 per day, for their time. This payment is also offered for other CCCC program workshops. Funds are provided by the college department responsible for all the general recruiting efforts. Second-year LPT students help at non-workshop recruiting events on a volunteer basis.

Approximately eight to ten years ago, CCCC hired a part-time recruiter dedicated to the entire engineering department, which included the LPT program. The recruiter worked at all the college outreach events. But, since the recruiter was representing all the engineering programs, the LPT program instructor also participated in these recruiting events, often working alongside the recruiter. The extra exposure the part-time recruiter provided benefited the LPT program by promoting enrollment of capable, interested students. After four years, a downturn in the economy occurred. Consequently, state budgets tightened, and funding for a part-time recruiter was removed.

Fortunately, sub-grant funds from the LASER-TEC Regional Center[7] became available, which allowed the LPT department to hire a student as a dedicated part-time recruiter. The selected candidate had experience as a public school math and science teacher, was a talented presenter, and had sufficient time because he already had taken many of the required non-core courses. This LPT student worked at almost every recruiting event and attracted talented students to the LPT program. Hiring this dedicated LPT part-time recruiter also relieved the LPT instructor of the excessive time burden of recruitment.

Subsequently, the LPT program changed its curriculum: all the fifth-semester LPT classes were changed to distance learning, which meant that students were not required to attend classes on campus in their final semester. This allowed them to begin working as full-time employees, as long as they could handle the dual workloads of a full-time student (completing the LPT program) and an employee in the photonics industry.

The use of an LPT student as the dedicated part-time recruiter had been successful. However, when second-year students gained the opportunity to take on full-time jobs while completing the program, it created the problem of not knowing when a student recruiter might leave for an industry career. Therefore, a decision was made to divide the recruiter funds in half to provide for two dedicated LPT program part-time recruiters. Two LPT students were selected to fill the positions. This strategy has worked successfully for two years, enabling at least one recruiter to be available even if the other resigned.

Selection of Student Recruiters

The selection process for student recruiters is extremely important, because these students will be the face of the program to prospective photonics students. Since student recruiters work with limited supervision during recruiting visits, they must have the following abilities, skills, and resources:

- Oral presentation skills. They must be able to respond appropriately to student questions and challenges and fully describe the technical aspects of the photonics program, including expectations and requirements of students, career opportunities, and interesting information about photonics and laser applications. They should demonstrate enthusiasm about their choice to pursue a career in photonics.
- Strong academic standing and knowledge and experience with the technical material. They must be able to work extra hours without negatively affecting their course work.
- Dedication to their studies and proficiency in time management, record keeping, and report writing. They should be mature, trustworthy, and well-groomed.
- Ability to schedule recruiting visits, often by communicating with high school teachers and high school administrators
- Ability to troubleshoot and quickly resolve recruitment presentation equipment issues
- Reliable transportation to get to recruitment events.

Since these positions offer modest pay, students have been eager to be selected. A selection process was created:

- Interested students were required to submit a resume.
- A selection committee observed the candidates during a mock high school recruitment visit, using presentation material the candidate had created. The selection committee consisted of the lead photonics instructor, the electronics instructor, and a CCCC instructor who does not normally teach photonics students (such as a biology instructor). During the presentations, selection committee members posed to each candidate a question that an interested high school student might ask.
- After some discussion, the committee selected the best applicant.

Additional Student Recruiter Assignments

Student recruiters are also responsible for the following:

- Select and plan high school recruiting events. Determine: Who is the audience? What are the desired outcomes? Who will be attending? What facilities available at the

location of the event? All other recruiting events are led by students but planned by CCCC.

- Maintain a calendar of scheduled recruiting events.
- Collect and record data for an event log of completed recruitment events. The log should include information about impact, such as how many students attended and how many follow-up contacts the recruiter received.
- Ensure that recruiting presentations are updated. Develop new ones as required.
- Maintain recruitment equipment in operable condition. Add new equipment as needed.

Recruitment Tools Used

- Recruitment PowerPoint presentations
- Recruitment videos
- Laser light show demonstrations
- Laser and optics demonstrations, including diffraction gratings, laser pointers, and other light phenomena equipment
- CCCC LPT program brochures and handouts
- Employment opportunities for CCCC LPT completers

Leadership Provided by Program Faculty

- Select and orient student recruiters
- Observe the student recruiter presenting at least once on the CCCC campus
- Initiate the first high school recruitment event, while the student recruiter observes. During the visit, the student is asked to take over during the presentation.
- Follow up with the student recruiter after the presentation and suggest ways to improve
- Determine whether the student recruiter is prepared to conduct the next event

Results

The results from using CCCC LPT students as part-time recruiters have been very positive. Since the LTP program has begun hiring these part-time recruiters, it has consistently enrolled twenty to twenty-five first-year students, most of whom have been very talented and hardworking.

