The Entrepreneurial Fellowship Program

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1.0  Introduction - An Experiment in Education

In June of 2000, a new program was proposed to nurture Entrepreneurship at the Californian Institute of Technology (Caltech) and Art Center College of Design (Art Center), two Pasadena institutions of higher learning. A proposal was submitted to the National Science Foundation for their “Partnerships for Innovation” Initiative. In July of 2000, the proposal was selected as one of the winners for the 2001-2002 year funding. Our submission was called “An Experiment in Education” and had the following characteristics:

- A partnership between two very different institutions - one whose focus is science and engineering and the other whose roots are in art and design – with both having common interest in providing an entrepreneurial opportunity to their students.
- Following the post-doctorate student model, the students would be paid for their participation.
- The core-learning vehicle would be a business plan. Learning would be achieved through mostly informal instruction directed towards writing a strong business plan.
- Much of the instruction would be by experts, who would volunteer all or most of their time. This enabled over 90% of the program funds to be channeled to the students.

Thus, we saw the Program as a way of bringing educational services to a diverse set of students in an atmosphere of inquiry.

1.0  Need for the Program

Caltech and Art Center are very different institutions with little overlap of curricular interest. However, scientists, engineers, artists and designers frequently create highly marketable technology and products yet tend to lack business skills. Therefore, this Entrepreneurial Fellowship Program (EFP) was designed to serve students in honing their business skills in a region that has witnessed many impressive start-up businesses.

The NSF has several interests in a program like this, including job creation, regional development and enabling diverse elements from within a community to work together for the common good.

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2.0 The Program

2.1 Organization

The Program is guided by the idea that entrepreneurial students need not only classroom skills, but also personal and intellectual relationships with people in the financial, marketing, and legal communities. To this end, we have created a network that consists of executives of investment groups (venture partners), companies (business partners), local government, and not-for-profit groups (public partners). This network contributed to and guided the program management:

The Steering Committee consists of the presidents of Caltech and Art Center (David Baltimore and Richard Koshalek), additional faculty and administration from each institution, and representatives of primary industrial and government partners, who have contributing seed money to the program. This committee has been responsible for monitoring the progress of the program and for selecting the teams that were awarded fellowships. The Steering Committee meets approximately quarterly and sets the scope, the vision and the mission of the program.

The Working Committee. Lead by the Chair of the Engineering and Applied Science Division, this group comprises mostly faculty and staff from the two schools, with a few participants who are business professionals. The Working Committee, which meets 2-4 times per month, was given the responsibility of creating:

- Program awareness on both campuses
- Budgetary parameters
- Timetable for program
- Criteria for fellowship selection
- Selection procedure
- Curricular content
- Program timetable
- External mentoring and lecture contacts
- Additions and corrections to the program.

Part-time administrators from both campuses handle the day-to-day logistics of the program.
2.2 Identifying Candidates:

The first stage of the program was to create interest in this new program on both campuses and amidst “noisy” environments. At Art Center, despite various campus wide news media, it often proves difficult to catch the attention of a very focused student body. At Caltech the problem is almost the opposite, where due to the sheer number of campus activities, students suffer from information overload. To allow for the word to get out, we had scheduled an incubation period where the nascent student teams were nurtured, business proposals written, faculty support lined up and presentations created for the actual competition.

2.3 Choosing Teams:

From the healthy number of applicants for the program, we finally chose four teams totaling nine students. One team comprised all Caltech students; the others were a mix of Art Center and Caltech students. To our surprise, though there were graduate students who applied, with the exception of one post-doc, all the other Caltech students chosen were graduating seniors.

The criteria by which the teams were chosen were:

- Teams had to be formed in advance. Typically we looked for 2-4 members per team who would co-apply for Fellowships.
- The students had to be within 6 months of Graduation
- We looked for excitement, enthusiasm, passion, and commitment to stay the course.
- The Team had to have a written Business Plan, at least in prototype form.
- The Team needed to have taken some Business-related Caltech courses
- Teams needed an involved faculty member, familiar with the original idea or technology
- The team’s proposal had a high level of innovation
- The technology or product idea had to be sufficiently well developed that a working prototype either existed or could be developed within the time of the Fellowship.
- Team members could not be committed to other jobs and projects.

The above process had to be well understood by the communities on both campuses in order that students prepared themselves well for this opportunity. Members of the Steering Committee and others were available to coach candidate students on meeting the above requirements.

In the first instance, the prototype business plans (applications) were judged by assessing the strength of the business model, the use of technology, and the team members’ résumés. Each team’s formal presentation to the selection committee enabled us to obtain a more personal and instinctive opinion about their personal attributes and suitability for the Fellowship. Because of the way that the curriculum was designed, it was
thought that naïve business assumptions and product concepts could be corrected during the course of the Fellowship as the students gained a more sophisticated understanding of the intended markets.

