

The Cottonship Program: A Partnership Model Designed to Enhance Undergraduate Education

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ABSTRACT

A mini-internship program was envisioned to enable students to expand conventional classroom experiences by participating in a scientific meeting and regional travel. The Cottonship Program was designed to integrate the interests of three stakeholders (university, industry, and students), with the goal of enabling undergraduate students to observe the diversity of scientific applications and career options in commercial agriculture. During the week-long Cottonship Program, students attended research sessions, technical exhibits, and met with academic and industry leaders at the annual Beltwide Cotton Conference. A multiday tour was organized to expose students to regional geography, soil and water management, agricultural enterprises and commerce, environmental issues, and cultural heritages. Academic expectations were completed when students shared their summary report with industry supporters. In a postevent survey of the participants, the most meaningful experiences cited by students were an expanded awareness of science, the observation of unique crops and geographic regions in the USA, and a greater awareness of career options. Before the Cottonship experience, only 25% of the undergraduate participants expressed any interest in graduate school; afterward, 58% enrolled in a graduate program after completing a B.S. degree. Industry representatives reported they gained a better understanding of today's students and potential employees in noninterview discussions. The program was financially supported by 15 agricultural firms, with assistance from the cotton (*Gossypium hirsutum* L.) industry. The university expanded its traditional classroom learning process in cooperation with commercial firms. Participating faculty and tour hosts gained personal reward in organizing and providing these experiences for undergraduates.

TODAY'S AGRICULTURAL CURRICULA are built around new paradigms that involve basic concepts in biology, environment and natural resource concerns, and economic constraints. Students tend to retain information better from personal experiences (Druger, 1997); this is the basis for most laboratory exercises. Students more readily assimilate information from their own experiences and perceptions.

Academic courses often address subject matter in a structured time period, with limited opportunity for discussion or integration of knowledge from other courses. Classroom learning is generally measured by cognitive achievement. Internships and field experiences enable students to integrate their academic experiences with personal observations. Internships and other forms of experiential learning provide students with skills of collaboration, interpersonal communication, decision-making, and leadership (Christian, 1978). For example, learn-

ing by experience and observation builds on individual interests, and that assimilation incorporates general information from the past to specific observations, further nurturing the intellectual process.

The integration of biological and social sciences is usually acquired through experiences in the first employment after students graduate. Conventional academic education offers little opportunity for career exploration or familiarization with graduate education programs. Employer and public expectations of college graduates have shifted in recent years, with a greater need for students to understand the broader implications of their degree (Miller, 1995).

Some academic activities complement traditional classroom activities. Self-guided field trips have been developed to expose students to local soils and environmental resources in a flexible learning experience (Darmody, 1983). These field trips were well regarded by students and were extremely beneficial to extending basic classroom knowledge. Independent study courses offer opportunities that differ from formal classroom experiences but usually focus on one specific issue, with little interaction with other students.

Moser and Flowerday (1983) surveyed university educators and described internships, laboratory work, and farm work experiences. They reported that universities were placing increased emphasis on internships. Many employers preferred applicants who had demonstrated their competency and work skills in an internship program. However, most internship programs involved a full semester relocation for the student, and substantial financial commitments from an employer. An internship usually occurs in one geographic region with one firm and varies in duration, degree of faculty and employer supervision, and the types of assignment (Wikle, 1996). Since internships were not possible for all students, other types of nonclassroom experiences were needed in today's industrial environment.

Communication skills are increasingly important in today's environment, particularly in industries involved in technical services or products. McFarland et al. (1994) emphasized the need for students to gain experience in both oral and written communication. They noted that many employers may hire students who lacked a technical background but possessed good communication skills. Zey et al. (1999) interviewed employers to determine strengths and weaknesses of college graduates, as a basis for strengthening undergraduate education. Lack of communication skills, unrealistic perceptions of job responsibilities, and other factors suggested that students would benefit from informal discussions with employers.

