Undergraduate experiential learning in the natural sciences at a Hispanic serving institution

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Abstract

Many undergraduate students at Texas A&M University-Kingsville are first generation students, in which their experiences are often local or regional in scope and their perspectives are shaped by family ties and cultural traditions. This paper evaluates the impact of a program designed to help range and wildlife students realize the value of obtaining a degree and securing employer-desired work skills to achieve their future employment goals. Experiential and active learning methods were utilized in this program. Results indicated that students benefited from this program as it facilitated their understanding of the importance of completing their degree and acquiring work skills that will allow them to become more marketable within the natural resources profession.

Key Words: experiential learning, internships, marketability, undergraduate education, underrepresented populations

INTRODUCTION

Over the years, undergraduate educators have sought many avenues to create a fertile learning environment in which students will retain information presented to them and maintain interest in the topics being covered. Questions such as "How do students learn best? How can we fashion efficient education so as to increase their proficiency levels? What can we do to encourage students to stay in school and graduate?" (Byerly, 2001, p. 697) are asked repeatedly by educators. Where can the educator turn to create a suitable learning environment and more specifically, impart and retain the knowledge and skills necessary to be competitive within the job market upon graduation? These features are not easy ones to fulfill in today's classroom.

One approach takes students out of the traditional classroom to actively involve them in a form of learning that presents the learning environment as three primary components: "modeling, collaborating, and simulating" (Byerly, 2001, p. 697). The initial component, modeling, is facilitated via the instructor replicating/presenting the concepts being introduced to the students. The second component requires collaboration where students 'reenact' the presentation they have experienced. Lastly, the most crucial of the three components, simulating, allows the students to inculcate what they have learned from modeling and collaborating. Higher order thinking skills are utilized in simulation bringing all three components of the learning environment together for the student. This format is known simply as "experiential learning."

"The term experiential is in widespread use in education, in general, and is seen as an approach to education that implicitly trusts the learner's ability to learn through experience" (McKeachie, 2002, p. 246). Experiential education thereby can be deemed a means or technique that can take place anywhere, at anytime, with any academic program. McKeachie (2002) believes experiential learning possesses both "cognitive and motivational goals. Educators hope that abstract concepts will become meaningful when students see that they are helpful in describing and understanding 'real life' phenomena" (p. 246). Field or laboratory experiences tend to have the same effect on students as to trigger questions in students' minds that will ultimately generate active learning (McKeachie, 2002). It is vital to the learning process to link scholarship, ideas, and action, thereby increasing students' genuine motivation and awareness. Students are engaged in both a multi-sensory and multi-modal environment that allows for the experience of real-life contexts, to adapt the experience to their own “individual meaning and engage in real-life contexts, to engage in complex actions that mirror life outside school” (Thomas, 2009, p. 94).

Although experiential learning has been used in various disciplines, there have been few attempts to apply this learning method to undergraduate students in the agricultural and natural resources sciences. A study by Fenwick and Gartin (1990), which included an experiential learning component via an agricultural internship program, found practical knowledge attained from the program to be quite beneficial to the students in their future employment. Moser and Flowerday's study confirmed the idea that "Educating students in agricultural sciences for careers in today's agriculture demands greater technical skills plus a more holistic perspective of agriculture...internships with specific companies and organizations provide the most effective learning method for experiential education" (as cited in Fenwick & Gartin, 1990, p. 23). Others, using a wider array of experiential learning techniques (e.g., problem cases, field journals, service learning, games, trips, group research and teamwork, debates, and role playing), have found elevated positive responses among students that believed hands-on experiences provided them with a better understanding of the course material and aided in realizing the applicability of

course content to the real work environment (Millenbah & Millspaugh, 2003).

Lack of efforts to incorporate experiential learning in the agricultural and natural resources sciences is particularly disconcerting because hands-on learning is thought to be essential for undergraduate students for increased employment opportunities upon graduation (Kinkel & Henke, 2006). This is even more significant for those from underrepresented groups that may not have support mechanisms in place for making career choices in agriculturally related fields (Jones & Larke, 2003). Oftentimes, these students have low retention and graduation rates (Otero & Rivera, 2007). Additionally, students lack familiarity with publicly-owned natural resources, are unaware of employment possibilities outside their local geographic region, and lack the academic and experiential skill sets needed to be competitive within their chosen field of study.