Success Factors

The factors for successful implementation of students as part-time recruiters are:

- The selection process
- Carefully describing the expectations of the assignment

- Orientation and practicing one or two events
- Frequently monitoring progress and obtaining feedback about quality of service
- Managing fulfillment of expectations

If the student recruiter is not performing appropriately on a consistent basis, the recruiter is replaced.

Rewards and Expectations for Student Recruiters

If funds are not available for compensation, the instructor responsible for the program will need to rely on student volunteers. Often, a few talented, capable students are willing to volunteer but may be unable or unwilling to commit enough time for significant positive recruiting impact, unless some incentive is provided.

Issues

- Students who are willing to serve as recruiters may not have sufficient time to devote to recruiting.
- Students who are available and interested in recruiting may need to understand that this work is beneficial to their professional development.
- Since volunteer recruiters are not college employees, liability protection for damages or injuries caused by student recruiters may not be covered by the college's insurance. This issue should be presented to the legal department of the college for a determination.
- Student may need to be compensated for driving their vehicle at their own expense.

Recommendations

- Support comprehensive student recruitment as a vital component for the success and stability of the program.
- Attempt to convince the college leadership to allocate some funds for student recruiters. If compensation for their time is not possible, they should at least be compensated for their expenses, including transportation to recruiting events.
- Devise a student recruitment scheme that develops "soft skills" such as planning, quality control, team building, and data collection and reporting. These are valuable skills that future employers will look for in technician job applicants.
- Assure that neither you nor the college is liable for accidents involving student recruiters.
- Try to keep faculty time required for this effort to a minimum. Select and train competent recruiters. Assure a data keeping and reporting system that allows you to adequately monitor the work of the recruiters in a minimum amount of time.

Student Recruitment at Tri-County Technical College

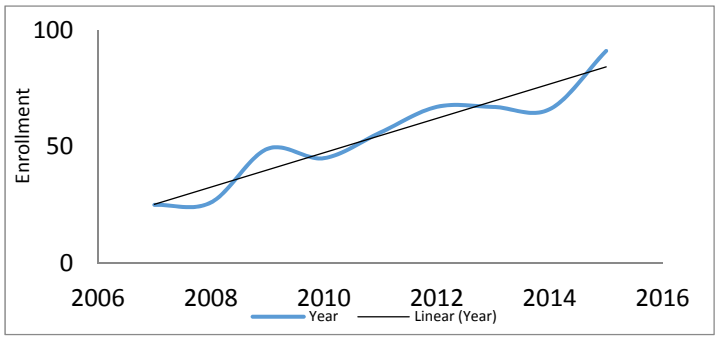
Dorian McIntire

Background

Tri-County Technical College (TCTC) serves the South Carolina residents of Anderson, Oconee, and Pickens Counties. The college enrolls about seven thousand students on its four campuses in Pendleton, Anderson, Easley, and Seneca. The main campus is located in Pendleton, South Carolina, where photonics technicians are educated.

The General Engineering Technology program (GET) is a multidisciplinary program at TCTC with a student enrollment of between eighty and one hundred students (maximum capacity). The program's core curriculum consists of courses in electronics, photonics, robotics, hydraulics, pneumatics, and programmable logic controllers. The GET program has experienced a steady growth of eight students per year, on average, since 2007.[8] Several practices have contributed to the program's growth:

- Project Lead The Way (PLTW) Technical Advanced Placement (TAP) credit for two GET courses: Digital Electronics and Computer Aided Design (CAD)
- On-campus technology workshops for elementary school and middle school students
- STEM shows at middle and elementary schools
- GET student project showcases on campus for college students with undeclared majors.



GET Program Growth

High School TAP Credit

PLTW began offering its TAP (advanced placement) program in 2010. The TAP credit offering gave the program director and other GET instructors access to PLTW students during student showcases and similar events. GET instructors were also invited to serve on the PLTW advisory board as a result of this partnership. The students in the TAP program have exhibited a natural inclination for the GET program, once they have become aware that the program is an enhanced continuation of what they were enjoying in PLTW courses.