In 1996, agronomy students at Texas A&M University expressed an interest in participating in the Beltwide Cotton Conference. This conference is an annual professional meeting with plenary and technical sessions covering all aspects of cotton (*Gossypium hirsutum* L.). Technical papers commonly include breeding and genetics, physiology and pest management, fiber quality, environmental factors, and marketing.

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Since faculty and graduate students were already involved in this meeting, we wanted to explore the involvement of undergraduate students as a means to broaden their perspectives on science, crop diversity, and natural resources in a global industry.

A program was designed to link the several stakeholders who were interested in undergraduate students in agricultural sciences. Texas A&M University and the National Cotton Council developed an initiative known as the *Cottonship Program*. A short-term, internship-like program was conceived as a partnership to involve three stakeholder groups: the university, industrial firms, and students. University faculty would assume a lead role in organizing the program, and the university would cover some of the expenses. Industrial firms were interested in exposing students to commercial activities and stimulating graduate studies. The Cotton Foundation provided complementary registrations for students. Students were interested in career exploration, meeting company representatives, and travel. Students agreed to enroll for academic credit and commit a week of vacation time. Students were expected to assume some financial responsibility for some of the expenses, which assured that they made a significant commitment and personal investment in the program. Students were also responsible for their commercial airline fares but were reimbursed after successful completion of the trip. The National Cotton Council, through its Cotton Foundation, assisted with registrations, some special events, and served as the focal point for the program. This model was discussed with several stakeholders and was implemented in 1997.

Specific goals for the Cottonship Program were to:

1. Expand classroom experiences and explore career options by having students meet industry leaders and observe technology-intensive industries.
2. Enable students to participate in a professional meeting and related activities that ranged from scientific discovery and commercial applications to international trade.
3. Observe natural resources, human cultures and history, and economic and environmental factors associated with regional agriculture in the USA.

PROGRAM DEVELOPMENT

The goal of the Cottonship Program was to extend undergraduate education by enabling students to participate in a technical meeting and field studies. Each year the pre-trip development process involved student applications, coordination with the National Cotton Council, development of an itinerary and tour route, and predeparture orientation for students.

Students were invited to prepare an application, which included academic information, current employment, career plans upon graduation, their interests in the Cottonship Program, and a commitment for academic enrollment. Participants varied from 19 to 21 yr in age, with grade point averages ranging from 2.4 to 3.8. Females made up 46% of the participants and 73% of the students came from farm or rural backgrounds. At least one-half of the students held a part-time job in a research-related program during the school year. The application mechanism proved to be a self-selection process, in that only mature, serious students were willing to commit to the time and academic requirements of the program. With

support from industry, personal funding was not a limiting factor for students.

In preparation for the trip, regional agricultural and natural resource features were reviewed to identify research sites, unique crops and geological features, environmental and water management issues, and historical and cultural sites. Emphasis was placed on activities that would not commonly be encountered in the classroom or through personal travel within the state.

A detailed itinerary was prepared for a week-long experience and included travel logistics, lodging, and all other aspects from the time of departure to the completion of post-trip obligations. Briefing sessions were held before departure to review travel details, dress code, and performance expectations. Students were attentive to suggestions and assisted in making arrangements for the trip. Airline schedules were managed through a common travel agent to assure low-price fares and common arrival and departure times at the destination city. Other pre-trip activities included the preparation of personalized business cards, name tags, and suggestions on selecting technical sessions at the Beltwide Cotton Conference.

STUDENT EXPERIENCES AT PROFESSIONAL MEETINGS

The students had opportunities to participate in technical and poster sessions, grower workshops, industry exhibits, and receptions with industry leaders and media events during a 3-d period. Students reviewed the technical program in advance to select programs of individual interest. The technical papers and posters most commonly selected included crop genetics and breeding, cultural practices, host plant resistance, pesticides and pest management, mechanization, and economic outlooks. Students learned that they could easily interact with people from research labs, extension programs, commercial firms, and service sectors. Students gained new perspectives of their own potential by observing graduate students and other recent graduates who were now in leadership roles.

At a trade show, students were exposed to a diversity of businesses representing all aspects of the domestic and international cotton industry. Students met with representatives involved in plant protection, seed, packaging, technical service, software, and equipment industries and observed how academic topics and new technologies were commercially delivered.

