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The student role in catalyzing an innovation movement in higher education

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The Student Role in Catalyzing an Innovation Movement in Higher Education

An Honors College Project Presented to
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Honors College of
James Madison University

by Christopher Daniel Ashley

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Dedication

This thesis is dedicated to the students, faculty, and other professionals who have worked to empower students to become agents of change on and beyond their campuses. Your efforts to spread innovation and entrepreneurship throughout higher education ensure that all students gain the necessary attitudes, skills and knowledge required to compete in the economy of the future.

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Preface

The purpose of this paper is to highlight the significance of the student role in enhancing the innovative and entrepreneurial landscape of higher education. Furthermore, the paper presents methods in which students can go about catalyzing a movement of change, and discusses examples of how these methods have been effectively applied. It is important to note that the methods and examples included in this paper are by no means the only ways students can go about creating change at their institutions. They are simply some of the methods that have been taught by Stanford University's University Innovation Fellows (UIF) Program and have worked for students at James Madison University to enhance their landscape. This paper reflects the findings and experiences of students who have been trained in the UIF program, and who have applied the training to their campuses.

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Introduction

Creativity breeds innovation which, in turn, breeds growth in an economy. While the concept of innovation has recently gained a foothold as a commonplace term, the fact that it drives economic growth has been true for centuries. As early as 1776, a connection between innovation and economic output was observed and discussed by Adam Smith- one of the fathers of modern economic thought (Smith, 1776). More recently, Nobel Prize-winning economist Robert Solow attributed the majority of growth in an economy to technological change, or innovation, in other terms (Solow, 1988). From an economic perspective, simple theory dictates that growth can stem from two possible sources: either an increase in inputs or an improvement in processes that cause increased output from the same quantity of inputs. The latter serves as a basic understanding of innovation, and defines a simple relationship between it and economic growth.

In a study done by Hasan Torun of Ege University in Turkey (2007), economists calculated that “approximately fifty percent of U.S. annual GDP growth is attributed to increases in innovation” (p. 30). With such a large observed dependence on innovation to generate growth, it is no surprise that higher-education institutions have begun building the topic into curriculum and strategic plans. In 2011, 142 major universities submitted a letter to the U.S. Secretary of Commerce pledging their commitment to innovation and entrepreneurship on campus, and requested continued support from the federal government in these areas (U.S. Office of Public Affairs, 2013). In response, the U.S. Department of

Commerce released a report (2013) proclaiming “the Obama administration is committed to fostering innovation and supporting entrepreneurs, both of which are key drivers of U.S. economic growth” (p. 4). The report discusses how universities across the country are contributing to the support of innovation and entrepreneurship in order to accelerate growth, and specifically highlighted five key areas of focus:

- Promoting student innovation and entrepreneurship;
- Encouraging faculty innovation and entrepreneurship;
- Actively supporting university technology transfer;
- Facilitating university-industry collaboration; and,
- Engaging in regional and local economic development efforts (U.S.

Department of Commerce, 2013).

This thesis focuses on the first key area, and explores the student role in enhancing the innovative and entrepreneurial landscapes of college campuses and surrounding communities.

According to the report by the U.S. Department of Commerce, today’s universities are more focused on the “pedagogical value of entrepreneurship as a set of skills that can be applied across professional environments and activities to supplement the students’ classroom experience” (2013, p. 10) rather than explicitly training students to launch their own companies. Coinciding with the release of this report, the University Innovation Fellows (UIF) program was launched with the intent of catalyzing this innovation movement from a student level to apply the

skills and mindsets across all disciplines and studies. The program and its methods of sparking student-led change are specifically focused upon in this paper, in an attempt to highlight the significance of the student role in creating innovative change in higher education.

