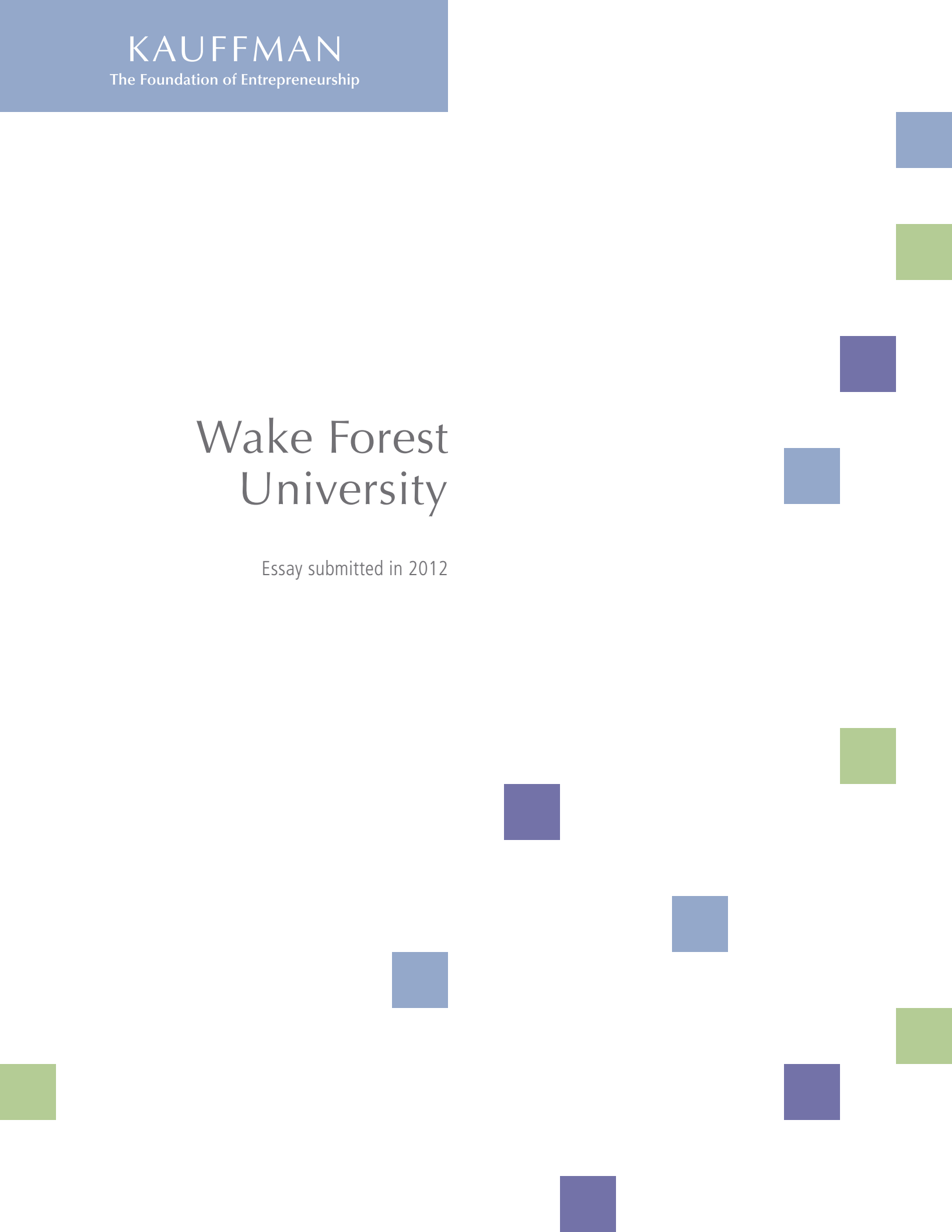


Wake Forest University

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**Changing a Campus Culture: The Role of the Kauffman Campus Initiative in Promoting
Entrepreneurship at Wake Forest University**

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“Wake Forest is expected to be on the cutting edge of innovation and creativity. We are called to prepare leaders for a world that knows dizzying change. The way students connect and learn is vastly different than in previous generations. And we are called to prepare them for leadership in a world that demands innovation – in science, technology, and medicine, as well as in government, the professions and corporate life.”

“Entrepreneurship flows naturally out of an atmosphere where students have long been encouraged to pursue their own thoughts and dreams and creativity”.

President Nathan Hatch, Wake Forest University.

Introduction

Wake Forest University, founded in 1834, is a private coeducational institution, distinguished by a teacher-scholar model, small class sizes, and a commitment to liberal arts education. Its components at the time of the Kauffman Campus Initiative (KCI) grant included the undergraduate liberal arts program at Wake Forest College of Arts and Sciences, the Wayne Calloway School of Business and Accountancy and the Babcock Graduate School of Management (now combined to form the Wake Forest Schools of Business), the Graduate School of Arts and Sciences, the Divinity School, the School of Medicine, and the Law School. Undergraduate student enrollment, including the Calloway School’s 450 students, was almost 4000 of a total enrollment of 6200.

Like most liberal arts colleges Wake Forest, before the KCI grant, had no formal programs or initiatives to serve non-business school students or faculty interested in entrepreneurship. Outside the business schools, no faculty members taught or conducted research in the field, and there was little formal opportunity or support for students to explore entrepreneurship. Except in the popular press, liberal arts students and faculty were not exposed to the philosophy or research underlying entrepreneurship, or its practice, and could not easily comprehend how their disciplinary interests might align with entrepreneurial pursuits.

Although no formal entrepreneurship program was available to liberal arts students, an entrepreneurship curriculum and co-curricular programs were available to students from the University's two business schools. The Calloway School and Babcock Graduate School of Management offered a selection of courses in entrepreneurship, held business plan competitions for student entrepreneurship teams, and secured entrepreneurial firm internships for qualified

students. Both business schools' programs had been identified by ranking organizations such as *U.S. News & World Reports* and *Entrepreneur* magazine. Few liberal arts students found a way to access resources offered by the business schools, largely because access to business school classes was severely limited.

At that time the lack of programming for liberal arts students was not unusual. Entrepreneurship was, and still is to a great extent, associated with business. The general focus of liberal arts disciplines on knowledge and understanding is often at odds with the *perceived* focus of business-related curriculum on wealth creation with profits as a critical outcome. Liberal arts faculties around the nation express concern about diluting their primary focus on education and maintaining the independence of universities from commercial interests. Moreover the ideals of liberal learning include developing a critical appreciation of moral values, as well as applying and using knowledge in the service of humanity. Therefore, the distinctions between entrepreneurship and liberal arts can only have become more pronounced over the last decades in the light of corporate scandals that have dominated headlines. Dartmouth professor Charles Hutchinson concludes that "for many of the Arts and Sciences faculty, anything that makes money is inherently evil" (Thayer School Directions, 2001).

The Planning Process

During the KCI planning process, input and perspective on entrepreneurship and liberal arts were sought from a wide variety of internal and external sources including: a survey of faculty from 15 departments of the College of Arts and Sciences; a series of small, informal gatherings to further explain the history of the Kauffman Foundation, its broad concept of entrepreneurship, and Kauffman Campus Initiative grant; and the forming of an interdisciplinary committee to plan the Wake Forest University programmatic efforts and response to the request for a proposal from the Kauffman Foundation.

Nearly eighty percent of faculty who responded to the survey thought there was potential for entrepreneurship efforts within their disciplines; and many of those responding suggested specific ideas and collaborative projects with students that could be part of such an effort. Many also expressed interest in meeting to further plan how the University might develop the program.