Many undergraduate students at Texas A&M University-Kingsville (TAMUK) are first generation Hispanic students (TAMUK is a Hispanic Serving Institution [HSI]; approximately 60% of the 6,200 students are Hispanic), in which their perspectives are often shaped by close family ties and cultural traditions, and their experiences are typically local or regional in scope. Approximately 50% of the students in the Dick and Mary Lewis Kleberg College of Agriculture, Natural Resources and Human Sciences (ANRHS) are Hispanic, of which about 26% (2005–2008) are in the natural resources (animal and wildlife sciences) curriculum.

For those students within the natural resources curriculum at TAMUK, many are unaware of the importance of having a college degree, which is essential in securing quality employment. For example, the one-year dropout rate for freshman in the ANRHS averaged 42% (unpublished data 2004–2009, TAMUK) and the six-year graduation rate averaged 36% (unpublished data 1999–2009, TAMUK). Additionally, many students are unfamiliar with the skills desired by employers such as using Global Positioning Systems (GPS) and Geographic Information Systems (GIS) equipment. These problems are not unique to the agricultural and natural resources program at TAMUK or other HSI's. Nationally, there is a lack of skilled graduates from underrepresented groups trained in agriculture and natural resources to meet the needs of an increasingly diverse United States population (Maughan, Bounds, Morales & Villegas, 2001; Jones & Larke, 2005; USDA Hispanic-Serving Institutions National Program, 2010).

The present study, focusing on using the learner-centered approach of experiential learning, was undertaken primarily to engage and encourage underrepresented students within the Department of Animal and Wildlife Sciences (ANWS) at TAMUK to finish their course of study by exposing them to new and exciting natural resources topics and experiences, training them in the use of high tech equipment, promoting standards of excellence, teaching them about public lands and related natural resource management issues, and developing communication and interpersonal skills, which are essential in gaining employment within the natural resources profession upon graduation. In addition, students had the opportunity to learn first-hand about the employment opportunities in agriculture and natural resources throughout the United States to those that earn a college degree.

METHODS

The 3-year program was divided into two parts. Part 1 was a 3-week off-campus course conducted during early summer in 2006 and 2007 in which the students, instructors, and mentors engaged in active, cooperative learning exercises and conducted site visits to natural resources facilities throughout the Rocky Mountains. Part 2 of the program engaged students in internships

located outside Texas during summer 2007 and 2008.

Program Part 1

A specialized one-credit hour course, *Problems in Range and Wildlife Management*, offered through the ANWS at TAMUK, was created in which students meeting the following criteria were allowed to enroll in the course: successful completion of the Principles of Wildlife Management course, a minimum 2.5 grade point average (GPA), and high character standing such as recommendations from professors and willingness to obey the rules of the course. The objectives of the off-campus course were to (1) broaden student knowledge about North American wildlife and issues pertaining to their management; (2) increase student knowledge of federal and state agency responsibilities in wildlife management; (3) provide students with advanced technological skills through workshops and hands-on training; (4) develop observational skills and writing skills; and (5) develop social and work skills within a multicultural group environment.

Three distinct areas of focus were included in the course. First, range, wildlife, and natural resource-related topics were taught by Dr. Diana Doan-Crider in conjunction with on-site visits to private ranches, Native American reservations, historical sites, national forests, national parks, and state (Montana Fish, Wildlife, and Parks Department) and federal (U.S. Forest Service, United States Department of Agriculture [USDA] Natural Resources Conservation Service, USDA Animal and Plant Health Inspection Service, United States Department of Interior [USDI] National Parks Service) facilities located in New Mexico, Colorado, Utah, and Montana. In addition, USDA and USDI personnel presented information to the students about wildlife and habitat management issues pertinent to the specific geographic region. On-site visits to federal agencies were designed to provide students with first-hand observation of natural resources professionals within a work environment, teach them about multiple-use land management issues at these agencies, and make available opportunities to network with professionals that could facilitate future internships and employment upon graduation.

Second, instruction was provided by Eric Redeker (Director of the Wildlife Research Technologies Laboratory at the Caesar Kleberg Wildlife Research Institute, TAMUK) on the use of advanced technology equipment, which included training in basic principles of geodesy, cartography, ArcMap GIS, and GPS using handheld personal digital assistants (PDAs), laptop computers, and specialized software designed specifically for the course. This aspect of the course included a pre-trip training session and a 7-day workshop at a natural conservation education facility east of Glacier National Park in Montana.