On-Campus Technology Workshops

Each summer TCTC offers a technology workshop, typically conducted by GET faculty, for fifth graders and middle school students. The workshops are organized around a theme; a few past themes have been "Light and Lasers," "Interactive Art with Arduino," and "Controlling

Light with Arduino."[9] The workshops are a catalyst for getting young students interested in technology. Tours of GET labs and student projects are part of the experience.

Off-Campus STEM shows

For many years, GET faculty members have conducted STEM shows at several nearby elementary and middle schools. These shows have become very popular, and the instructors are often asked to return each year. Since these shows require a tremendous amount of logistics and planning, the shows eventually became a huge burden for the few faculty members involved. Most GET courses are project-based, so involving GET students in this endeavor is a useful way to ease the faculty burden of these STEM shows while giving GET students an opportunity to demonstrate their skills to an appreciative audience. Their involvement has turned out to be an effective way to engage not only GET students, but also K–12 teachers and their students. The GET students receive a grade for their participation in the event based on the quality of their presentation. They must also provide their own transportation to the visited school. GET students enjoy having their expertise appreciated by both K–12 instructors and students. Many K–12 students have commented that they would like to eventually enroll in the program.

GET Student Showcases

In many GET courses, students must showcase projects they created for a grade. These projects are displayed in the college café near the end of the semester. These showcases have several benefits:

- They increase awareness of the GET program among students, faculty and advisors
- They locate the GET project labs in a list of places to visit for visiting groups of students
- They provide an opportunity to post student projects on social media sites

These efforts are of particular use in reaching college students with undeclared majors, and they have helped the GET program recruit and enroll these students in the GET program every year.

Engaging local teachers, their students, and K-12 school administrators will increase awareness of and interest in your program. Keeping an "open lab" visiting policy is also an effective strategy for marketing a program to both outside visitors and other students attending the college.

Student Recruitment at Indian Hills Community College

Greg Kepner

The Laser & Optics Technology program at Indian Hills Community College (IHCC) offers an eighty-one-credit Associate of Applied Science Degree that includes thirty-eight semester credits of laser and optics coursework. The program includes a nine-month common core Electronics Technician Diploma that is shared with the Robotics /Automation Technology program and the Electronics Engineering Technology program. Since IHCC's Laser &

Optics Technology program began in 1985, it has graduated 556 students, who have gone on to start careers at 137 different companies in thirty-five states and two foreign countries.

IHCC typically has fifteen to twenty graduates per year, and job placement is nearly 100 percent every year. Any employable graduate that is ready to begin a career in the photonics industry is virtually guaranteed a job, as long as he or she is willing to move to a location where opportunities are readily available. The graduates' annual salary range in 2016 was $43,000–$70,000, and the average salary was $53,500, up from $50,500 in 2015.

Considering that starting salaries are excellent and job opportunities abound, one might expect that students would line up to enroll in this program. Often, that is not the case. It is still a challenge to enroll enough students to meet industry demands. There are several possible avenues to address this challenge. Participating in career and college fairs is one way of sharing program information. Special events such as focused "Senior and Junior Days," STEM festivals, summer camps, and career days are additional ways of highlighting program information. Bringing students to IHCC to visit is often an effective way to showcase the college's technical programs. IHCC hosts student groups for day visits as well as special overnight visits for a "college immersion experience." All these recruiting activities help get the word out to prospective students.

Another great option for recruiting students is using current students as ambassadors for the program. Current students are engaged in the program and know exactly what is happening day to day at the college. Generally, prospective students are more likely to listen to current students than to college recruiters because current students are usually closer in age and have genuine experience in the program, so their explanations don't seem like a sales pitch. When visitors or prospective students come to campus to visit IHCC, current students act as hosts to share information about technical programs. The current students may demonstrate laboratory activities and equipment operation, in addition to discussing coursework and career opportunities. Generally, second-year students make the best hosts, because they have more experience in the laboratories and are more knowledgeable about the programs and career opportunities than first-year students are. Most students are enthusiastic and willing to show people what they know. Some of the entertaining and popular demonstrations include laser light shows, balloon popping with lasers, aligning optics (mirrors, lenses, prisms, etc.), and laser etching of names or artwork designs onto materials. Whenever current students are actively engaged in recruiting new students, IHCC instructors prepare them with accurate job placement and career opportunity information and provide technical guidance as needed for equipment demonstrations.