Between 35-40 faculty in the arts, sciences, and humanities attended small, informal meetings to further explore what the grant and the related programming might entail for the institution. They expressed enthusiasm for ways in which the grant program might enhance student learning in their disciplines, and help students better understand how to pursue their academic passions. From the small, informal meetings, faculty members self-identified to be part of the interdisciplinary team to develop the mission, vision, and objectives for the entrepreneurship program. The team was formed in August 2003 and met weekly throughout the fall term. Because of the perceived gulf, discussed above, between liberal arts and

entrepreneurship, the committee spent considerable effort defining “entrepreneurship” and drafting a compelling mission statement for the university's effort.

During the committee's deliberations several important themes emerged as a consequence of problems that faculty across campus had encountered in their educational and research missions within the university. First, there was consensus that a need existed for greater creativity and willingness to try innovative approaches on the part of students. Students seemed to be more comfortable in following the path of a defined program of study, and less willing to experiment with novel ideas. Second, faculty often felt that the most fertile areas for possible innovation and creativity were at the boundaries between disciplines, but that traditional liberal arts curriculum did not often offer opportunities to bridge such gaps. Third, a sense emerged that liberal arts faculty wanted their students to be able to put their knowledge and learning to productive use – and this may be uniquely Wake Forest due to its long-standing motto of "*Pro Humanitate*" and the sort of students it attracts – to make a difference in the world. The consensus of the committee was that entrepreneurship education would encourage students to be creative and innovative in their thinking, would help bridge the gap between disciplines across campus, and would provide the skills students needed to put their ideas into action.

Mission, Vision, Objectives

The mission thus crafted by the team and adopted for the program was to create and sustain an environment to foster entrepreneurial thinking and action across the campus at Wake Forest University. The vision was to make entrepreneurship accessible to “any student, any discipline, at any time” in their college careers. The definition of entrepreneurship was broad, befitting our liberal arts environment: “the process through which individuals and groups take advantage of their knowledge and resources to identify and pursue opportunities, initiate change and create sustainable value in their lives and the lives of others.” Through our efforts we sought to enlighten Wake Forest students in all disciplines about their individual and collective abilities, to encourage them to create their own pathways in life, and to use their entrepreneurial skills on behalf of their communities as well as societies throughout the world.

To build a sustainable culture of entrepreneurship we planned the following actions:

- elevate the effort to a visible university-level office;
- launch a multi-year communication program to create greater awareness and understanding of entrepreneurship within the liberal arts community;
- create entrepreneurial champions among liberal arts faculty through education, exposure and incentives;
- add courses in entrepreneurship and creativity throughout the curriculum;
- provide cross-disciplinary and experiential learning opportunities related to entrepreneurship;

- add four new faculty positions in the liberal arts to provide enhanced teaching resources for entrepreneurship curriculum initiatives;
- provide enhanced opportunities for students to become involved in social entrepreneurship, consistent with the university's *Pro Humanitate* motto;
- establish a university center for entrepreneurship to support entrepreneurial efforts outside the normal curriculum; and
- establish a 5th year entrepreneurship institute to support postgraduates completing entrepreneurial projects begun as undergraduates.

Outcomes

Visibility and Communication

In order to elevate the visibility of the activities of the grant and to achieve cross-departmental integration, the Office of Entrepreneurship and Liberal Arts (OELA) was established and a director hired to manage the overall programmatic efforts. In addition, three senior faculty members, two from the College and one from the undergraduate business school, were designated Program Directors to coordinate key areas of the overall program: communication and awareness, curriculum and faculty development, and the new undergraduate student center for entrepreneurship. The appointment of senior faculty in these areas brought credibility to the total effort in the liberal arts environment.

Reinforcing the image of the program as being part of the liberal arts environment was the decision to locate the administrative offices for the program in a liberal arts department building and not within the business school. This sought to help overcome any possible negative perception that this was a business school program.

In order to demonstrate to faculty the relevance of entrepreneurship to the liberal arts, a significant communication and awareness program was carried out, including sponsoring appropriate guest speakers at the intersection of entrepreneurship and the liberal arts; developing a newsletter that was sent out monthly during the school year, and creating a significant website for the program. The website and newsletter carried stories about student, faculty and alumni entrepreneurs. One of the early and unique communication efforts was soliciting faculty to write short stories about individuals in their fields they considered entrepreneurial. Five faculty members' stories were chosen to be published in a booklet distributed to Wake Forest faculty. The stories portrayed two entrepreneurial colleagues in Chemistry and one each from Economics, Philosophy and Theatre.

The communication program also helped to brand Wake Forest University to prospective students and parents as a place to pursue a liberal arts degree and to find a path to a successful career in the 21st century. The Admission Office recognized the salience of this message and invited representatives from OELA to speak at events, which helped to strengthen the brand further. As the first years of the grant passed, we began to hear students expressed the sentiment

that they chose Wake Forest over other universities or colleges because of the entrepreneurship program. Three years after the OELA program was begun, a student survey revealed that 49 percent of freshmen were interested in taking entrepreneurship courses.

Entrepreneurial Champions

"The (Kauffman) initiative opened my eyes to two things. First, students did not need to put their dreams on hold during the four years they attended college. Second, professors have a unique ability to act as entrepreneurs and catalysts for student entrepreneurship. By working with other participants in the Kauffman initiative, my trajectory as an assistant professor was radically reshaped. I left the "publish or perish" mentality by the wayside and adopted a "partner for productivity" strategy as a teacher-scholar".

Associate Professor of Physics, Jed Macosko

Entrepreneurial training for faculty was one of the key sustaining measures for the program. Our goal was to build a cadre of faculty members committed to a culture of entrepreneurship, who could serve as opinion leaders in their departments and mentors to students. In order to do this faculty needed to learn more about the entrepreneurial process and its relevance in their field.

We have held semester long faculty seminars every spring to explore the principles and teaching of entrepreneurship as related to various disciplines. The seminar is led by faculty for faculty, and the topic is selected by seminar participants. The first two years the focus of the seminar was to define the role of entrepreneurship on a liberal arts campus (and to convince skeptics that the concept had a legitimate role). After establishing legitimacy, seminars topics have included more in-depth study of the entrepreneurial process; social entrepreneurship (a good fit with our *Pro Humanitate* motto); and creativity and innovation. This spring the seminar was led by award winning documentary film producer Peter Gilbert and Pat Dickson, a member of our business school faculty. The subject is technology, media, and entrepreneurship.

A deliverable for each participant in the faculty seminar has been a new course proposal that would in some way incorporate ideas about entrepreneurship or innovation into a discipline-based course. We provided a small monetary stipend to faculty for their participation. Over time we reduced the stipend and finally eliminated it as we discovered that the stipend was less necessary for encouraging participation than a stimulating topic.

The seminar has been an indispensable recruiting tool for the program. To date, fifty-two faculty members from twenty-eight departments have participated in the faculty seminar program. Over a seven year period, forty percent of participants have used their improved knowledge to create new courses, and others have enhanced their existing courses.

Curriculum

A significant part of the Wake Forest effort has been to involve faculty in the designing of new curriculum initiatives in entrepreneurship. The course initiatives span freshman year through senior year and into postgraduate work and involve most departments of the College, Schools of Business, and Medical School. Course development grants encourage faculty and departments to develop new courses at the intersection of the various liberal arts disciplines and entrepreneurship or to revise existing courses to add entrepreneurship components. As of 2012, 58 faculty members from 23 departments have designed and taught fifty new courses.