Third, instruction about soil geology and morphology of the Rocky Mountain Region was provided by Dr. Shad Nelson (Department of Agronomy and Resource Sciences, TAMUK). The primary focus was on soils and landscape features of the Tetons, Yellowstone National Park, and the Snake River Valley.

As part of the course, students were required to learn about the expedition of Lewis and Clark through reading assignments and site visits along the Lewis and Clark route, and create their own virtual journal using specific geographic locations on digital maps linked to field trip activities, wildlife species observed, and natural resources offices, field stations, and personnel visited. These activities were designed to facilitate learning by allowing students to reflect on and document their experiences, thereby providing greater depth to experiential learning and an opportunity for true learning (Walker, 2005; Justice & Fernandez, 2007). This activity also

facilitated development of communication skills, which is considered essential for preparing students to be successful wildlife professionals (Ryan & Campa, 2000).

A post-course survey was developed by the project directors (Authors) and external project evaluators (Dr. S. Glasscock & J. Cupit). This voluntary survey was designed to determine the program's influence on student's perceptions pertaining to future employment and defining career opportunities, the value of becoming a better student, the importance of a college education in realizing future employment goals, and desire to seek employment outside of Texas. Additionally, background information was requested to aid in understanding student's academic development and extrinsic factors that could influence academic success. The survey design included Likert Scale questionnaires, multiple-choice questions, and opened-ended questions.

Program Part 2

Part 2 engaged students using internships at participating USDA facilities or universities during summer 2007 and 2008. Eligibility of students for internships included successful completion of the course in Part 1 of the program and evidence of interpersonal skills, high quality work, and professional competency skills (based on what was observed by instructors and mentors during the course trip). Such standards are essential because employers seek high quality, motivated students for temporary employment and tend to view internships as an extended interview for permanent positions (Pheanis, 2003). The objectives of the internships were to (1) enhance experiential learning opportunities of highly qualified students and (2) help students experience the natural resources work environment, network with professionals, and develop good work habits that will increase their chances of employment within the natural resources profession upon graduation. Additionally, scholarships were awarded to each student to provide financial assistance in relocating to their assigned job locations outside of Texas.

Students had the opportunity to enroll in a three-credit hour internship course within the ANWS. In 2007, enrollment in the internship course was optional, whereas in 2008, enrollment was mandatory. The course required submission of progress reports and a final report describing work-related activities and experiences, which was designed to engage students in reflective thinking and hone their writing skills.

Based on future employment objectives, students had two internship options: (A) general work experience or (B) research experience. Option A was designed to provide "real work" learning opportunities for those students wishing to seek employment following receipt of their baccalaureate degree. Option B internships were designed to provide advanced learning opportunities at a participating USDA center/laboratory or university with expertise within a particular discipline for those students wishing to continue their academic education beyond the baccalaureate degree. Upon returning from the internship, students from both options would enroll in a special course within the ANWS, where the students could synthesize and communicate their experiences in the program using various multimedia outlets targeting the general public, students at TAMUK, and, as appropriate, the scientific community. Students were expected to develop a web page about their internship experience for posting on the TAMUK web site. Additionally, for those students that received research internships, each would prepare a poster presentation and submit an abstract for presentation at an appropriate professional society meeting or conference, and if possible, develop and submit a manuscript of their research to an appropriate peer-reviewed scientific journal.

At the conclusion of their internship, students were asked to complete a voluntary

assessment survey to evaluate their opinions about their summer employment experience. The survey was cooperatively developed and analyzed by the external evaluators that conducted the survey for Part 1 of the program.

RESULTS

Program Part 1

Twenty-five students (seven Hispanic males, two Hispanic females, 10 Caucasian males, and six Caucasian females) participated in Part 1 of the program. Representation of underserved students (36%) was numerically higher than that of the ANWS over the same period (26%; range: 25–27%). All students received an A for the course, which benefited their GPAs.