The University Innovation Fellows Program

In 2011, the National Science Foundation awarded a grant to Stanford University and VentureWell to create the National Center for Engineering Pathways to Innovation, or “Epicenter”. Epicenter’s mission was to empower collegiate engineers to bring their ideas to life for the betterment of the U.S. economy and society (“About Epicenter”, 2017). As Epicenter developed over the following years, the program directors began to realize that students of all disciplines- not just engineering- have the potential to realize their ideas and improve the world around them. Thus, in 2013, the Epicenter launched the University Innovation Fellows program to “empower the next generation of student leaders to seize the opportunities for change that exist at their schools” (Moore, 2013, p. 2). The UIF program took a grassroots approach to integrating innovation and entrepreneurship into the university culture, as it allowed students to take ownership of the change they wished to see on their campuses. UIF director Humera Fasihuddin explained, “if students can organize and fill gaps and demonstrate their combined interest, they can make the change happen” (Moore, 2013, p. 3).

It was this mentality that laid the foundation upon which the University Innovation Fellows program evolved. In less than four years, the application-based program has grown to over 1,000 Fellows distributed across 185 universities internationally. Accepted applicants participate in an intensive six-week online course that trains them to evaluate and map out the innovative and entrepreneurial

landscapes of their own schools. The training teaches empathetic design processes as it arms the students with the network, tools, and resources to enhance those ecosystems. The resulting network of like-minded students share a mindset of and passion for innovation, creativity, and entrepreneurial thought. However, what truly sets these students apart is their drive to make lasting impacts at their schools.

In 2016, the National Science Foundation grant expired, and the University Innovation Fellows program found its new home at Stanford University's Hasso Plattner Institute of Design. Since its initial launch in 2011, the University Innovation Fellows program grew and evolved from a prescriptive program to a community of student leaders who create new learning opportunities for their peers while inspiring them to seize opportunities, define problems, and address global challenges. Fellows across the country are founding student organizations, hosting interactive events and workshops, collaborating with faculty on new courses, creating student makerspaces and prototyping labs, and providing opportunities for cross-disciplinary collaboration at their schools. They advocate for lasting institutional change with academic leaders, and represent their schools at national events to further catalyze the national innovation and entrepreneurship movement.

From Theory to Practice

As the University Innovation Fellows program has developed and evolved over the past several years, its implementation tactics have been refined to incorporate tips, tricks, and failures that have been observed in various training cohorts. The following sections describe these tactics, and provide the necessary resources for students to create innovation movements on their campuses, with or without official training of the UIF program. Most importantly, each tactic highlights the significance of the student perspective and involvement in keeping the program effective.

Identifying Gaps

The first step in fostering a culture of innovation and entrepreneurship at a college or university is evaluating the current landscape and identifying the gaps within. To help formalize this process, the University Innovation Fellows program introduced the Landscape Canvas (Appendix A). This tool serves as a framework that allows students to classify both on and off campus resources that affect their schools' innovative and entrepreneurial ecosystems. This tool was inspired by the Wenger-Trayner concept of “communities of practice”. These communities are “groups of people who share a concern or a passion for something they do and learn to do it better as they interact regularly” (Wenger-Trayner & Wenger-Trayner, 2015, p. 2). This concept has three main identifying characteristics:

1. The Domain: A community of practice is more than just a club or network of individuals. It must have a core shared domain of interest which defines its identity. This implies a commitment by members to the domain, and a shared competence that distinguishes members from non-members. This competence is not necessarily recognized outside of the community, as long as the members value their collective competence and learn from each other.
2. The Community: As members pursue their interest within their domain, they engage in discussions and joint activities to help each other and share information. They build relationships, and care about their standing with each other. The key is in the interactions and shared learning experiences

which bind them into a community. For example, The Bloomsbury Group fit this description as they routinely met at coffee shops to share and discuss progressive ideas and theories in WWI-era London.

3. The Practice: Members of a community of practice are not simply those who share a common interest. Members must be practitioners, developing a shared aggregation of resources including experiences, stories, tools, and ways of addressing common recurring problems. This sharing of knowledge that has been gained through hands-on relevant experience in their practice separates a community of practice from a common-interest group, such as a student rock-climbing club. The differentiator is the common practice within the group, such as a shift of nurses who regularly share stories and tips during their lunch break about how to handle various situations with patients (Wenger-Trayner & Wenger-Trayner, 2015).