Our original concept was to offer a series of workshops on basic functional skills to provide the knowledge liberal arts students would need to plan and implement ventures. We also planned workshops on special topics on the entrepreneurial process that would be useful for business students, as well as liberal arts students. Students were excited about the workshops but quickly asked us to make them credit bearing courses. Although not one of the original nine activities outlined in the KCI proposal, it soon became apparent that we needed a minor in entrepreneurship to house the innovative courses that our faculty were developing as they sometimes could not find a home in an existing department and to respond to student requests for credit bearing courses related to entrepreneurial skill development.

We approached the suggestion of a new minor with some trepidation, as the OELA program had only been in operation for a year. For the reasons mentioned above, we expected to encounter resistance to something that sounded business-like from our colleagues in the liberal arts college faculty assembly. Yet when one of the liberal arts faculty, who self-described herself as "the closest thing to a socialist" on this campus, stood up for the program, it passed the faculty vote by a wide margin. This faculty member had witnessed entrepreneurship in action in subsistence-level communes in Latin America, and was fully convinced of the power for good of the entrepreneurial approach. The topic had also packed her course with energetic, can-do students.

When we proposed the minor in Entrepreneurship and Social Enterprise (ESE) to the University Faculty, we estimated that it was unlikely to grow to more than 40 students. We grossly underestimated student interest. Today approximately 80 students out of each class starting as sophomores select the minor for a total of about 240 minors. In fall of 2011, a survey of incoming freshmen found over one third of incoming student expressed interest in entrepreneurship and the entrepreneurship and social enterprise minor. The ESE minor is today the most popular minor at Wake Forest. It complements any major and allows liberal arts students to apply their majors in new and exciting ways.

The ESE minor requires three core courses (9 hours) plus 9 hours of electives. The three core courses are *Innovation and Creativity*; *Foundations of Entrepreneurship*; and *Managing the Entrepreneurial Venture: Startup to Early Growth*. We chose to follow a life cycle of the venture

(idea generation, concept evaluation, implementation) rather than a functional model (entrepreneurial marketing, venture finance, etc.).

To identify electives, we followed the advice of Dennis Ray (1990) to investigate what courses were presently being offered on our campus that were relevant for an entrepreneurial life or career. We reviewed the course catalogue and interviewed department heads to identify courses and gain their permission for listing the courses as electives. The courses fell under three categories: Thought and Behavior, Leadership and Engaging the World, and Entrepreneurial Process. In the beginning the list of electives was quite long. Over time, as we saw the courses that students actually chose and as ESE specific courses were developed and offered regularly, we winnowed the number. Because business school students were also minoring in Entrepreneurship and Social Enterprise but received basic business knowledge through their required business courses, we created a separate track in the minor. Business school students take the *Creativity and Innovation* course, as described above, but substitute an upper level *Entrepreneurship* course (3 hours) offered by the Schools of Business and a 300-level ESE elective (3 hours) for the other two core courses.

Experiential Learning Opportunities

Research in entrepreneurship reveals that student learning is most effective when it involves personal action and experience. Wake Forest has a rich history of applying experiential learning in a number of different formats and settings. We identified two key activities that would provide entrepreneurial students an opportunity for active learning through doing.

Seed Grants: In our proposal we planned to institute two venture contests each year: a fall elevator pitch, or cocktail napkin competition for short-form proposals of new venture ideas, and a spring traditional business plan competition. In the first year students proposed interesting new venture ideas but many students failed to move the ideas beyond the proposal stage. Some new venture activities were more appropriately tested by implementing and testing customer reactions than through a more formal business planning process. Finally, many of the ventures, both commercial and social, students created were not business models appropriate for funding from investors, the usual goal in business plan competition. Our experience in the first year of the grant convinced us that it would be more useful to provide competitive seed grants to students planning and creating ventures.

The seed funding program provided grants ranging from \$250 to \$10,000 (with an average of about \$1000) to fund market research, prototype development, or implementation costs. Students could apply for funding more than once in the entrepreneurial process after demonstrating progress from earlier funding rounds. In all, \$124,000 in seed funding has been distributed to 111 students in seven years.

Internships: Internships provide students the opportunity for first-hand experience at the intersection of their chosen discipline and entrepreneurship. Internships must fit students'

entrepreneurial career interests, the lead entrepreneur must be willing to develop a close working relationship with the student intern, and there must be a meaningful role for the student to make the internship effective. Although we expected student internships to increase from a projected 25-30 per year in early years of the grant to 75-80 in later years, we found that student demand, appropriate entrepreneurial internships, and funding kept the number of internships at the 25-30 per year level. Students are increasingly expected to develop internships in their major fields of study for career development purposes. This is especially true in the business school, which now requires an internship as part of its degree programs. Students could also elect to work on their own venture under the supervision of faculty members and receive a stipend for their effort. Although we expected companies would bear part of the cost of the internship stipend, we found that most startups, early stage entrepreneurial companies, and social ventures were unable or unwilling to provide full stipends to students. This problem was probably exacerbated by the recession that occurred in the United States in 2007

Our original intention was for students to receive credit as well as a stipend for internships and independent work on their ventures. Faculty were to play an important role in the entire process from selection of sites, recommendation of students, mentoring the actual internship or independent study, and supervising development of deliverables, and faculty members were to receive a stipend for their effort. However, we encountered resistance from the undergraduate College on two fronts. First, a student was not allowed to receive a stipend and credit for the same piece of work and second, faculty members in other programs were not provided stipends for overseeing internships or independent studies in their respective disciplines. Instead it was considered part of their normal teaching load. Consequently, we separated the for-credit and stipend options for students and discontinued most faculty stipends except those available during summer session. An added complication was that students must pay summer school tuition for the course credit associated with an internship. Most students therefore opt for the stipend, no-credit option.

Despite these normal “growing pains” internships continue to be an important and popular component of our program. They have served our students well by providing invaluable hands-on experience in entrepreneurial companies and have frequently opened the door for additional employment opportunities.

Faculty Positions: In the grant proposal we envisioned providing enhanced teaching resources for entrepreneurship curriculum initiatives by adding four new faculty positions in the liberal arts through visiting professorships of four, three, two and one year durations. These positions would augment existing faculty needs in the areas of creativity, science, social science and the arts and provide role models for existing faculty. Although we hired the first visiting professor (in creativity) in the second year of the grant and she remains at the University, it quickly became apparent that there was enough interest from existing Wake Forest faculty members to meet the needs of our curriculum initiatives, and we refocused our efforts and limited resources on encouraging, training, and supporting existing faculty members.

One of the unique components of our Program was the realization of the importance of creativity to the entrepreneurial enterprise. Learning and exercising creativity are believed to enhance the ability to detect patterns, identify opportunities (Krueger, 2007; Lumpkin & Lichtenstein, 2005), and understand alternative paths one may follow in pursuing entrepreneurial career paths. In recognition of this fact, as we mentioned above, we collaborated with the Dean of the College and the Department of Theatre and Dance to hire a Visiting Professor in Creativity, which has become a permanent position for the program. The creativity program now offers first-year seminars and courses in creativity and innovation. The courses, and other forums, teach students about creative problem solving and opportunistic thinking, and encourage students to practice these skills in their lives.

Courses include both theory and practice of creativity as explicated by such scholars as de Bono (1971) and Csikszentmihalyi (1996). Supporting coursework, speakers from the arts and humanities, professional creativity consultants, and field trips with students to sites where creativity in organizations is occurring strengthens the link between theory and practice.

Social Entrepreneurship: Even before the Kauffman grant, compelling social entrepreneurship work was happening at Wake Forest. Theatre major Melissa Jones developed a theatre production company to stimulate children's confidence. Economics major Rosita Najmi started Project Bokonon to provide medical services and supplies to the West African nation of Benin. Since receiving the grant, student interest in social entrepreneurship has grown. Students ventures have included: Terrafinity, a an alternative energy 501c3 based on biodiesel production and distribution, Medmarketplace.com, a website that allows people to recycle used medical equipment, and The Snap Project that teaches children of East Africa the power of photography in advocacy for social change. Early misperceptions that liberal arts students would only gravitate to social entrepreneurship and business students to only commercial entrepreneurship have proven wrong.