Of the twenty-five students that participated, seven (28%) graduated, 17 (68%) were enrolled at TAMUK through the end of the fall 2008 semester when the program ended, and one (4%) had withdrawn. This represents a 96% retention rate, compared to the overall (freshman through senior) retention rate (52%) in the ANWS, but was similar to the sophomore through senior retention rate (Dr. S. Henke, ANWS Department Chairman, personal communication, September, 19, 2010). Of those that graduated, three (43%) entered graduate school (two in ANWS at TAMUK and one in Department of Wildlife and Fisheries at Mississippi State University), one was hired by Ducks Unlimited, one was working as a substitute teacher in Harlington Independent School District (TX), one was seeking employment, and the status of one was unknown. Mean GPA of the seven graduates was 2.8, which was similar to the mean GPAs of all students that graduated from the ANWS during 2006, 2007, and 2008 (2.9, 2.9, and 2.7, respectively). Mean GPA of the 17 participants still enrolled at the end of the fall 2008 semester was 2.6, which was higher than all undergraduate students from the ANWS during the same semester (2.4 GPA). Comparisons of individual students before and after their participation in the program found the GPAs of nine (36%) students increased, three (12%) remained the same, and 15 (56%) decreased.

Thirteen of twenty-five (52%) students completed the voluntary survey. Survey results from the external evaluation by Glasscock and Cupit (2008) found the following: 100% of survey respondents were planning to seek career opportunities within the range and or wildlife field, 54% were considering careers with federal or state natural resources agencies that emphasize range and or wildlife management activities, and 30% were considering entering graduate school. Ninety-three percent of the respondents believed the program helped them become a better student overall and 100% of respondents believed participation helped them in understanding the importance of a college degree. Seventy-eight percent indicated that they were more likely to seek employment opportunities outside their familial center.

Based on summary background information, all students believed that their friends and family were supportive of their academic endeavors. However, 31% believed that economic barriers could negatively influence their ability in reaching career goals and 61% thought they had to compromise between academic and non-academic responsibilities. Eighty-five percent of respondents had a role model or mentor in their chosen career field and believed that a role model was beneficial to realizing their career goals. Academic behaviors included keeping up-to-date with assignments (always: 46%; most of time: 46%), participating in study groups (always: 7%; most of time: 31%; sometimes: 31%), skipping class (sometimes: 46%; never: 54%). Thirty-one, 38, 15, and 15% of respondents indicated that their GPAs prior to taking the course were

2.5, 3.0, 3.5 or greater than 3.5, respectively. Additionally, most respondents indicated that they participated at least once in activities that would benefit their career goals such as volunteer work, attending wildlife club functions, taking leadership positions, discussing careers with others, and engaging in undergraduate research opportunities.

Program Part 2

In 2007, ten students participating in Part 1 of the program met the qualifications for internships. Of these, three students had made other commitments and declined the internship. Seven students (four Hispanic males, one Hispanic female, and two Caucasian males) participated in internships of which six were hired by the U.S. Forest Service (Montana, New Mexico, Utah) and one by Colorado State University. One student elected to take the internship course offered through ANWS, and enrolled for both the Summer I and Summer II semesters.

In 2008, five students (three Hispanic males, one Hispanic female, and one Caucasian male) participated in internships of which four were hired by the U.S. Forest Service (Montana and Utah) and one by the USDA Natural Resources Conservation Service (Colorado). This included two Hispanic males with internships in 2007 that were asked to return for a second internship by the U.S. Forest Service. One of these students was placed in the Student Career Experience Program (SCEP) within this agency.

All students receiving internships chose Option A ("real work" learning opportunities for those students wishing to seek employment following receipt of their baccalaureate degree) over Option B (research-oriented internship focus). Students that enrolled in the internship course received an A.

Students returning from summer internships elected not to enroll in the special course that was designed to teach multimedia skills describing their internship experiences and developing a web page. Reasons most commonly cited was additional cost of an elective course that was not required for graduation. However, a web page was developed (Authors) and placed on the ANRHS website (http://aghs.tamuk.edu/research_hsi01.html) that featured a PowerPoint presentation (along with a PDF version for downloading) of the various activities participants engaged in during the course trip in 2006. Additionally, the web site featured biosketches and pictures supplied by two USDA summer interns from 2007 and five from 2008 along with on-location video clips from three of the interns describing their internship experience.