It is often necessary to take the information directly to prospective students. Many people don't even know that programs and career opportunities in laser optics and technology exist. For off-campus events such as high school classroom presentations, current students are very effective recruiters. At IHCC, instructors give current students an optional class assignment to make a presentation at the high school of their choice. Most students choose their home high school because they are familiar with the teachers, classes, and possibly some of the students. Presenters often work in pairs to support one another and reduce the anxiety of public speaking. For consistency and accuracy, some instructors provide PowerPoint presentations and handouts, although some students create their own presentations. Some very effective handouts include flyers created by OP-TEC, such as "How Lasers are Used"

and "Laser and Optics Careers Pay Off."[10] Additionally, equipment demonstrations or portable laser light shows are very popular during presentations.

After each presentation, prospective students fill out contact cards, and presenters collect them for the admissions office. Each student presenter reports back to his or her instructor regarding the outcome of the presentation. Current students that make presentations at high schools do so voluntarily, so there is no financial compensation. Students provide their own transportation, but consideration is given to reimbursing students for mileage expenses. Many insightful students recognize the benefits of helping their own chosen program by recruiting new students and sharing information, which only serves to strengthen enrollment and enhance the program's longevity and overall effectiveness.

CREATING A RECRUITMENT PROJECT TO TEACH PHOTONICS STUDENTS SOFT SKILLS

Project Management as a Component of Photonics Technician Education

Project management is the discipline of initiating, planning, executing, controlling, and completing the work of a team to achieve specific goals and meet specific success criteria. A project is designed to produce a unique product, service, or event that successfully meets defined goals and objectives within a specific period of time. Successful accomplishment of a project requires leadership, teamwork, goal setting, resource allocation, communication, and setting and meeting timelines and standards of quality. The primary constraints are scope, time, quality, and budget.

Typical phases of a project are:

1. Initiation
2. Planning and design
3. Executing, monitoring, and controlling tasks, assignments, and schedule
4. Completion and evaluation

Employers highly value employees who are knowledgeable and experienced in project management, because they have acquired the following "soft skills":

- Leadership
- Planning
- Goal setting
- Teamwork
- Scheduling and time management
- Resource management (making maximum use of available time, budgets and effective tools)
- Setting and adhering to standards of quality in their work

Requiring a group (team) of photonics students to plan, conduct, and evaluate student recruitment tasks engages them in a project in which they learn and practice these soft skills. Student recruiting can be a valuable component of a photonics course, because it requires knowledge, hands-on activity, and practice giving oral presentations about photonics. Students gain not only course credit, but also employability skills. The photonics program, meanwhile, gains a cost-effective strategy for recruiting new students and leveraging faculty members' limited time. This assignment works best as part of an existing photonics course.

Organizing Photonics Students to Conduct Student Recruitment Projects

The following discussion describes a general plan that a faculty member or program chair can use to organize and engage photonics students to recruit new students. Faculty members

will likely need to alter this plan to meet the capability, resources, and limitations posed by their students, institutions, and communities.

1. Leadership and staffing
   - Select a group of two to eight photonics students from a photonics class to be assigned the student recruitment project. If the class size is large enough, more than one group can be formed, each with different recruitment goals.
   - Organize the group and ask members to select a leader and a backup. Ask each member to identify times when they are available to participate in the project. The group leader or backup should record this information and possibly construct a calendar to display it.
   - Set times and dates for planning meetings.
   - Explain the purpose of the project and expected outcomes.
2. Planning

   Several meetings may be needed for initial planning; then periodic meetings should be scheduled to update plans. The faculty member should attend these meetings. Students should prepare and distribute meeting minutes to the group.
   - Determine the scope of the project and agree upon a written goal and expected outcomes.
   - Sample goal: "Interest and encourage at least XXX people to apply to become students in the institution's associate degree photonics program."
   - Determine which populations this group will serve. (If an additional group is formed, each group may serve selected populations.)
     - Sample populations to be served: high school students, college students without a declared major, adults in the community in need of knowledge and skills for a new career, college completers who want a new major or career, and returning veterans.
   - Identify team members who have an interest in, familiarity with, and/or connections to one or more of the populations.
   - Develop strategies for serving each population group.
     - High schools: visits, presentations, day camps at the college, social media, etc.
     - College students: get names and contact information of students with undeclared majors; plan demonstrations and/or exhibits on campus, use social media
     - Adults in community: advertisements, announcements, special events, social media
     - Returning veterans: distribute information, create exhibits, and/or plan demonstrations at college-sponsored events for veterans

     Information on these strategies should be tracked, organized, and shared among the entire group.
   - Assign members to identify and collect contact information on organizations to work with in each of the areas cited above.