University Center: As the OELA program grew, it became important to provide a physical space for students interested in entrepreneurship and new venturing to meet and to do their work. Prior to the KCI grant the business school had begged and bartered for modest space in the basement of a university administration building for a student entrepreneurship center. Appointed with college dorm furniture, but also provisioned with technology resources, it became the early home for a number of student ventures.

In support of the KCI application the business school committed to provide a larger well-appointed space in its new building in 2003. The new 2500 square foot space included team work stations and offices, a resource library, open ideation space, graphics work tables, and technology for computing and for rehearsing presentations. Glass walls, bright lighting, comfortable lounge chairs and a splashy center logo made this an inviting space for students to meet and receive mentoring and coaching from the Entrepreneurship Center Director and Entrepreneurs-in-Residence. With changes in administration, a general space crunch, and the

reorganization of the program including a move to the Wake Forest administration building this important student space was lost. We are attempting to recoup the loss and to build an even better student-centric space in our Innovation Center proposal (see below).

Fifth Year Program: Students often have wonderful ideas for new ventures, but they seldom have sufficient time to fulfill their degree requirements and simultaneously develop their new venture ideas completely. Therefore as a part of our grant proposal we decided to provide one year post baccalaureate Fellowship grants to liberal arts students who demonstrated ability and whose projects held promise. The post baccalaureate Fellowships were to provide them time, coursework, and access to University resources to fully develop their ventures.

We typically provided two fellowships per year during the grant period. Students applied during their senior year. The Fellowship term was for one year, and Fellows received a stipend to cover living expenses. Fellows could enroll at no charge in up to two undergraduate or graduate courses per semester. Fellows also could apply for seed funding through the normal funding process. A faculty advisor provided oversight for Fellows.

While valuable the fifth-year program has proven difficult to administer because it spanned the Schools of Business, the graduate program, and the undergraduate program, all of which have different aspirations, requirements, and funding structures. In addition, there were reservations about the amount spent per student and whether that was a good use of resources. We are actively seeking a better model which would embody the strengths of the program with a sustainable business model or an endowment to provide the required funding.

Impacts in the Academic Units

Schools of Business

The OELA program has had a significant impact in academic units beyond the liberal arts – in the Schools of Business, the Medical School, and the Law School. Inarguably, the single biggest impact has been on the Schools of Business. Since business schools are the traditional home of entrepreneurship programs, we devote greater attention to the impact in this unit. This can be better understood by examining changes triggered within the business school by the advent of the OELA, and then changes occurring at the interface between the business school and the university itself. Each of these perspectives must also take into account other exogenous factors that influenced the thinking and priorities of the business school administration.

Although the expressed purpose and intent of the OELA was entrepreneurship education "outside the business school," at the outset of planning and implementation there was faculty resistance to the program within the business school. The usual criticisms were offered that the field of entrepreneurship lacks academic rigor (e.g. Low, 2001; West, Gatewood, & Shaver, 2009). More importantly, however, were concerns about the allocation of scarce resources within the business school. It was made clear to the business faculty that the KCI effort was fully

externally-funded, and that the business school actually received important indirect funding from the Kauffman grant to supplement its annual operating budget. Yet the condition of the grant also required additional fundraising over its five year life, and business faculty expressed concern that donors giving for entrepreneurship would lessen future donations for other important areas. Business faculty also observed resources being used to finish off physical space for the entrepreneurship center in the building and the provision of teaching reductions for business faculty involved in the university-wide entrepreneurship efforts. In the latter case, this meant the business school would have to recruit adjuncts to staff sections of its courses and that such courses – especially in the core curriculum – might not necessarily be taught by academically-qualified faculty.

Strong leadership and greater involvement of faculty in the business school helped overcome internal concerns. The dean of the business school had supported entrepreneurship initiatives for years. Not only was such support critical in upward selling of the OELA program concept to the university's administration, it provided a consistent message to business school faculty that embracing this area would be a strategic priority. Like members of the arts and sciences faculty, some members of the business faculty also began to take part in the faculty seminars offered through the OELA program and subsequently began to incorporate elements of entrepreneurship into their courses. Increasing student demand also led to a permanent change in the core curriculum within the business school, in which "Entrepreneurial Strategy" is offered as a capstone strategy course alternative to the usual corporate strategy course. Over time the demand for the new course has grown so much that multiple sections are now offered.

The greatest impact on the business school has been in its relationship with the rest of the university. Increasing student demand for business and entrepreneurship courses was one factor which precipitated changes. But other significant events also factored in to the changing relationship – including new deans of both the business school and the college of arts and sciences, a new provost, and an external environment from 2008-2010 in which the financial markets crisis saw declines in endowments place cash flow pressures on academic institutions far and wide. Wake Forest was no exception.

Against this milieu of circumstances, the university began moving toward a "profit center" approach for discrete academic units including the business school. In this model the undergraduate business school received implied tuition revenue credit (less university and facilities overhead allocations) for every student who majored in its programs, and it was required to keep its costs in line with such implied revenues. Yet the "problem" of vastly increased interest across the university in entrepreneurial studies remained. With formal admission to the business school capped, the business school's expense ledger could not accommodate teaching resources devoted to non-business students. As described earlier the new Entrepreneurship and Social Enterprise minor (ESE), located in arts and sciences, grew rapidly and now represents the largest inter-disciplinary minor within the university. But there is content in core courses in that minor that arguably should be taught by business faculty experienced in

teaching entrepreneurship. So the business school and the university have entered a new strategic partnership through which the university now provides financial resources to the business school, in excess of its usual per-major implied revenue, to offset the costs of business school faculty and administration associated with the ESE minor for non-business students. In addition, the business school now offers "New Business Development" as an approved undergraduate concentration within the B.S. in Business degree. Within this concentration business student may take non-business courses in the ESE curriculum in partial fulfillment of the requirements.

The advent of the OELA program and the changing external contexts have co-created both a more vibrant level of student activity across campus and a new relationship between the business school and the university. But eight years following the startup of the OELA at Wake Forest, not much has changed within the business school itself. The curriculum focus remains on traditional disciplines such as finance and marketing in which there are ample post-graduation job opportunities. Faculty continue to conduct research in their home disciplines, and those conducting research on entrepreneurship are evaluated favorably in annual reviews to the extent their papers are published in top tier journals. So although the OELA program has had an opportunity to better prepare students across the university to anticipate and manage their futures and to engage in entrepreneurial behavior, within the business school much remains as before the OELA. We view this as neither positive nor negative, since the OELA program's intended effect was "outside the business school."

Medical Center

Wake Forest Baptist Health is a multifaceted medical school and hospital facility with state-of-the-art research, teaching, and clinical components. The Medical Center campus is separated from the undergraduate campus by three and one-half miles but the interplay of entrepreneurship on both campuses has been synergistic. In the last decade there has been a growing belief that academic medical centers that generate and translate knowledge to prevent, diagnose and treat disease in the 21st century must have vigorous and effective programs to deliver those innovations to the community and the nation.

At the time of the Kauffman grant and reflective of the new culture that was growing at Wake Forest University, the Medical Center was also developing innovative programs to bring technologies to market. The OELA program has placed a number of undergraduate interns at the Center to assist scientists in determining the feasibility and appropriate business models for research innovations. The interns have proven helpful to emerging start-ups and some have grown to play pivotal roles in their management teams. Entrepreneurial faculty and staff at the Medical Center have given freely of their time to guest lecture in OELA funded courses, workshops, and seminars on the Reynolda campus. The result has been a stronger connection between the Medical and undergraduate campuses.