These three requirements of a community of practice were built-in to the Landscape Canvas, which is split into five stages of discovery:

1. Discover: This section lists resources which generate awareness about the importance of innovation and entrepreneurship to students, and describes their fundamental elements. Resources in this section are those with perceived value to students, and can include introductory courses, inspirational events such as a TED talk, and how-to workshops.

2. Learn: Resources in this section are the ones with potential value to students. Here, students recognize the importance of innovation and entrepreneurship, and want to become more involved through learning and growing their skill sets. Examples may include courses which convey innovative and entrepreneurial concepts, extracurricular clubs, and competitions.
3. Experiment: This section deals with resources that have applied value. Students interested in these resources want to apply their knowledge to a specific challenge or program, and may consider starting their own project or venture. These resources help students strengthen ideas into viable opportunities, and may include experiential courses, makerspaces, and industry collaborations.
4. Pursue: Resources in this stage assist students in committing to a project or opportunity and seeing it through to implementation. This may include startup accelerators, seed funding sources, campus patent consultants, and grant resources.
5. Spin Out: Resources in this segment are for students who have mastered their understanding of the innovation and entrepreneurship process, and employ that mindset in everything they do. These resources may include manufacturing spaces, dedicated mentors, and technology parks.

Upon completion of the Landscape Canvas, students should have a clear picture of the resources that exist in their school's ecosystem, as well as the gaps between

each segment. These gaps and findings in the landscape will be different for each school, but there are several common observances that are commonly found in higher-education institutions:

1. Inverted Course Structure: Many universities that are just beginning to integrate innovation and entrepreneurship into their mission exhibit an inverted course structure when it comes to teaching innovation and entrepreneurship. The concepts are not introduced until 300 and 400 level course offerings. This structuring is based on the incorrect idea that students need to accrue a certain depth of knowledge in their particular field in order to apply basic innovative and entrepreneurial concepts to their studies. In reality, students need to begin exploring their potential to be innovative and entrepreneurial at an early age so the mindset and thought processes are ingrained by the time they begin developing a more focused knowledge base. By the time most students are taking 300 and 400 level courses, they have already begun to plan their careers through accepting internship or job opportunities, and the perceived risk to change gears and experiment with innovation and entrepreneurship is too high. The structure of curriculum dealing with innovation and entrepreneurship must be inverted to introduce the concepts during students' first and second years, so they can apply them to everything they learn throughout their remaining studies.

2. Disciplinary Silos: Once students finish their general-education curriculum and begin studying in their specified major, they often find themselves interacting with the same students in the same major in the same building on campus every day. Dr. Clayton Christensen of Harvard University explained that “educators and institutions of higher learning can be the least innovative because they build silos and focus on deep learning rather than interdisciplinary problems and ideas” (Capener, 2015, p. 1). Departments often compete in a constant-sum environment where resources are scarce and only obtained by outshining other departments. The resulting culture is one which promotes superiority over other departments, and discourages sharing of resources and ideas. This issue stems from poor metrics which incentivize personal success over a shared group mentality. However, students have too little influence to fix a university-wide misalignment of incentives, and must focus on breaking down the barriers between disciplines in other ways, discussed later in this paper.
3. Textbook vs. Experiential Learning: While more and more schools are increasingly offering experiential learning opportunities through trips, capstone projects, and industry collaborations, higher education is still firmly rooted in the transference of knowledge through textbooks and simulations which teach the theory of various concepts. However, the real world demands that new employees bridge the gap between theory and practice, and develop true competencies necessary for success in the industry. Kolb’s cycle of

learning depicts the experiential learning process, beginning with conceptualizing abstracts, testing new ideas based on abstract theory, engaging in authentic situations, and reflecting and relating to prior experiences to build a connected set of knowledge (Kolb, 1984). This process is cyclical, so the expanded knowledge base then contributes to the understanding of new abstract concepts, and so on. A report published by the National Science Foundation concluded that active, rather than passive, teaching approaches reduced failure rates by 55 percent and improved exam grade by an average of 6 percent, or half a letter-grade (National Science Foundation, 2014). The first universities in Western Europe were founded in 1050, and the lecture-based teaching methods used then have been the prevalent method ever since. While students will not be able to dethrone this age-old practice overnight, they can create more experiential learning opportunities for their peers to fill the void until higher-education teaching theory is reformed.