- High school outreach and recruitment
  - ✓ Obtain contact information for schools, administrators, counselors, and science and technology teachers.
  - ✓ Determine appropriate events (assemblies, class presentations, exhibits, etc.).
  - ✓ Plan for college career days and camps for high school students
  - ✓ Schedule events
- College outreach and recruitment
  - ✓ Obtain contact information for students without declared majors.
  - ✓ Determine college policy regarding contact with students and use of social media.
  - ✓ Does the college have a career coach that can assist in the project?
  - ✓ Obtain and distribute information on lasers, optics, interesting applications, and career opportunities. (When possible, use terms like "lasers" and "optics" instead of "photonics.")
  - ✓ Identify appropriate places in the college to exhibit, place demonstrations, and distribute promotional information.
- Community outreach and recruitment
  - ✓ Identify and secure contacts in organizations that support STEM events and displays (museums, education districts, civic celebrations etc.).
  - ✓ Obtain permission to participate in events and displays that these organizations sponsor.
  - ✓ Plan and prepare exhibits and displays for these events that provide information about light, lasers, and related technician careers.
- Veterans
  - ✓ Identify assignments in the army, air force, navy, and marines in which military personnel are trained in and work with electronic, optic and laser equipment.
  - ✓ Determine when and where military personnel who are leaving the service are oriented to college and career training opportunities.
  - ✓ Request opportunities to exhibit and distribute materials that show how military assignments relate to photonics applications and career opportunities.

- Design strategies and assign member responsibilities for each outreach area and event. Establish a reporting system to monitor progress.
  - High schools
  - College students
  - Adults in the community
  - Veterans
- Identify and sequence the activities needed to complete each strategy.
- Determine resources needed for each event and how the group will obtain them.
- Develop a budget.

3. Execution of the project components
    - Allocate responsibilities
    - Coordinate and monitor progress of tasks and events
    - Maintain or alter the schedule and tasks
    - Create and conduct events that display and provide information about light, lasers, and related technician careers.
    - Obtain and distribute information on lasers, optics, interesting applications, and career opportunities. (When possible, use terms like "lasers" and "optics" instead of "photonics.")
    - Collect information about people who attend the events and are interested in photonics; follow up with those people.
    - Control the budget.
    - Understand and deal with institutional requirements.
4. Evaluation and lessons learned
    - How many people attended each event?
    - What response did you receive from those in attendance?
    - What follow-up steps did the group take?
    - How many people have applied or been accepted to the program?
    - Which strategies did you find most effective? Which generated the best response?
    - What strategies would you recommend changing or dropping in the future?
    - What would you do differently?
    - Group members rate one another 1 (lowest) to 5 (highest) on the following:
        - Quality of work performed
        - Planning
        - Focus on the goal
        - Teamwork
        - Scheduling and time management

RECRUITMENT EVENTS AND TOOLS

The following sections of this monograph provide information about successful recruiting events and tools. The tools, including flyers, brochures and informative handouts, are available to download from the OP-TEC website at http://www.op-tec.org. These materials can be customized for use by any college.

Student Recruitment Events and Strategies

Background

Enrollment in college photonics programs depends on making prospective students in the community aware of information that will inspire them to consider enrolling in the associate degree program to become a photonics technician. Simply posting information about the program in the college catalog or online is not an effective way to recruit students. General college promotions that do not create interest in a specific field have very limited success.

Faculty and staff at many of the U.S. colleges that offer photonics courses or programs are actively exhibiting and demonstrating equipment at relevant community events. Many are also creating special events specifically to promote photonics and their college's photonics program.

These event target specific audiences:

- High school students and their parents
- Students at the college who have not declared a major
- Adults considering a career change
- Returning veterans
- Women
- Underrepresented populations

This section describes events that colleges are successfully using to recruit students to photonics programs. It serves as a checklist to consider when planning a recruitment strategy or project. For further details on a specific event, contact OP-TEC to be directed to a college contact who can describe the event in more detail.