Another point of synergy is the Innovation and Entrepreneurship Initiative at the Medical School Campus. The Innovation and Entrepreneurship Initiative was formed to 1) educate faculty to the opportunities, challenges and techniques in bringing new therapies and services to market; 2) provide a supporting role within the academic environment to support faculty entrepreneurship; 3) support financially and technically the early development research and ideas that have commercial potential; 4) provide expert leadership, advice and guidance on the most direct and efficient pathways to commercialization; and 5) investigate and recommend different and novel models of commercialization, including accelerators, asset management companies, closer ties with venture capital firms with national and international scope.

While the evolution of the Medical Center entrepreneurial culture is not a direct offshoot of the OELA, it is an indirect effect of an environment that came to appreciate entrepreneurial action and a raised awareness of the importance of innovation, creativity and entrepreneurship on both campuses. The thought leaders in entrepreneurship move easily back and forth, contributing to programs on both campuses by co-teaching courses, participating in the entrepreneurship faculty seminar, and cooperating through entrepreneurship internship programs.

The Law School

Again although not directly tied to receiving the KCI grant, the Community Law and Business Clinic was established by the Wake Forest School of Law in 2009. The CL&BC provides law and graduate business students with an opportunity to develop skills needed to practice in the increasingly complex legal and regulatory environment they will encounter as professionals. In addition, the CL&BC uses the resources and expertise of Wake Forest University to enhance community development efforts in Winston-Salem, Forsyth County and regionally. The clinic provides a full range of one-on-one legal services to entrepreneurs engaged in small business and social enterprise, including community members, students, and faculty. It also delivers workshops on legal issues frequently confronted by new ventures and startups.

Funding Partners

The KCI grant required the institution to raise matching funds through donations, grant writing, or other forms of fund raising. One of the most beneficial effects of the OELA is that it has stimulated faculty to take a more active approach to fund raising. Faculty members involved in the entrepreneurship program have become more entrepreneurial in writing grants seeking funding for their entrepreneurial projects, as well as their more typical disciplinary interests. (See examples under Changing Attitudes below.)

Two major gifts in 2007 provided an on-going stream of funding for primarily student activities: one encouraged entrepreneurship in internet, e-commerce, and evolving technologies and a second supported the venture activities of liberal arts students. Early success stories from the OELA allowed us to secure these gifts. Both gifts provide on-going funding for seed grants, internships and related activities.

In 2011 a named chair in Innovation, Creativity, and Entrepreneurship was endowed in support of the program. Through the generosity of an alumnus and his family Wake Forest has made a lasting commitment to the program. The majority of the funds generated by the endowment support student focused activities including seed grants, internships, scholarships, and courses. It is significant that the Chair is located in the Undergraduate College and not in the Schools of Business. This point underscores the philosophy of the OELA that entrepreneurial thinking is important to the Liberal Arts experience.

It has been argued that establishing both cognitive (basic familiarity) and sociopolitical (conforming to recognized principles or accepted rules and standards) legitimacy are necessary prerequisites for successful innovative ventures (Aldrich & Fiol, 1993). The same can be said for launching entrepreneurship programs. The OELA Program established a foundation and formal legitimacy for the WFU efforts. In so doing it became possible for individuals to seek and gain additional funding for our programmatic and staffing needs.

Arthur Vining Davis

The Arthur Vining Davis Foundations supports private four-year, residential, liberal arts institutions that place strong emphasis on teaching and whose students choose majors primarily in the arts and sciences rather than career or vocational studies. The A.V. Davis Foundations' grant provided funding to support faculty related activities (curriculum initiatives and faculty development) in the OELA. The A.V. Davis grant also provided funding for dissemination activities related to the program. These were important aspects of the program to ensure a lasting faculty impact at Wake Forest University and a possibility for extensions of our program activities to other colleges and universities.

National Science Foundation

The National Science Foundation was also critical to the success of our activities by extending our ability to educate and support students and faculty interested in commercializing technologies by providing financial resources and a link to community resources. Beyond the basic goals of the program to provide educational and experiential learning opportunities for students, the program sought to develop meaningful and sustainable partnerships between industry and academia and to serve as a connecting link to major economic development initiatives in the life science, design innovation, sustainable energy, and mobile applications of the Piedmont Triad Region of North Carolina.

One of the most interesting and successful initiatives was what we called the Liberal Arts Business Models initiative, which supported efforts to discover and develop frameworks for successful “business models” in various liberal arts disciplines. The development of these models would occur through experience-based learning opportunities for students and faculty working together to assess and develop the commercialization potential of lab research. A faculty member and a student or preferably a small group of students with both business and technical backgrounds would develop a feasibility analysis and concept plan for the commercialization of a venture idea.

An early example of the value of this initiative is illustrated by a course that a senior biology professor offered entitled *Designer Antibodies: Creating a Life Science Company*. This course was an experiential learning opportunity that offered eight Wake Forest students the opportunity to explore the entire process of creating a new venture -- ranging from research and feasibility analysis to the early stages of commercialization. The student team capitalized on their classroom experience by continuing to pursue the venture outside of the classroom. A number of the faculty we highlight in the mini-cases below participated in this program.

NCIIA – National Collegiate Inventors and Innovators Alliance

The Kauffman grant also encouraged us to look for other partners to continue to build the momentum among students across our campus. In 2010 and 2011, NCIIA named two Wake Forest undergraduates, who had participated in the Kauffman grant initiatives, as NCIIA student ambassadors. Student ambassadors receive a stipend for coordinating campus events to highlight commercialization opportunities available to students and faculty through the NCIIA and other campus programs. This year’s student ambassador organized a TEDx conference, with a registration of 1600, at Wake Forest University focusing on creativity, social ventures, and scientific innovation.

NCIIA also funds course and program grants. In 2010 NCIIA awarded a grant to Wake Forest for an Innovation Fellows Certificate Program, consisting of a series of workshop focused on the commercialization process, a coaching/ mentoring program, and the provision of resources and experiences to increase commercialization outcomes. The workshops are designed to provide student teams the opportunity to apply the knowledge that they receive to the ventures they are pursuing. At the end of the workshop series, students will pitch their ventures to investors and experienced entrepreneurs. Students who successfully complete the program will be recognized with certificates during the Annual Excellence in Entrepreneurship Award Banquet.

Although not limited, our primary target is students enrolled in the Entrepreneurship and Social Enterprise (ESE) courses or the ESE minor. There is a strong cadre of faculty members to

participate in the program, who have developed experience teaching inter-disciplinary courses over the last 6 years because of the KCI grant.

In addition industry coaches and mentors are recruited from the community, from our alumni base, and from parents of existing and past students. The Innovation Fellows program allows us to focus the efforts of community partners, developed through the NSF Partners for Innovation program and alumni and parents to encourage and support E-Teams.

CERE Center

The Center for Enterprise Research and Education (CERE) was founded in 2010 by a group of faculty members from diverse disciplinary background who were brought together because of the KCI grant. CERE is staffed by scholars and specialists in cultural anthropology, business, economics, finance, entrepreneurship, political science, and comparative religion. The Center seeks to integrate traditional values and cultural and ecological sustainability with contemporary market opportunities and resources.