4. Hidden Resources: At some universities, innovative and entrepreneurial resources exist but are unknown to the students. This happens because schools are split by disciplines, while innovation and entrepreneurship span multiple disciplines. Top administrators may see an abundance of resources on paper, but in reality they are split up and tucked away in all corners of campus. For example, the design lab may be housed in the art school, the engineering department likely runs the prototyping lab, the business school

may contain the business development center and student accelerator, and the technology transfer office may even be located in a non-academic building off-campus. At first glance, this looks like an array of all the tools a student may need to take their idea to market and launch a business. However, this division of resources across a wide map leads to students not knowing what resources exist, where to find them, or who to ask for help. Student awareness of such resources must be increased through aggregating these resources into a common location. Long term, this could mean creating an innovation and entrepreneurship department to house all the resources. In the short term, though, students can address the problem by creating a website or reference tool that outlines and virtually aggregates the resources with their peers.

While these four observations do not apply to all schools, these are the most commonly identified gaps by students from universities in the University Innovation Fellows network. Each campus will have its own set of strengths and weaknesses, and completion of the Landscape Canvas will help students evaluate their own campus ecosystems. These are simply four areas students should consider when analyzing their own innovative and entrepreneurial landscapes.

Identifying Stakeholders

After evaluating their innovative and entrepreneurial landscapes, students need to identify key stakeholders on their campus. Stakeholders are the individuals who are invested in the environment, or those that are at least interested in it. This list would typically include the president, provost, deans, and students, but it can also include relevant faculty members, student organizations, community members, or companies. Students who construct a sufficiently thorough list will end up with a large list of names that need to be sorted by level of investment and administrative power. To more easily sort through the list, Dan Toma, author of “The Corporate Startup”, created the stakeholder radar map (Appendix B) to help manage the expectations of each individual stakeholder based on their degree of organizational power and interest in the movement.

The radar map is a simple two-axis system which sorts all stakeholders into one of three groups. The X-axis represents a stakeholder’s interest in the project, and is split into three categories: low, medium, and high interest. The Y-axis represents the level of organizational power a particular stakeholder holds in the ecosystem, and is divided likewise into low, medium, and high power segments. Curved lines are drawn to connect both axes at the categorical divisions, and separate the chart into three categories as shown on the diagram. Students then take their list of stakeholders and position them on the radar map based on their ranking in both categories.

Once positioned, Toma advises to closely manage stakeholders in the “high” category by periodically giving them an in-depth report on the progress of the project. He suggests keeping “medium” level stakeholders in the loop, and only monitoring “low” level stakeholders. To further understand the stakeholders, they should be labeled as critics or supporters on the map, and adjusted as needed if their position or opinions regarding the project change. The ending result highlights the stakeholders worth investing time and energy into, as well as those who are likely to help initiatives become successful.

Understanding the Stakeholders

After identifying stakeholders, students must take the process one step further and focus on understanding the stakeholder. When developing key strategies to help close the gaps in a Landscape Canvas, it is important to learn and understand stakeholders' motivations and pain points through empathizing with them. Initiatives planned without empathizing with the stakeholders will likely become misguided or ill-informed, and will fail to bridge the gap identified in the landscape. This process of getting to know stakeholders is a main tenant of design thinking and human centered design mentalities which the University Innovation Fellows program champion. These ideologies emphasize designing initiatives to explicitly serve the needs of the stakeholders and customers, rather than developing the product first and then trying to find potential customers second. In other words, teams should strive to fill in two blanks: our users need a better way to _____ because _____. The key in this sentence is the second blank, focused on understanding the reasoning behind a solution.