High School Visits

- High school classroom visits. Classroom visits include presentations, demonstrations, and hands-on activities for the students in the class. It's best to meet with the teacher before the visit to discuss ways to align the hands-on activity with the course curriculum. You can visit engineering, electronics, and technology classes at a nearby STEM Academy or Career Tech Center, as well as math classes (algebra or higher) and science classes (chemistry or Physics) at regular high schools. Target audience: grade levels 9–12.
- High school after-school club and program visits. After-school clubs and programs are held at the school and meet primarily after school hours. After-school clubs and programs are designed to get high school students more involved in their academics

through fun and educational activities and to help them develop the academic and social skills that will help them succeed. These visits include presentations, demonstrations, and hands-on activities for students who participate in the club or program. Target audience: grade levels 9–12.

- Professional development photonics workshops for educators. Professional development workshops in photonics give high school teachers hands-on training, help them integrate photonics into their lesson plans, and inform them about academic and career pathways in the field. Providing professional development workshops establishes a strong communication network with dedicated STEM secondary educators. Target audience: high school educators.
- Career and college fairs. At career and college fairs, local businesses and colleges have the opportunity to set up tables or booths at high school or college campuses to talk to students and parents who are interested in their field or program. Career and college fairs are meant to raise awareness about the importance of college and connect students with different professions, college programs, and local businesses. Table or booth setup includes handouts and other outreach materials, interactive activities, and demonstrations, videos, or posters. Target audiences: grade levels 9–12 and parents.

At the College

- Campus and lab tours. Host one or more groups of high school students during a campus visit: give them a tour of the program's facility and laser/optics labs and introduce them to instructors. Include hands-on activities, presentations, and demonstrations. Target audience: grade levels 9–12.
- Photonics workshops. Photonics workshops are structured learning experiences focused solely on the field of photonics; they also help students learn about college programs and academic and career pathways in photonics. The workshops can be held on weekends or during the summer. Include guest speakers, presentations, hands-on activities, and demonstrations. Target audiences: college students and other adults in the community.
- Workshops for Hispanic high school students and parents. Facilitate a workshop specifically for Hispanic high schools students and their parents. Workshops should include presentations and handouts about the program written in Spanish and English. Ideally, have a guest speaker who is bilingual, and present information in both Spanish and English. Target audiences: Hispanic students and parents**.**
- Meetings with college student organizations and clubs. Set up meetings with school organizations and clubs for veterans and underrepresented populations to develop connections with students and other adults who may be interested in your program. Partner with these organizations and clubs to organize outreach events. Target audiences: veterans, women, underrepresented populations, and college students with undeclared majors.
- Meetings with the Veteran Student Affairs Department Connect with the Veteran Student Affairs department director or coordinator on campus. Develop ways to partner with Veteran Student Affairs on events and outreach materials for veterans.

Discuss with the Veteran Student Affairs director or coordinator how to get in contact with local military bases and Transition Services Officers in your state and service area. Target audience: veterans.

- Public lectures. Host free lectures that are open to the general public. Invite industry leaders, scientists, and alumni to discuss advancements in photonics that affect people's everyday lives. Topics should be carefully selected to ensure that they relate to everyone, not just STEM-inclined people. Lectures should be followed by information about the college's photonics program, enrollment, graduation, and work placement and end with lab tours. The lectures can be held on campus or in nearby communities. The approach effectively builds public awareness in local communities. Target audiences: the general public, educators, parents, and students
- Information sessions with student advisors. Host work lunches with students' advisors. These lunches are informal gatherings to walk advisors through the specifics of the college program, paths for remediation, enrollments, graduation, and opportunities for internships and employment. These lunches give advisors the data and information they need to offer students the most comprehensive advice. Include informational handouts. The info session can be facilitated by the department chair, faculty members, and a student recruiter. Target audiences: high school and college student advisors and counselors.

In the Community

- IWITTS. Attend Institute for Women in Technology, Trades, and Science (IWITTS) recruiting training to learn how to recruit and retain more female students. The purpose of the IWITTS training is to help educators close the gender gap for women in technology, trades, and science, as well as learn how to increase the number of female students in relevant college programs. Target audience: college educators. www.iwitts.org/
- Hiring fairs for veterans. Connect with the Veterans Transition Assistance Program at your local military base to find out when they're hosting their next hiring fair for soldiers transitioning from military to civilian life. The hiring fair is an opportunity to interact with soldiers, veterans, and their families and discuss your photonics program, opportunities offered by your college's Veteran Student Affairs Department, and career opportunities in photonics. Table or booth setup includes handouts and other outreach materials, interactive activities, and demonstrations, videos, or posters. Target audiences: veterans, military personnel, and their families.
- STEM events and conferences. Exhibit at STEM-related events and conferences to interact with hundreds of high school students and members of the public to build awareness about photonics, photonics careers, and your college's photonics program. Events can be targeted to specific audiences. Table or booth setup includes handouts and other outreach materials, interactive activities, and demonstrations, videos, or posters. Target audiences: high school students, underrepresented populations, and the general public.
- Partner with community and national organizations. Connect with community and national organizations and give them examples of events you could cohost for

community high school students, veterans, women, underrepresented populations, and adult students. Partnering with community and national organizations helps reach specific audiences to inform them about photonics, your college's photonics program, and career opportunities in photonics. Target audiences: high school students, adult students, underrepresented populations, women, and veterans.