Nine of 12 post-internship surveys (75%) were completed (survey data includes responses of both students that completed consecutive internships). Based on the responses, seven percent indicated that they had completed the internship as a direct result of the program. All respondents indicated that the internship experience met their expectations and would recommend the internship opportunity to other students. Eighty-eight percent rated the work experience gained by the internship as excellent and wished to participate in internships the following year. Of those that wished to participate the following year, 86% wanted to return to the same agency. However, 62% indicated they might also consider internships offered by other agencies as well; 23% had no further plans to participate in internships.

Eighty-eight percent of respondents rated the opportunity to apply classroom knowledge to field applications as excellent-to-very good and 11% as good. Eighty-eight percent rated excellent-to-very good the opportunity to learn new natural resources methods and techniques and gained practical work experience that would be beneficial for future employment. Rated highly were factors associated with communication skills, which included the opportunity to

work as a team member (rated excellent: 77%, good: 11%) and opportunity to network within the natural resources field (rated excellent-to-very good: 88%, good: 33%). Based on findings reported by Glasscock and Cupit (2008), internship aspects enjoyed most were "working outdoors (44%), learning from supervisors and staff (44%), hands-on learning (33%), participating in rewarding and challenging work (22%), being in a new environment (22%), and learning about the agency they were working for (11%)." All respondents indicated that the internship increased their motivation to complete their undergraduate degree, but to varying degrees; 60, 20, and 20% reported significant, moderate, and slight increase in motivation, respectively.

DISCUSSION

Kolb's experiential learning model (1984) proposes that learners "go through a cycle of concrete experience, reflection on that experience, abstract conceptualization, and application of the insights in a new context" (as cited in Cranton, 2006, p. 149). This format of learning allows the individual to process the lived experience(s), thereby providing a more meaningful learning experience.

The present project, focusing on using experiential learning through nontraditional courses and internships, was successful in engaging undergraduate students, in which over 90% of the survey participants believed the project allowed them reach a higher level of academic achievement and recognize the value of obtaining a degree to meet career goals. This finding supports the view of Teranishi (2007) in which experiential learning for underserved populations report that "experiential learning pedagogy contributed to students' sense of self and identity, [and] relational development" thereby creating an awareness of how important the "hands on" experience was to their future careers. The experience of the course and internship instilled (1) development of a better understanding of the natural resources profession; (2) recognition of the diverse employment opportunities nationwide in natural resources-related fields; (3) understanding the importance of obtaining a college degree to secure future employment; (4) developing and refining critical technological, interpersonal, and communication skills; and (5) willingness to venture outside of familiar environments to explore career opportunities.

Although it was believed that increasing student's understanding of the importance of staying in school and obtaining a degree would be reflected in an increased GPA as students continued within their curriculum coursework, it was not particularly evident (however, no additional tracking or tutoring was addressed through this project, and may have improved results if this were the case). Based on GPA comparisons before and after participation, a majority (56%) of individual student's GPA's decreased. This is particularly relevant because all 25 students participating in Part 1 received one-credit hour of A, and six students taking the internship course received a minimum of three-credit hours of A (one student received six-credit hours of A). Mean GPA of the seven participants that graduated was similar to the mean GPA of all students that graduated within the ANWS, whereas the average GPA of the 17 participants at the end of the fall 2008 semester was marginally higher than all undergraduate students from the ANWS. This was particularly disconcerting because students selected into the program had to have a minimum GPA of 2.5, which did not reflect a cross section of students within the ANWS (students need a 2.0 GPA to maintain good standing). It is likely that as students progressed in their curriculum, they encountered advanced courses that required intensive study, which could not be afforded by some students, reflecting the belief espoused in the survey findings regarding

a compromise between academic and non-academic responsibilities. It is possible that regardless of a student's understanding and motivation about the importance of academics, other responsibilities reflect the reality of real life situations of some students (at least two students had to deal with parental health issues), which may dampen higher levels of academic achievement.

Although the program ended before many of the students graduated precluding long-term monitoring of success rates, it is clear that students benefited from this program in that it facilitated their understanding of the importance of staying in school, obtaining employer-desired skills, and completing their degree to become more marketable within the natural resources profession. For example, of the nine Hispanic students that participated in the program, seven were placed into internships, of which two received successive internships. Internships are particularly important for both the student and the employer. The student gains valuable work experience in their chosen field while in school, and the employer can observe a temporary employee to assess their "fit" within the organization and potentially offer a full time position to an experienced individual upon graduation (Pheanis, 2003).