CERE builds on WFU projects and training programs in Benin, Kenya, Uganda, Tanzania, Nicaragua, and the Chiapas region of Mexico to establish Wake Forest as the leader in entrepreneurial research, practice, and education in developing countries. CERE faculty are developing a comprehensive methodology to assess the needs of entrepreneurs and Small and Medium Enterprises (SMEs) for education and enterprise development programs and to determine the impact that culture, political systems, religion, environmental conditions and participant differences have on those needs. Its ultimate goal is to identify training and micro-enterprise development models that are appropriate and effective in different cultural settings.

Other Centers

Nascent Centers in Biomimicry, Applied Math, and Apps for Disabilities all found their starts through seed funding from the Kauffman grant. We are justifiably proud of these spin-offs and continue to encourage innovative endeavors like them.

Changing Attitudes

As we mentioned at the beginning of the chapter, creating a culture of entrepreneurship and integrating it into the liberal arts environment presents significant challenges for any institution. Liberal arts faculties in general are concerned that higher education has drifted away from the primary concern of educating the whole person and towards a sole concern of preparing them to secure their first job. In addition the perception of entrepreneurship as focused on money and wealth creation is at often at odds with other values held by liberal arts faculty to be more important. Add to that the fact that students arrive and leave the university in predictable patterns, while faculty members have much longer tenures, and it becomes apparent that winning the minds and hearts of faculty is critical. While we only faced one vocal critic, who chose to write

two editorials in the Old Gold & Black student newspaper, there were – and still are – other naysayers and skeptics who are less publicly vocal.

There were a number of strategies adopted to counteract the predicted reaction, including adopting a definition for entrepreneurship that encompassed value creation in all its forms, using student and faculty stories to demonstrate entrepreneurship as not just about wealth creation, and instituting the entrepreneurship faculty seminars that allowed faculty to investigate the concept with their peers. Professors Stephen Boyd, Religion, and Ulrike Wiethaus, Humanities, reflect on the value of the Faculty Seminar in Entrepreneurship and share how they've put lessons learned into action in their own lives and in the University and greater communities.

A reflection from Stephen Boyd....

I came to the Kauffman faculty seminar with little knowledge of entrepreneurship, and I had never heard the term “social entrepreneurship.” Within a couple of weeks, that changed. I learned that entrepreneurship—the creation of value through creative initiatives—often necessarily involves more than one traditional discipline. This is true also of social entrepreneurship, the creative leveraging of financial and social capital for social purposes.

I and colleagues from the Departments of Business, Physics, Computer Science, Health and Exercise Science, Humanities, Political Science, Biology, and Religion talked among ourselves, and with visitors, about the various initiatives we were undertaking. Through this exchange and dialogue with my colleagues, I have learned various lessons.

One that stands out is the idea that the work I and others are doing in the community could be considerably strengthened by the expertise of colleagues and students in various disciplines on campus. An example of this is my recent collaboration with colleagues and students for my work with the Board of the Darryl Hunt Project for Freedom and Justice. Recently started by a local man who was wrongly convicted of murder and served eighteen years in prison before he was exonerated, the Project's mission is to help other wrongly convicted inmates, advocate for criminal justice reform, and assist the ex-incarcerated with the challenge of re-entering into society in a productive way. Students from Professor Stan Thomas' *Introduction to Database Management* course are going to help us by creating databases for the Re-Entry Initiative and the Innocence Project. Professor Terry Baker has offered student assistance from his spring course, *Accounting for Entrepreneurs*, to help with a business plan for the lawn care business that will employ our clients. Professor Carol Anderson in the Clinical Law Program plans to offer students an opportunity to do legal research for the Innocence Initiative, for which students in Professors Angela Hattery and Earl Smith's *Gender, Power, and Violence* course have screened applications.

Another discovery from the seminar: the skills involved in being a successful entrepreneur can be taught. This semester I am teaching a new course, *Religion and Public Life*. Students are currently in service learning placements in 22 agencies and institutions in the city of Winston-Salem. In addition to the classroom approach of learning the different, more traditional theological motivations that religious people have for public service, the students are receiving a three-week training session from Chris Baumann, the head organizer for Winston-Salem's C.H.A.N.G.E. (Communities Helping All Neighbors Gain Empowerment). They are learning “skills for public engagement” that transcend the perspectives and contributions that any one academic department can teach. Among their projects are: translating the prison

journal of Darryl Hunt; organizing a campus “penny campaign” to support Samaritan Ministries, a local soup kitchen and homeless shelter; analyzing the community benefits of the Dell incentive deal, in terms of jobs produced; interviewing teachers and PTA leaders about education issues; translating for Hispanic residents in a variety of settings; and apprenticing at the Winston-Salem Institute for Dismantling Racism.

It might be possible to institutionalize this kind of inter-disciplinary cooperation at Wake Forest in a Social Entrepreneurship Program that will enable our faculty, students, and alumni to design and grow nonprofits in Winston-Salem and beyond to address social issues. For now, Kyle Layman ‘05 is using a fifth-year internship researching other college and university programs to see what we might be able to do here. With the efforts of the Office of Entrepreneurship and Liberal Arts and the new understanding of entrepreneurship spreading among faculty and students alike, our campus is moving in the right direction to institute such a program and better connect with our communities in ways that are mutually rewarding.

Stephen Boyd, Easley Professor of Religion and Chair, Religion Department

A reflection from Ulrike Wiethaus...

Much of the success of the recent Kauffman faculty seminar is no doubt due to the enthusiasm, creativity, and intellectual courage of the seminar director, Professor Ray Kuhn. Given that the six faculty participants gathered from diverse disciplines and with different goals in mind, the potential for misunderstandings and miscommunication seemed almost too big a threat. Instead, we learned from each other, acting as a “group think tank.”

Together we developed a common vocabulary for delineating the central and peripheral elements of an entrepreneurial paradigm in a liberal arts setting. This entrepreneurship and liberal arts paradigm is still in its early stages, and therein so fluid as to accommodate different economic and philosophical models. At least at the moment, entrepreneurship denotes a certain kind of process rather than a desired social end product or an ideological position. Karl Marx and Friedrich Engels were indeed social entrepreneurs; an economic system based on equal exchange and barter finds its place under the umbrella of entrepreneurship as much as does later capitalism.

The development of entrepreneurial language manages to lend itself to such theoretical inclusiveness; an example of this is renaming the expected outcome of entrepreneurship, from “profit,” usually monetary, to “value,” of any kind. The entrepreneurial process stresses creativity, boldness, experimentation, and an acute awareness of the dynamics of innovation and team collaboration. These values are in sync with the contemporary challenges of and opportunities for globalization and the seemingly endless cross-cultural fertilization; for this simple reason, the paradigm of the entrepreneurial process will out-pace older models of learning that operate with a more static view of knowledge, replacing top-down instruction with team learning and a trust of new ideas and ideals.

In my own field, my new seminar for first-year students on culturally appropriate economic development for urban American Indian communities is a testing ground for finding out whether this new paradigm of team-learning and creating community-relevant projects offers better opportunities to accommodate and absorb the wave of new practices and knowledge unleashed by globalization than older, more rigid and hierarchical models.

The OELA program drew student entrepreneurs from across all the departments on campus. Stories about the students, their ventures, and accomplishments are celebrated on our website (entrepreneurship.wfu.edu/). However, the challenge in entrepreneurship education has not been attracting student interest and involvement. The demand from students at universities where entrepreneurship programs existed has been strong over the last 25 years. The challenge has been gaining faculty acceptance and involvement. The success of our program is evident in the way in which so many faculty members have embraced it. Over the course of the program over 80 faculty members have played an active role in the program. We have highlighted a sample of our entrepreneurial champions below. These individuals have changed the lives of the people that they touched and have been changed in the process.