Photonics Technician Student Recruitment Tools

Background

Optics, lasers, and photonics are not well understood or appreciated by many people in the United States, including many high school math, science, and technology teachers. However, these fields produce vibrant displays, thought-provoking exhibits, and futuristic applications in medicine, materials processing, defense, and virtual reality. Student recruiters are successfully using images and demonstrations of optical and laser phenomena to capture the attention of prospective students, which opens up an opportunity to describe careers and educational opportunities for photonics technicians.

An abundance of tools is available for creating interest in and understanding of optics and lasers, introducing interesting laser applications, describing careers for photonics technicians, providing examples of successful photonics technicians, and guiding interested listeners to photonics technician education programs at two-year colleges. Many of these tools have been successfully used by student recruiters in handouts, exhibits, demonstrations, and classroom programs. Some are used by teachers of high school mathematics, science, and technology. Others are used in site visits, day camps, and summer camps conducted by college photonics programs.

For over ten years, OP-TEC has made photonics college faculty members aware of available tools for recruitment. In 2013 OP-TEC intensified its efforts to assist colleges in student recruitment by supporting dedicated photonics technician student recruiters. In 2015 OP-TEC formed the Photonics Student Recruiter Network (PSRN) to facilitate the sharing of ideas, strategies, and tools to support student recruitment. Since that time OP-TEC staff members have collected this information and developed and tested many new tools for recruiters, which have been customized and used by a variety of colleges. In addition, OP-TEC staff members have posted on social media recent developments and applications of photonics. OP-TEC's website, www.op-tec.org, maintains archived listings of tools and media postings.

Sources for Recruitment Tools

Two technical professional societies, Optical Society of America (OSA) and the International Society for Optics and Photonics (SPIE), have produced posters, pictures of exotic optical phenomena, flyers, and demo kits. OSA and SPIE list these materials on their websites and provide free copies to schools and colleges. OP-TEC, LASER-TEC, MPEC, and several colleges have also created, tested, and used equipment demonstrations for exhibits and presentations. Information on employment opportunities and labor market demand information is available from O*NET Online (www.onetonline.org) , the U.S. Bureau of Labor Statistics, and OP-TEC's *Industry Survey of Current and Future Demand for Two-Year Degreed Photonics Technicians* (http://www.op-tec.org/resources/industry-demand-report).

Recruitment Tools and Materials	Technical Professional Societies	National and Regional Centers	Companies, Organizations, & OP-TEC Photonics College Network (OPCN) Colleges
Hands-on Activities	OSA Optics Discovery Kit SPIE Labs & Lessons	LASER-TEC Light & Optics Exploration Kit. LASER-TEC Laser Enabled Security System LASER-TEC Light and Optics Experiment Kit	PASCO Optics Kit
Handouts	All SPIE Optics and Photonics posters All OSA Educational Posters	Infographics – "How Lasers Are Used" and "Laser and Optics Careers Pay Off" Teacher Handouts – Math for Laser and Optics Technicians PACT books and booklets – Success Stories in Photonics Careers (2), High School Students Find a Rewarding Career in Photonics and Adult Learners Upgrading Your Career Individual PACT Handouts – Meet a Laser Technician (4) Military Veteran Brochures (4)	OPCN College Custom Program Brochures OPCN College Custom Made Flyers
Videos	SPIE "Optics: Light at Work" SPIE "Light in Action: Lasers, Cameras & Other Cool Stuff"	All OP-TEC Career Videos Optics and Photonics Related ATE TV Career Videos	
Social Media	OSA Twitter, LinkedIn, Facebook, and YouTube pages. SPIE Twitter, LinkedIn, Facebook, YouTube, and Blogger pages.	OP-TEC Twitter, Facebook, and YouTube pages.	OPCN College Facebook, Twitter, and Pinterest pages for photonics program.
Other	SPIE Online Resources OSA Online Resources	OP-TEC Press Releases OP-TEC Monographs *Career Pathways for STEM Technicians* (book)	Press Releases for veterans magazines – published articles about OPCN college programs newspaper articles about OPCN college programs TV Interviews and spotlights on OPCN college program O*NET Online U.S. Bureau of Labor Statistics