Retention has been a focus of TAMUK because this institution is an HSI. High retention rates are particularly relevant, given Hispanic males are more at risk of not graduating (Saenz & Ponjuan, 2009) and Hispanic females are severely underrepresented in higher education (Holguin, 2005), which precludes their entry into natural resources positions requiring a college degree. It was interesting to find retention rates of participants and the ANWS sophomore–senior student population were relatively similar even when participants believed that their experiences in the program reinforced the importance of staying in school. This suggests that there is a range of factors that motivate students to stay in school and work toward graduation, which needs to be examined more fully.

It has been recognized that creating awareness of employment opportunities is essential in guiding student's career paths (Jones & Larke, 2003). However, at the undergraduate level, students are typically unfamiliar with employment opportunities available to them, and lack insight regarding position requirements and duties. This program sought to increase student awareness using site visits by bringing students to the natural resources professionals within the professional's work environment in Part 1 of the program, which allowed first-hand observation and interaction with career professionals. Additionally, those that received internships in Part 2 of the program gained from direct participation in work related to their chosen field. Survey findings indicated this approach was successful in aiding students in increasing their awareness about employment opportunities and requirements of natural resources positions.

Besides increased awareness of natural resources employment opportunities within the students' discipline, it is also important for students to realize that employment opportunities occur across the United States, requiring a willingness to relocate to unfamiliar socio-geographical regions. Because opportunities for natural resources employment are limited in South Texas, there is concern that Hispanic students at TAMUK will not seek positions in other states upon graduation due to cultural traditions or lack of familiarity with other social and ethnic environments. For example, taking the individual out of their comfort realm (familial center) can often create an upheaval thereby impacting family and work commitments (Wright et al., 2009). Based on our survey results, students were willing to seek employment outside Texas, and this willingness was based on their experiences in the program. Site visits and internships allowed students to observe and interact with career professionals (possible role models) that chose to relocate to new geographic locations to realize their career goals. This likely provided evidence to the students that their career choice can also be realized.

Eighty-five percent of participants reported having a role model within their chosen career field. However, it was unclear whether the students were engaged with mentors prior to their participation in the program. Regardless, the value of having a role model is particularly an important factor influencing career choice, as "role models play two of the most critical roles in the career decisions of youth" (Jones & Larke 2003, p. 16). The lack of role models undoubtedly is one of the reasons that minorities are not pursuing careers within the natural resources profession (Maughan et al., 2001). Overall, it appears that transformative learning occurred, which is based on emancipatory critical reflection (Wright et al. 2009), in which cultural preconceptions about exploring employment opportunities beyond South Texas were challenged and removed.

An additional benefit of the course in Part 1 of the project was the interaction of students from different cultures as well as experiencing other cultures (e.g., Native American, Southwestern, and American western cultures). Benefits of cultural interactions to students inside and outside the classroom have been recognized (Casillas, Torres & Valentine, 2009). Cross-cultural interactions via projects such as the one undertaken herein have been shown to increase students' "cultural sensitivity and awareness as they develop the skills and experiences needed in a global society" (Merryfield, 2003, p. 146). A student's world has a wide array of choices that are made up of interdependence rather than independence. Understanding this multicultural world is fundamental to students' future success, personally as well as professionally. Therefore, exposing students to cultures other than their own helps prepare them to understand the world through a cultural lens that is often times much different from their own. In addition, this exposure will equip students to deal with multiple-use land management challenges from stakeholders with diverse backgrounds, which is a necessary skill in federal land management agencies.

The program also benefited TAMUK (specifically the ANWS) in at least three ways. It provided the following: (1) an experiential learning course template that benefits students in the course curriculum, which develops students' skills making them more marketable and, thereby, meeting expected outcomes at the department and university level; (2) facilitating retention of participating students, particularly Hispanics; and (3) adding two additional students into the Master's degree program.

The present study used an array of experiential learning techniques (field trips, workshops, use of advanced equipment, journals and reports, team exercises, and internships) to instill the importance of graduating in realizing career goals and to better prepare students for the natural resources profession upon graduation. Benefits of the program are realized at three levels: (1) the student, (2) the department, college, and university, and upon graduation, (3) the society in which these young professionals are placed.

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