Several commercial firms invited students to attend evening social and hospitality functions. Students gained experience in meeting new people from diverse geographic regions, learned how to initiate conversations on professional topics, and observed recent graduates in their new professional roles. These social experiences helped prepare students for job interviews and explore career roles for themselves. Students displayed more confidence in their communications skills and outreach to others as the week progressed. The availability of personalized business cards for each student enhanced their self confidence and the ease of exchanging information with others.

Since science must be translated and communicated to be useful, technical conferences typically maintain a press room to assist media representatives. Students toured the press

room where communication specialists explained print and broadcast communication processes. Media representatives were observed transforming technical papers into news releases and broadcast interviews. Several news articles prepared in the media room were noted by students later in trade journals.

REGIONAL AGRICULTURE AND TOURS

In conjunction with the cotton meeting, students toured an agricultural area, which included subtropical agronomic and seasonal horticultural crops, historical and cultural sites, environmental and geographical features, and marketing. Student discussions were facilitated by traveling together in a van, especially in discussing regional points of interest or land resource regions. Highway maps and supplemental readings were provided. Although annual meeting sites varied across the southern USA, over the 4-yr period each group had similar experiences.

In 1997, students traveled by van from College Station, TX, to New Orleans, LA, and observed alluvial soils and marine estuary areas in route. The trip included programs at rice (*Oryza sativa* L.) and sugarcane (*Saccharum officinarum* L.) research stations to see production practices, research activities, and market channels. Presentations at a marine biology center covered marine flora and fauna, environmental sciences, and wetlands ecology of the Mississippi delta region. Students visited a state park featuring early homestead lifestyles, the Port of New Orleans to see commodity exports, and observed other cultural features of New Orleans and the Mississippi River region.

In 1998, students flew to San Diego, CA. Gray whale (*Eschrichtius robustus*) migrations and marine ecology in the Pacific Ocean were observed in a boat tour. By van the group traveled from sea level over the coastal range to visit an agricultural center in the Imperial Valley. Field tours included winter vegetable production, harvesting and shipping processes, alfalfa (*Medicago sativa* L.) production and winter grazing, the All American Canal system, which provided water for irrigation and electrical power generation, an environmental visit to the Algodones Sand Dunes, and visits to Mexico and Yuma, AZ.

In 1999, near Orlando, FL, the group toured crops and biotechnology displays at the Epcot Center, along with citrus (*Citrus sinensis* L.) production and packing facilities in central Florida. In the Everglades region, extension service and industry representatives provided a tour of sugarcane and winter vegetable production, marine deposits, muck soils, drainage problems and canal systems, migratory water fowl, nonconsumptive recreational land use, and the rural-urban-environmental conflicts in land use issues.

In 2000, the group toured some remote agricultural areas in southern Texas, where water was a limiting resource. Water issues included land management to enhance watershed yields, aquifer recharge, and legislative issues in water for agriculture, households, petrochemical industries, and coastal fishery industries. Students observed production, harvesting, and processing of winter vegetables. Cow-calf (*Bos taurus*) operations, winter pasture programs, and wildlife-hunting enterprises were explained at a commercial ranch. Bankers discussed agricultural finance and ecotourism industries.

Table 1. Course requirements for Agronomy 485 cotton trip.

Requirement	% of Grade
1. Attend scheduled events, be attentive, and interact with others.	35%
2. Prepare notes of appreciation to hosts, sponsors, speakers, and others.	25%
3. Respond to directions and display appropriate dress and behavior.	25%
4. Prepare single-spaced two-page report of individual experiences and assist in preparing a consolidated summary booklet.	15%
Total	100%

GRADING AND STUDENT ASSESSMENTS OF THE PROGRAM

Students enrolled in a special problems course at Texas A&M University to participate in the Cottonship Program and earn one academic credit. Course requirements and grading criteria were reviewed with students beforehand (Table 1). Students were encouraged to take notes and record daily observations. Letters were prepared to express appreciation to hosts and financial supporters. Each student prepared a 2-page summary on their individual experiences and trip highlights. Over the 4-yr period, all students demonstrated sound judgement, appropriate behavior and dress, and good time management, perhaps as a result of establishing clear expectations beforehand.