Recruitment Tools for Special Populations

1. High school students
2. College students
3. Other adults
4. Returning veterans
5. Women
6. Underrepresented groups

Student Recruitment Materials and Tools

To access and download OP-TEC student recruitment materials, go to: https://www.dropbox.com/sh/rpcoxkei045e71y/AACN3IcV1-dGCwVy3_gYKoF4a?dl=0
To access and download OP-TEC student recruitment materials from OP-TEC website, go to:
Veteran Brochures: http://www.op-tec.org/veteran-resources
PACT Books and Booklets: http://www.op-tec.org/alumni/photonics-alumni-council-for-technicians
Infographics: http://www.op-tec.org/photonics-careers
To access and request all education resources from OSA, go to: http://www.osa.org/en-us/membership_education/youth_education/
To access and request all education outreach materials from SPIE, go to: http://spie.org/education/education-outreach-resources

Examples of Press Releases

To access and view a published article about Indian River State College (IRSC) in the Veteran Voice Newspaper, go to: http://issuu.com/veteranvoice/docs/veteran_1-31-2014 (Begins on page 3)
To access and view the interview of a Northwestern Michigan College (NMC) veteran student featured in the Northern Express, go to: https://www.northernexpress.com/news/feature/article-7241-what-happens-to-the-ones-who-serve-when-they-come-home/
To access and view a published article about NMC, go to: http://www.traverseticker.com/story/nmc-a-best-for-vets-school

Examples of Social Media

OP-TEC Facebook Page: https://www.facebook.com/OPTECenter/
OP-TEC Twitter Page: https://twitter.com/OPTEC_Center
OP-TEC YouTube Channel: https://www.youtube.com/user/OPTECcom
LASER-TEC Facebook Page: https://www.facebook.com/LaserAndFiberOpticsEducation/?hc_ref=SEARCH&fref=nf
Cincinnati State Technical College Facebook Page: https://www.facebook.com/Cincinnati-State-Laser-715429778577020/
Indian River State College Robotics and Photonics Institute Website: http://www.cometothedarkside.info/

OP-TEC and ATETV Videos

To access and download OP-TEC career videos and ATETV phonics videos, go to: http://optecvideo.opteccrm.org/recruiter-videos/

Other Resources

ONET Online https://www.onetonline.org/ and US Bureau of Labor Statistics http://www.bls.gov/ have been referenced in college program brochures and custom materials created by student recruiters. For more details, please contact OP-TEC.

SUMMARY

Effective student recruitment will ensure high program enrollments, which will result in program stability and a larger number of completers who will benefit from rewarding careers. It will also relieve the photonics technician shortage that constrains market growth in this field and places our country's ability to defend itself at risk.

Evidence is strong that program-focused student recruitment results in higher enrollments and more completers. Comprehensive student recruitment efforts that depend solely on faculty members typically overextend the faculty members, reduce the time they can spend teaching and counseling students, and put them at risk of burnout.

Where possible, employed student recruiters can develop and maintain effective program outreach. However, college resources to support employed student recruiters are minimal, which means that grant funds must be made available or recruitment must be enhanced by student volunteers. Student outreach and recruitment resources and successful strategies are available to support college outreach activities.

This monograph has described a plan to engage teams of photonics students in planning, preparing, conducting, evaluating, and documenting successful student recruitment activities. If this plan is properly executed, the students will learn and acquire valuable "soft skills" that will complement the technical knowledge and skills they learn in their classes and labs. Employers value new hires that have acquired "soft skills"; these technicians will benefit from improved job performance and more rewarding careers.

We encourage college faculty members to study and follow these plans for developing and using student teams for program outreach and recruiting. The tasks that students perform in recruiting will give them employable skills that justify their inclusion as required coursework.

About the authors:

Dan Hull, Principal Investigator, Executive Director of OP-TEC, The National Center for Optics and Photonics Education

Gary Beasley, Lead Instructor, Laser & Photonics Technology, Central Carolina Community College, North Carolina

Dorian McIntire, Professor of Photonics, Tri-County Technical College, South Carolina

Greg Kepner, Principal Investigator, Director of MPEC, The Midwest Photonics Education Center, Iowa

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