Mary Martin Niepold, Journalism Department

In 2006, Mary Martin Niepold took her first trip to Kenya as a volunteer with the Amani Children's Foundation to work with children orphaned by AIDS. She discovered that although there were programs aimed at orphans, there were no programs designed to help the grandmothers raising the estimated one million children orphaned by losing both parents to HIV/AIDS in Kenya or the more than half-million in Tanzania. When she asked "Who is taking care of the grandmothers?" The answer came back "nobody."

After returning from that first trip and doing more research, Niepold says, "the idea was born to find a way to train these grandmothers. I didn't want to do handouts, I wanted to train them so that they could have ongoing income to keep their families together." • With a seed grant and interns from the OELA, Niepold founded The Nyanya Project (nyanya means "grandmother" in Swahili), a non-profit agency that helps grandmothers of AIDS orphans form working cooperatives to generate the income necessary to provide healthcare, education and a home for their grandchildren through the sale of handmade crafts and agricultural products. The organization of the project came together with surprising speed. Within months the Nyanya Project was incorporated and became a registered 501c3 organization.

Through volunteers and paid staff the project teaches grandmothers, who live on less than \$1.00 per day with no government assistance, how to earn sustainable incomes and save for the future. The project began in Kenya, expanded to Tanzania and then to Rwanda.

Recognizing the importance of being able to communicate a message to an audience for entrepreneurial success and the desire to give Wake Forest students a chance to "learn an entrepreneurial skill *and* make a difference," Mary Martin Niepold created a cross-listed course

in Journalism and ESE, *Introduction to Professional Writing*, or, as she more appropriately renamed it, "*Writing for Social Good*." The course adopts a not-for-profit for two semesters, identifies its target markets and develops a communication plan with the content to deliver the message, including website content, advertising, and public relations.

Niepold credits the support she received from the KCI grant in helping her achieve her dream of helping her grandmothers. "Receiving a grant from the Entrepreneurship program at Wake was really my first confidence builder. Through their support, I was able to explore ways not only to become an entrepreneur myself, but to become a better teacher for students who were interested in making a difference. For all of us, entrepreneurship became far more than theory. Ever since we've been able to put feet to our words."

In 2009, Niepold was named a Purpose Prize Fellow, an honor for social entrepreneurs over 60 who use their experience and passion to take on society's biggest challenges. "For me, the honor of being named a Purpose Prize fellow really goes to the African grandmothers," says Niepold. "They provide love and sustenance to their families and AIDS orphaned grandchildren under incredibly harsh circumstances. They inspire me."

Jed Macosko, Department of Physics

Jed Macosko, a bio-physicist, received an OELA course development grant, which he used to develop a First Year Seminar called *Life's Molecular Machines: From AIDS Tests to Hydrogen Cars*. The course investigated the molecular machines within the cell, covered cell biology and the technical aspects of the field while challenging students to apply their knowledge to develop new products or services for the marketplace. Some student entrepreneurs from the class formed a company called BioBotz.

After the course was over, Professor Macosko continued to meet weekly with the Bio Botz students in an independent study. With a seed grant and internship stipends, students continued to develop the company during the summer semester. BioBotz' mission is to encourage children's interest in science, especially biotechnology, through educational games, cartoons, toys and storybooks. They developed 3- D figures representing kinesin, myosin, and dynein, molecular motors that are important in cell functioning, and a story line detailing how these "characters" save the cell from an invading virus.

Then with an Educational Enhancement Grant from the North Carolina Biotechnology Center and a partnership with the Center for Biomolecular Imaging of Wake Forest University Health Sciences, the Center for Design Innovation in downtown Winston-Salem, and faculty and students from 3-D animation programs at Winston-Salem State University, the University of North Carolina School of the Arts and Forsyth Tech and a local high school, some of the original students from the BioBotz team and Dr. Macosko developed a film called "Cell Side Story" and constructed a detailed encyclopedia of the molecules shown in their film.

"Cell Side Story" is a three minute film of the love story of male and female animated characters that dramatize what happens within cells. Kenny Twist represents kinesin, a motor protein found within cells. The DNA girl is DNA, the nucleic acid that tells the cells what to do. The musical video, designed to teach the basics of biotechnology, will be made available to North Carolina high school students.

Dr. Macosko also teamed with Anthony Pecorella, WFU' 06, to win a \$26,000 grant from the John D. and Catherine T. MacArthur Foundation in its 2009 Digital Media & Learning competition. The team's winning project, "CellCraft: Exploring the Cell through Computer Games," was based on concepts developed with help from Carol Strohecker at the Center for Design Innovation and BioBotz students. Pecorella participated in OELA's program while at WFU, teaming with another master degree student to form a gaming venture called Retina Software. Unable to find funding for Retina Software, he decided instead to develop a bioscience-based strategy board game that allowed players to coordinate organelles, fight off viruses and expand their cell's boundaries.

In the CellCraft video game, these same analogies have been employed to teach both children and adults how cells function. As of December, 2010, CellCraft has accumulated over 3 million plays at an average game-time of 45 minutes. Pecorella and CellCraft's lead programmer, Lars Doucet, have formed a company, Level Up Labs which released its first game in January 2012—the highly acclaimed Defender's Quest: Valley of the Forgotten.

Dr. Macosko comments, "The initiative opened my eyes to two things. First, students did not need to put their dreams on hold during the four years they attended college. Second, professors have a unique ability to act as entrepreneurs and catalysts for student entrepreneurship. By working with other participants in the Kauffman initiative, my trajectory as an assistant professor was radically reshaped. I left the "publish or perish" mentality by the wayside and adopted a "partner for productivity" strategy as a teacher-scholar. Before joining the initiative, I worked on my own research projects and my own classes. Since teaching my first initiative-sponsored class, I have launched three companies, been more active as a biotech consultant, and have started a new branch of research that has nearly doubled the external grant dollars coming into my lab. My productivity in terms of publications is higher, but my real productivity is measured by the joy I have in seeing things of value created through partnerships"

Jean Simonelli, Anthropology Department

Dr. Simonelli is an applied cultural anthropologist who is interested in community development at it pertains to Mexico and Central America; as well as globalization, economics and conflict resolution. Dr. Simonelli participated in one of the early Entrepreneurship Faculty Seminars, and went on to lead the seminar in the following two years. She received a grant to develop, *Free Trade, Fair Trade: the Independent Entrepreneur in the Global Marketplace*, a field-based seminar that identifies and compares the barriers to market participation experienced

by independent entrepreneurs in the developing world. The course is cross-listed in Anthropology and ESE. In spring of 2011, the *Free Trade, Fair Trade* course added a field study component in Chiapas, Mexico, an area where Jeanne has spent over 30 years working with co-operatives and individual entrepreneurs seeking better economic returns for their efforts. The trip to Chiapas was also a chance to gather data for a research project on co-operatives as collective entrepreneurial action. This project is part of a larger research project of CERÉ and includes faculty and students from a number of disciplines.

Dr. Simonelli, who identifies herself as the “socialist on campus,” says, “One of the most positive outcomes from the Kauffman grant is that the courses bring together students from different backgrounds to examine complex issues that require different perspectives to identify and solve. In the case of my course, anthropology, business and economic students wrestle with the concepts of the free market versus fair market, and which produces better outcomes for people. Another outcome of the grant is that it has brought together faculty members from different disciplines, “...who now have the opportunity to work and learn from each other.”