After completing four regional trips, a survey was conducted in February 2000, to determine student perceptions and benefits of the program. Survey procedures generally followed methodologies outlined by Salant and Dillman (1994). A 3-page survey instrument was constructed with both closed- and open-ended questions, pre-tested and revised, and then distributed to the 26 students who had participated in the program. Students were asked about their initial reasons for participating in the program, to assess the relative importance of their experiences at the Beltwide Cotton Conference and regional tours, and to evaluate the impact of their experiences on their career plans. Using closed-end questions, each participant was asked to score the usefulness of various experiences on a Likert scale of 1 to 5 (1 = most important, 5 = least important). An average for each question was calculated to combine responses. Open-ended questions were included so that respondents could comment on personal experiences or particular interests. The final response rate was 96%, with each tabulated rating based on 25 responses. Of the participants, 54% were still in undergraduate programs and 46% were in graduate school or employed in agricultural research, environmental work, or nonagricultural jobs.

The top two reasons students cited for wanting to participate in the Cottonship Program were an interest in learning more about cotton (with an average score of 1.8, on a scale of 1–5), and an opportunity to meet industry representatives (rated at 2.4) (Table 2). Interestingly, about 50% of the participants already had some experience in cotton and wanted to learn more, while the remainder had no previous knowledge of cotton but said they wanted to learn about the industry. Additional reasons in wanting to participate in the program were an opportunity to see regional agriculture in the USA (score of 3.1) and to earn college credit (scored at 3.4). Few students cited an interest in graduate school, just wanting to travel, or to have something to do between semesters (scores ranged from 4.2 to 4.5).

Table 2. Pre-trip factors cited by students in wanting to participate in a technical meeting and regional tours.

Ranking	Initial reasons cited for participating	Relative importance†
1	Opportunity to learn about cotton	1.8
2	Make contacts with industry representatives	2.4
3	See agriculture in another region of USA	3.1
4	A chance to earn college credit	3.4
5	Explore graduate school interests	4.2
6	The trip in general and a chance to travel	4.3
7	Trip offered something to do between semesters	4.5

† Weighted averages based on student assessments, where 1= most important reason and 5= least important reason.

Table 3. Most valuable experiences after attending the Beltwide Cotton Conference, as assessed by undergraduate students.

Ranking	Most valuable experiences from the technical conference	Relative importance†
1	Attending technical sessions and hearing research papers	1.8
2	General sessions and hearing key issues from industry leaders	2.6
3	Visiting commercial exhibits and meeting representatives	2.7
4	Visiting posters and talking with authors	3.8
5	Attending social events and receptions	3.9
6	Visiting the media room and meeting with journalists	4.2

† Weighted averages based on student assessments, where 1= most important benefit and 5= least important benefit from the Beltwide Cotton Conference.

Considerable latitude was provided for students to select activities of their choice at the technical conference. Clearly, the most valued experience students cited was attending technical sessions and hearing research presentations, which scored 1.8 out of 5.0 (Table 3). This high ranking was interesting to note, given that undergraduates are usually not accustomed to highly technical research papers and hearing lecture-type presentations confined to a 15-min period. In written and oral comments, none of the students felt the research papers were too technical or eluded their understanding, which may indicate that undergraduate students may be capable of grasping more information in a short time, in contrast to traditional college lectures.

General sessions, where industry leaders discussed contemporary topics, were scored at 2.6. Students were attentive to overviews and panel discussions on new technologies, social and economic constraints, and marketing outlooks. Visits to commercial exhibits and informal discussions with representatives also ranked high (score of 2.7). In first encounters, some students were reluctant to initiate conversations but quickly gained self-confidence and asked questions. Students reported that these informal discussions gave them insights on corporate programs, products, and processes. In contrast, students placed only moderate value on the poster sessions, talking with graduate students and faculty researchers, attending social events, or meeting with media representatives (scores ranged from 3.8 to 4.2). However, all of these activities provided additional opportunities for students to interact with professional people and were well regarded. Although the media room visit received the lowest ranking, students grasped the importance of commercial communication and expressed pleasure in meeting with agricultural writers.