3.0 Creation of Syllabus

The EFP program was designed to teach recent Caltech and Art Center Graduates the concepts and applications of business principles to the start up of companies. A complementary objective was to cultivate entrepreneurial behavior in students with diverse technical and design backgrounds. In addition, it was important for us to make clear that the EFP was an educational program and should be judged as such. If a successful business arose from the program, that was fine but we did not intend the EFP to be a business incubator. We designed the curriculum to:

- Be both intense and focused as befits an accelerated program – erring on the side of “too much information”.
- Be application-driven yet founded on fundamental business principles – emphasizing basic tools rather than theoretical material.
- Foster behaviors conducive to entrepreneurial activities, e.g. teamwork, leadership and networking – supporting exercises were included early in the program.
- Not neglect “soft” subjects such as the management of people in order to emphasize more rigorous “subject matter” skills, for instance, the product design process.
- Emphasize subjects that Caltech and Art Center students have typically had less exposure to, such as business principles.
- Form a framework for continuous future learning in these and other related subjects by providing reference sources and avenues for future learning provided.
- Allow students to achieve a working knowledge, enough to enable them to formulate intelligent decisions in the future. They will not become “experts” on the subjects covered
- Encourage innovation and experimentation to test new methodologies supporting our objectives.

While we were not guaranteed success, we sought objective and continual evaluation of our effectiveness and were prepared to make rapid changes as required.

- Include mentorship by professionals and faculty members as a key educational resource.
- Incorporate real-world experience through case studies of local startups and witness actual presentations to Angels.

The curriculum combines traditional academic study with practical, real-world training in a broad range of subjects, from accounting, law and marketing to presentation skills and strategy.
The curriculum development process itself was intended to be entrepreneurial in nature. We favored trying new ideas without the certainty that they would work. We made changes on the fly, based upon feedback from the Fellows and our own judgment. Both the methods and content of instruction were intended to reflect the realities of a business start-up environment, emphasizing rapid decision-making and cultivation of intuition, risk-taking, and opportunist business thinking.

To document our experiment and to benefit from the Art Center side of the partnership, a graduate from their Graduate Industrial Design Program was engaged to video-tape both public events as well as (with the consent of those involved) private conversations.

Subjects fall into two broad categories: traditional business topics and real-world skills.

<table>
<thead>
<tr>
<th>Business skills include:</th>
<th>World skills include:</th>
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<tbody>
<tr>
<td>• Marketing</td>
<td>• Leadership &amp; Strategy</td>
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<td>• Product Development</td>
<td>• Culture &amp; Ideation</td>
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<td>• Finance</td>
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<td>• Business Law</td>
<td>• Communication</td>
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<td>• Business Plan Creation</td>
<td>• Team Building</td>
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<td>• Seeking Capital</td>
<td>• Ethics</td>
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One of the guiding principles of the Program was to emphasize the subjects that the students knew least about. Concerned that the Fellows would launch into a product development effort unprejudiced by anything the market would desire or even tolerate, our strategy was to force them to put down (design) tools and begin immediately with sections on Marketing and Teamwork.

3.1 Marketing

We were quite fortunate in obtaining the services of an experienced market consultant, Chris Halliwell (formerly of Regis McKenna) and her colleagues. In addition, the lead off marketing lecturer was Dr. William Davidow, a Caltech Trustee and the principal of Mohr Davidow, a leading VC investor from Silicon Valley. Dr. Davidow has written two marketing books, one of which (Marketing High Technology: An Insider’s View – Free Press, 1986) was used as the reference for his three lecture / discussions.
3.2 Teamwork
Kimberley Heart, a consultant in forming teams, led the Fellows through several exercises to help them form and sustain interpersonal bonds within their teams. Kimberley also made herself available as a teamwork mentor, particularly during the early stages of the Fellowship.

3.3 Courses Incorporated
In addition to the seminars and classes created specifically for the EFP, the Fellows participated in regularly scheduled classes at Caltech. During the fall term, the Fellows attended “Product Development,” a class co-taught by Caltech Professor Ken Pickar and Art Center Instructor Geoff Wardle and “Accounting & Finance” by Caltech Professor Mark DeFond. The Fellows served as teaching assistants in the winter term for “Entrepreneurial Development,” a class taught by Caltech Professor John Baldeschwieler.

3.4 Tech Coast Angels
Another very important component of the program is the exposure of the Fellows to actual bi-weekly presentations by entrepreneurs to an Angel investment network (www.techcoastangels.com). The students heard the presentations and were then permitted to sit through the Angel analysis of the various companies. Students could then match the Angel’s judgment against their own and learn what works and what doesn’t. This real world experience was very valuable in adding illustration to our Lectures on what features characterize a fundable company.