Recently Dr. Simonelli and a number of her colleagues submitted a seminar proposal to The School of Advance Research (SAR), Santa Fe, and the Society for Applied Anthropology (SfAA). The accepted seminar proposal, *Artisan Production and the World Market: Collaborating in Theory, Methods, Practice*, will be presented at the 2012 biannual short seminar and SfAA’s 2013 Plenary Session. The seminar will bring together an interdisciplinary, intercultural group of artisans and the scholars who work with them to discuss ongoing work in all areas of production, marketing and consumption of crafts and boutique food products. The seminar will examine practical marketing and business skills for small-scale producers, develop methodologies for understanding and enhancing networks; and evaluate the process to enrich related cultural and economic theory.

Paúl Pauca, Department of Computer Science

Dr. Paúl Pauca is a professor of computer science with specialized interests in image analysis and the development of applications for mobile computing. In a recent reorganization of the computer science offerings at Wake Forest the introductory computer science course, CSC 111, was changed from a single programming language course to a series of options designed to appeal to the new generation of undergraduates. One of these options focused on teaching programming and logical problem solving while developing apps for Android, iPhones, iPads and related devices. This was the perfect course for cross-listing in the ESE minor since there was considerable interest among WFU undergraduates in start-ups that focus on mobile computing.

Dr. Pauca’s interest in mobile computing goes far deeper. His son Victor was two- and- a half when he was diagnosed with Pitt Hopkins Syndrome (PTHS), a rare genetic disorder affecting his muscle control, speech and overall physical and cognitive development. It was

difficult for Victor to communicate with his family, and existing devices designed to enable communication were too expensive and less than effective. Dr. Pauca realized that he could use his computer science skills to help, while integrating such work into the computer science curricula. In collaboration with students he developed an iPhone/iPad app that would allow Victor to communicate by tapping on icons showing his needs which express through audio recording these needs to others. The versatility of this app, Verbal Victor, was a breakthrough in communication not only for Victor but for children and adults with similar disorders throughout the world.

Tommy Guy, a former graduate student of Pauca's and now a doctoral candidate at the University of Toronto, was lead programming engineer for Verbal Victor. The challenge was to offer intuitive image and audio functionality with a simple interface using camera and microphone to enable customization to a users' particular needs. "And we wanted it to be affordable," says Guy, who received funding from the OELA to develop a prototype. The \$7 app designed for iPads and iPhones has sold over 3000 copies to date at the App Store. Sales have far exceeded their expectations. People from all over the world have downloaded it for use by loved ones affected by a variety of conditions, including developmental syndromes such as PTHS, autism, and L1 syndrome and acquired conditions such as brain injury, Parkinson's disease and Lou Gehrig's disease.

Dr. Pauca's work continues with students expanding the number of apps targeted for assistive technology. A graduate student with support from the entrepreneurship program developed a new product targeted at children with autism and his students routinely visit local schools for disabilities as part of his programming courses, interacting with teachers, therapists and children with disabilities themselves. His socially-relevant approach to teaching is attracting interest in the computer science community both regionally and nationally. He is also expanding his research work in this area, bringing innovation and creativity into the field of assistive technology.

As a result of the various facets of this work, Dr. Pauca and his students are investigating a sustainable model for their research and development efforts. An intern funded by the entrepreneurship program investigated the feasibility of various models for delivering mobile application to the marketplace. As a result, another student, also funded by the entrepreneurship program, is creating a non-profit, *Apps for the Greater Good*, that will provide knowledge, marketing, and products for assistive technology for a wide range of physical and cognitive disabilities.

Dr. Pauca comments "the innovation, creativity, and entrepreneurship program planted a seed in my work through their course-development grants that is germinating into a full blown applied research program in disabilities, with a clear outreach to the community. My students are able to apply material learned in the classroom to help people with disabilities, yet the real life

lessons for them come through their personal interaction with teachers, therapists, and children with disabilities themselves.”

Dilip Kondepudi and Abdou Lachgar, Chemistry Department

Dilip Kondepudi and Abdou Lachgar are cutting edge scientists with a penchant for green technologies that have the potential to change the world. Since inception, Dr. Kondepudi and Dr. Lachgar have been active members of the Environmental Studies Program. About five years ago, they noticed strong student interest in sustainable practices. But Drs. Kondepudi and Lachgar believe that to create a sustainable economy, students must have an understanding of what such an economy might look like and how new products and services can be designed and brought to market. The entrepreneurship program was an excellent opportunity for them to begin teaching courses that combined the science of green technologies and entrepreneurship.

With support from the OELA, they attended a workshop on Green Technology Entrepreneurship hosted by University of California-Davis and supported by the Kauffman Foundation. Dr. Lachgar also participated in the Entrepreneurship Faculty Seminar. With this background and a course development grant, they designed a course, Green Technologies and Entrepreneurship, which they co-taught with colleagues in the Schools of Business. They now teach two courses cross-listed in the Chemistry Department and ESE.

The first *Green Technologies: Science and Entrepreneurship* is a course that introduces students to the science and entrepreneurial opportunities of select green technologies. Students learn the fundamental science of energy use and renewable energy and apply this knowledge to develop a business plan to bring a “green product” to market. The second is *Renewable Energy Entrepreneurship: Science, Policy and Economics*, an overview of the most important renewable energy sources. This course explores the science, policy and economic issues related to renewable energy and investigates the potential for new markets, new products, and new entrepreneurial opportunities in the market place.

Dr. Kondepudi adds “ The Kaufman grant is the catalyst that made it possible for me to develop courses in which I could teach both science and entrepreneurship. To make our economy sustainable, it is important for science students to learn about entrepreneurship. It gives me great pleasure to see enthusiastic student response to these courses. They have a high level of interest in green technologies and they enjoy learning about entrepreneurship. They love the challenge of making a green-tech business plan and analyzing its strengths and weaknesses. Most of all, teaching some of the courses jointly with faculty from the business school has been a very rewarding experience for me, a lot of fun”.

The Present and Future

Challenges

The Kauffman Campus Initiative grants were large and comprehensive. They allowed each recipient institution to experiment with entrepreneurship in many different ways. As our grant wound down it was necessary to adapt to the financial realities of a post-Kauffman-grant financial environment, and to take the best parts of our program and make them sustainable. This was difficult because externally funded programs are typically not ingrained into the University infrastructure; they come and go as grants are won and recede.

At Wake Forest the Office of Entrepreneurship and the Liberal Arts needed to be integrated into the University culture for the long run. Dean of the College Jacque Fetrow challenged a task force of faculty members with strong ties to the program to create a revised structure that would ensure the program's sustainability. Under her leadership the committee reorganized the program under the name of "Innovation, Creativity, and Entrepreneurship" (ICE), broadening its appeal and reach across the campus. The main challenge was to find ways to fund the administrative staff and the faculty teaching within the minor. This was accomplished in two ways. The Program ICE now has roots in the undergraduate college which funds the teaching of classes in Creativity and Innovation, the Schools of Business, which teach the core courses, Foundations of Entrepreneurship and Managing the Entrepreneurial Venture, and in the newly formed Office of Personal and Career Development, which houses the experiential aspects of the program including seed grants, competitions, and internships. This structure has effectively spread the cost of the program over multiple administrative units. The second important change is that the entrepreneurship electives taught by faculty throughout the college have been mainstreamed, as they are now cross-listed with their respective departments and are considered part of the normal teaching load of each participating faculty member. This effectively weaves them into the fabric of the College which is critical to the long term health of the program.

Wake Forest has instituted a new supra-departmental structure of research Centers and Institutes. The next steps for ICE are to apply to move up to a center status building on a strong base of entrepreneurship research at the institution and ultimately to become an institute which will allow it to coordinate entrepreneurial efforts across all campuses including the Wake Forest Medical Center, Divinity School, Law School, Schools of Business, and the College. Over the next decade we will see if ICE flourishes on the academic vine. It is sure that it has a strong root system nurtured by the Kauffman Campus Initiative.

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