Students provided these open-ended comments on the technical conference:

"...enabled me to be part of a professional meeting and learn what transpired."

Table 4. Most meaningful experiences in regional agricultural tours and other travel experiences, as assessed by undergraduate students.

Ranking	Most meaning experiences in regional travel	Relative importance†
1	Seeing new crops and production systems	1.9
2	Observing crop harvesting, processing, and shipping	2.4
3	Land: observing soils, land forms, and regional geography	3.4
4	Water: watersheds, irrigation systems, and resource issues	3.6
5	Environmental: wildlife, wetlands, and resource management	3.8
6	Cultural: historical sites and regional cultures	4.2

† Weighted averages where 1= most important benefit and 5= least important benefit from regional travel and tours.

Table 5. Overall benefits to students in career development after the Cottonship Program.

Ranking	Major benefits for career development	Relative importance†
1	Expanded my awareness of science and biology	2.5
2	Helped me explore job markets and career opportunities	2.6
3	Helped me see a future role in an agricultural science	2.8
4	Enhanced communication skills and meeting new people	3.0
5	Considered graduate school as an option	4.0

† Weighted averages where 1= most important benefit and 5= least important benefit from the total program.

"...learned how to conduct myself...gained skills that are still with me."

"...gained role models for the first time by meeting females in leadership positions."

"...enabled me to meet new people from other regions and backgrounds."

Half of each year's trip involved tours of regional crops, natural resource features, historic sites, and other new experiences. Students consistently expressed interest in seeing new crops and production practices (score of 1.9) and the harvesting and handling aspects (scored at 2.4), which included processing facilities and commodity distribution (Table 4).

Soils and geographic features, watersheds and irrigation systems, and wildlife ecology and biotic systems were included in each trip but these experiences were rated relatively low (3.4–3.8). Brief visits to cultural heritage centers, museums, and trade centers (such as the Port of New Orleans) ranked lowest (score of 4.2) but none of the students expressed any displeasure in these experiences and appreciated these excursions as part of the total experience. Specifically, students commented that "...regional agricultural tours enabled me to see how managers operate in their offices," and to "...see farming in different regions and a chance to visit facilities that otherwise would not be open to the general public." Several students enjoyed the camaraderie and getting to know other students in their major during a week of intensive travel.

Students were asked to evaluate the major benefits and the lasting experiences from the program. Four of the five major topics were rated nearly equally (scores ranged from 2.5 to 3.0) (Table 5). Each of the five key questions in this part of the survey were followed by substatements, which enabled students to subrank some specific experiences relating each major benefit.

The greatest benefit cited was in obtaining a broader awareness of technical issues and the applications of science and biology for the future (score of 2.5). Students reported that they gained these perspectives from research presented at the tech-

nical conference, field tours of crop production and processing, and discussions of environmental issues.

The second-most important benefit was exploring different jobs and evaluating future career options (scored at 2.6). Students felt that they gained these insights by discussing internships and job alternatives with people who were in industry. Industry representatives could discuss the roles of entry and midcareer employees who were already in the agricultural work force.

Students gained a better perspective on the future of science and were able to see a role for themselves in agriculture (scored at 2.8). They were equally divided in their interests in education–research and marketing–technology transfer jobs. Students felt that the program enhanced their “people” and communication skills (score of 3.0). These top four career benefits were closely ranked (scored from 2.5 to 3.0) and reflected a maturity and broader understanding beyond most classroom experiences.