4.0 What has worked and what needs work?

4.1 What has worked:
- Feedback sessions: The Fellows are asked to provide formal feedback on a quarterly basis. This ensures that the committee and the students get an opportunity to air concerns and recalibrate the program’s activities, as necessary. We do this in two ways: videotapes and personal interviews. Students are asked by an interviewer to document their thoughts on tape, which often leads to more revealing statements about the program, although the comments are one-way conversations to the committee. We also bring the students and the committee face to face, to have a dialog about the program. This flexible adjustment of the program to the needs of the students is a critical component of our educational effort.
- Charettes: This is an intensive presentation exercise, with a day or so notice, in which the teams demonstrate their current level of understanding and innovation on a topic. The Fellows do a charette per quarter, which is attended by committee members, as well as faculty and business people outside the
program. This interaction has been extremely useful in assessing the students, identifying curriculum areas that needed more focus, and in offering the students practice in presentation, networking and performing under pressure.

- Participation in Working Committee meetings: The Fellows were often participants in the bi-weekly meetings to develop the program. In this way we learned what topics they wished to know more about, which speakers were particularly relevant, or any areas that the committee needed to improve.

- Mentors: Each student team had a mentor who met with them regularly to provide advice and guidance, and also to alert the Working Committee to areas that need improvement. We implemented this aspect of the program in the 5th month after the students expressed an interest in getting more “hands-on” assistance. The mentors have proved invaluable, helping the students to set near-term goals, mediate team disputes, and provide objective feedback to the Working Committee on where to focus its training efforts.

4.2 What needs work:

- Steering Committee. Many members of this group had more energy than the program made use of. We would like to find additional ways to engage them and benefit from their experience. One way is to have them host the Fellows as interns or formally arrange mentorship relationships between individual students and Steering Committee members.

- Working Committee. We should allow more time for planning and coordination. Despite admirable commitment from several people, the program would benefit from having extended connections to the faculties of both schools.

- Administrators. Due to budget constraints, we initially decided to only have a part-time administrator for the program. However, it soon became apparent that each school could benefit from having its own administrator to coordinate staff and facility issues particular to each location. In addition, the program would be best served if it too had its own administrator. While the workload is not full-time, the program is full-time. Often when a guest lecturer came to campus, we would have to scramble to assign someone to provide logistical support to the instructor. This put a strain on the Working Committee.

- Program Tasks: In an attempt to involve the students in the program management, we introduced a list of administrative tasks to solicit their participation. This included handling petty cash, arranging for speakers, updating the web site, etc. Without a manager regularly following up with the students and providing clarification and guidance, this initiative did not succeed.
5.0 The future of the Entrepreneurial Fellowship Program

5.1 Payment of Fellows

For the first iteration, it was never questioned whether we should pay the Fellows a stipend for the duration of the program. How much to pay them was debated extensively.

During the first iteration, many people external to the program have questioned whether it is necessary to pay students a Fellowship salary on such a program. They told us that the Program provides the student with a high value benefit, sufficient for a student with entrepreneurial ambitions to attend without reimbursement. Therefore, perhaps the biggest change planned for the next iteration is to abandon the Fellowship model, replacing it instead with a modest fixed stipend per student to cover expenses such as travel for business meetings.

This, of course, has major ramifications on the cost of running the program as well as probable affordability issues with the next generation of students.

5.2 Number of students enrolled

Relieved of having to fund students, it is now possible to enroll more students. Funding for the first round restricted us to awarding eight fellowships. For the second round we are aiming to enroll between twelve and fifteen, to increase productivity.

5.3 Duration of Program

The first iteration started last July and finished this March – nine months altogether. It was originally felt that it would take at least that long for the Fellows to absorb the lecture and advisory input and allow them time to build a solid business plan and seek backing for it.

In addition, many of the Fellows, when asked, stated a preference for a September start rather than the July beginning that we implemented.

Observation of the rhythm of this first program iteration suggests that some time could be shaved off while still covering the same ground. With this in mind and also taking into account that students would be supporting themselves on the next round, it has been decided to reduce the duration of the program to six months. We are quite confident that the course material can be covered in that time. It is less clear whether
the Fellows would have time to be in good enough shape to launch their business plan after the six-month period.

Therefore, it is proposed that after the sixth month period there would be an optional three-month period of mentorship. This effectively means that the Fellows would finish their learning program and be free to return to other studies, other employment or begin serious start-up activities but still have access to the course tutors and advisors for a three-month interval. This mentor phase would help them find their way at a critical phase and ease their transition.

5.4 The “Charette”

During the original design of the curricular content, the idea of regular charettes throughout the program was much discussed. A technique familiar to architects and other creative professions, this intense period of problem solving is familiar to many of Art Center’s students and faculty. It was decided that this would be a novel concept in the teaching of entrepreneurship. The idea was to “pressure” the Fellows into creating their business plans right at the beginning of the program so that they would quickly understand what they didn’t know. It also enabled the different teams of fellows to bond more quickly by forcing them to perform with each other under pressure. At regular intervals throughout the program, further charettes required the Fellows to reiterate their business plans folding in their increasing knowledge and experience. This seems to have been a successful part of the program, which will remain an integrated part of the next phase. However, the number of charettes and learning activities between each charette will be reviewed with the aim of making the program more time-efficient.

5.5 Caltech and Art Center

In two very disparate institutions, it has not been missed that business and entrepreneurial skills remain a common weakness amongst the student body of both campuses. In the first instance this seemed in itself to be an ideal platform to collaborate on.

However, as the program has developed, it has become evident that the very different creative processes of Caltech and Art Center have contributed other valuable inputs to the learning process for the Fellows. Engineers and scientists tend to arrive at solutions through rigorous, logical deduction supported by mathematically defined modeling, disciplines that gel well in the business world. Designers, on the other hand arrive at solutions through qualitative rather than quantitative reasoning, frequently the MO of entrepreneurs. Mixing these two cultures together in a high-pressure environment has been a valuable experience for both. In
many ways it has helped replicate the realities of starting a new company where often people of different backgrounds and temperaments find themselves working for a common cause. It is unanimously agreed that involving the two institutions is an important component of the program – now and in the future.

5.6 Marketing Phase

One of the key modules in the first program has been our marketing section, which stressed the significance of a thorough marketing strategy. It was clear that this part of the program needed even more focus including a yet more hands-on approach.

5.7 Selection Procedure

One of the most important and difficult phases of the program is the selection procedure. Much discussion preceded the first iteration. We are fairly sure that we finally selected the most promising of all of the applicants but we are not sure that we necessarily attracted the most ideal applicants.

One of the fundamental factors we face is this: by nature, entrepreneurs spot a “hole” in the market to be exploited and then figure out what product, technology or service is needed to fill the market. By nature, students of both Caltech and Art Center have already created a new technology or product before they look for a market – the wrong way round!

Therefore, we feel certain that our challenge is to ensure that successful applicants to the entrepreneurial program do not spend too much time on product development but concentrate on spotting the market first and that they understand the importance of this approach. As we start the publicity and selection procedure for the next round, we are very mindful of this. It is important that we send out the right messages to the student body of both campuses.

6.0 Conclusion

At this writing, we have no assurance that any of the Fellows’ proposals will be funded. In fact two of their four initial ideas have been abandoned. However, as we near the homestretch of our first iteration, we all feel that the Program has been a fascinating and highly revealing experiment in teaching entrepreneurial culture to students used to other fields of study. We all believe that the education mission has been fulfilled as measured by our own perceptions and that of the Fellows themselves. We all feel they will have acquired enough knowledge to understand very thoroughly what it takes to create a business out of an idea.
We have learnt a great deal and naturally know now what we wish to do differently for future iterations. We feel that there is room for changes to the fiscal aspects of the program, program content, program length and the number of participants.

With these and other changes, we are confident that we can continue to offer a unique, rewarding opportunity for our students.

7.0 Acknowledgements

Many people contributed to this program and we are very grateful for their dedication, enthusiasm and generosity:

**Fellows** – Eagle Jones, Joey Jones, Fred Romberg, Dan Schenck, Robert Sneddon, Matt Carroll, Serge Sverdlov, Yasufumi Shiraishi, Boris Axelrod

**Steering Committee** – David Baltimore, Richard Koshalek, Richard Murray, David Goodstein, Michael Dobry, John Ledyard, Ron Jernigan, Larry Gilbert, Abe Zerem, Puneet Newaskar, Rohit Shukla, Eric Dysart, Jonah Schnel, Larry Gilbert, Phil Weilerstein,

**Working Committee** – Richard Murray, Michael Dobry, Tony Luna, Steve Diskin, Andy Davidson, Dan Frydman, Dean Schonfeld, Simon Niedenthal, Kit Baron

**Visiting Lecturers** – Tony Luna, Kimberley Heart, David Zuckerman, Rich Wolf, Dan Frydman, Andy Davidson, Steve Diskin, Chris Halliwell, Patty Burke, Tim Bailey, Bob Michelet, Ken Deemer, Bill Davidow, Jim Brown, Dave Anderson, Brenda Laurel, William Deverell, John Glanville, Sara Hammes, Bill Jenkins, Mark DeFond, Bill Thomson

**Mentors** – Jim Brown, Andy Davidson, Steve Diskin, Geoff Wardle

**Administrators** – David Zuckerman, Peter Mendenhall, Renee Rottner, Elliott Andrews, Marionne Epalle, Kathryn Shaw, Grant Stafford, Amit Kenjale, Jin Park, Scott Payne

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