One of the most interesting findings on student attitudes was their low interest in graduate school, compared with their subsequent behavior. Before the trip, only 25% of the students expressed even mild interest in graduate school. After the trip, students ranked “graduate school exploration” as the least important benefit (scored 4.0) and only 35% of them mentioned that trip stimulated an interest in graduate studies. However, the low rankings before and after the trip regarding graduate school were highly inconsistent with their activities after graduation. We noted that within 1 yr after completing a B.S. degree, 58% of the former Cottonship participants were enrolled in full-time graduate program at three universities. In contrast, an average of 23% of all students who completed a B.S. degree in agronomic sciences in the past 5 yr at Texas A&M University then pursued graduate work after graduation. All of the participants were highly self-motivated, but the Cottonship Program appeared to have impacted their career perspectives and outlook on job potentials. Perhaps there were some subliminal impacts, as Cottonship participants observed the jobs held by recent B.S. graduates, seeing the need for advanced studies in technically oriented agricultural careers, and/or having personal interactions with people who held more interesting jobs after attending graduate school. In informal discussions with students after the Cottonship program, several students expressed a need an advanced degree to achieve their career aspirations. Others felt that they gained new insights on commercial agriculture and the need to obtain more education. Several participants initiated discussions with other faculty members on how to explore graduate school options, inquire about assistantships and procedures, or asked for letters of recommendations.

INDUSTRY PERSPECTIVES

Over the 4-yr period, 15 agribusiness firms participated in the program and provided financial support exceeding \$12 000. More than 85% of the companies were in plant protection and others were in seed or technical service businesses. More than one-half of the firms supported the program for 3 or more years. One company discontinued its participation after 1 yr. Annual contributions ranged from \$200 to \$500, plus “in kind” support, such firms hosting students for meals or special social events. Each sponsor received appreciation

notes from two or more students and an annual Cottonship Report. The annual report included a color photograph cover, a trip overview, and the 2-page summaries prepared by each student.

Seven representatives who had participated for ≥ 2 yr were sampled for a corporate evaluation of the program. Participants were asked to provide qualitative comments on the program and the benefits to their company.

Firms felt that substantial benefits accrued to them. They gained insights on how today’s students look at the future. Firms also gauged student readiness for the job market. Representatives welcomed the opportunity to provide career advice to students and felt that students readily accepted their suggestions. Other representatives assumed a mentoring role and looked forward to discussions that did not involve formal interviews or employee evaluations. Two representatives felt that students gained professional experience that others learned later or after they were employed. Overall, firms felt that the program was a good investment of their time, the cost was minimal in exchange for exposing students to corporate activities, and that the program enhanced classroom education.

After reading the student summaries in the annual report, sponsors felt the field tours exposed students to complex agricultural systems and environmental issues. They speculated that students gained experience in assessing field situations and asking candid questions that would make them more valued employees later.

GENERAL ASSESSMENT

Perhaps the most qualitative assessments were in unsolicited notes from students at the end of their survey. Before the trip, most students had not formulated specific career plans and were searching for career options for the future. The following are excerpts from 15 students on their career plans.

From students planning to or attending graduate school:

“...trip was very influential in my life...because of this experience I was determined/became encouraged to attend graduate school.” (five similar comments)

“...broadened my horizons and helped me prepare/decide on graduate school.” (three similar comments)

“...helped me bridge between being an undergraduate and becoming part of a scientific community.”

From students interested in technical service or environmental work:

“...helped me become more aware of positions and career options available in agricultural industries by seeing so many people in unique roles.”

“...gave me a better understanding of my potential role in agricultural industries...opened doors and windows for me.”

“...lined up a summer internship to gain experience in an industry I would not have considered previously.”

“...met people who expanded my interests in environmental issues in soil and watershed management...and increased my determination to work in this area.”

“...enriched my total educational experience, nowhere else in college did I get the first-hand experiences and observations on food and fiber production and processing.”

From students interested in production agriculture:
 "...seeing (regional agriculture) spurred my interest in cropping systems."
 "...travel outside of the state increased my interest in crop production and enhanced my determination to farm. I've been out of school three years and now farming 1500 acres [600 ha]."

The Cottonship Program offered students a concentrated opportunity to simultaneously explore career options, observe the value of research and graduate study, and travel to some unique regions in the USA. We believe that other faculty would find tremendous rewards in providing similar experiences for undergraduates.

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