The Hasso Plattner Institute of Design at Stanford University's Process Guide on Design Thinking suggests the best method to truly empathize with a stakeholder includes observing, engaging with, and listening to them to truly understand their perspective and position. The guide explains that in order to "create meaningful innovations, you need to know your users and care about their lives" (p. 2). Empathy maps (Appendix C) are useful tools to help gain this level of understanding towards stakeholders, as they frame six areas to explore with one.

These areas consist of “think and feel”, “hear”, “see”, “say and do”, “gains”, and “pains”. After completing empathy maps for each stakeholder, teams will have a much better understanding of how to best close the gaps in their landscape through developing initiatives that maximize satisfaction across stakeholders.

Establishing Strategic Plans

After fleshing out the Landscape Canvas and getting to know the stakeholders, students should be equipped with the knowledge and comprehension necessary to develop effective strategic plans. When choosing initial projects to focus on, new student change-makers often find themselves biting off more than they can chew, only to be disappointed when their valiant plan is thwarted by institutional resistance. For example, a common observation is that the general education program is outdated, doesn't cater towards innovative thought, and forces students to waste time taking classes they have no interest in. However, students must remember to view things from a grassroots level, where they can make a difference without complicated administrative approval. Changing an entire set of curriculum is a daunting and lengthy task for even the most experienced faculty and administrators. A study by York College reports that redevelopment of a general education program takes an average of 2.5 years to complete, and can easily take much longer (Macdonald, 2003). Students only have four years in higher education, so dedicating their efforts to changing curriculum would be an inefficient use of that time. Instead, students should focus on the "low hanging fruit", or the areas they can make continuous impacts relatively quickly. By focusing on these types of initiatives, students can catalyze a movement across campus that will eventually influence long-term administrative agendas.

From the start of their work, students must have a bias towards action and implement the Lean Startup Approach- designing, prototyping, testing, and revising their ideas to fit the needs of their campus. Students must keep in mind that most change at an institution comes from the top down, and is outside of their direct control. By creating demand and interaction from a student level, a movement will gain the traction necessary to be recognized by university administrators, and will begin to change the culture of innovation and entrepreneurship at the school.

Applying the Process – James Madison University

Strategic plans will vary from school to school, depending on their current landscape, goals, and resources. At James Madison University (JMU), a total of eighteen fellows have gone through the University Innovation Fellows training over the past three years, and have been working to enhance the landscape over the past three years. Through following the steps outlined in this report, the team created a campus-wide movement which has helped establish the school as a leader in innovation and entrepreneurship. What started as an idea from five students in a board room has transformed into a change of culture and identity at the university, after persistent dedication to creating new opportunities for students.

While participating in the training program, the team recognized many of the common gaps previously discussed in this paper. Upon completing their Landscape Canvas, the team observed an inverted course structure, a bias towards textbook learning, a siloed campus, and poor student accessibility to the resources that did exist. Generally speaking, innovation and entrepreneurship were not typically discussed or considered by many students. Upon completion of the training program, the team embodied a strong bias towards action and immediately begin planning an event to generate buzz about innovation and entrepreneurship across the student body.

The JMU Fellows established a clear, simple goal for their efforts: to create innovation opportunities for students in order to help them realize their full potential to be creators and innovators, while simultaneously elevating James

Madison University's national recognition as a nationwide leader in innovation and entrepreneurship. The fellows made a strong statement about the unique power of student-led initiatives by planning, organizing, and hosting JMU's first student-run hackathon with a miniscule lead time of three weeks. In this time, the team raised almost \$10,000 in sponsorship and attracted over 60 students from across campus to participate in the event, named Bluestone Hacks. The students marketed the event with the intent of attracting not only the tech-minded students, but also non-traditional hackers in efforts to increase cross-disciplinary collaboration and help non-tech-minded students expand their perspectives. This was done through in-person marketing in classes to verbally explain a hackathon and dispel any misconceptions about the event, as well as tweaking the event to cater towards more students. By creating three themes of food, healthcare, and consumer devices, the event attracted more students than if they had chosen a traditional hackathon theme, such as "artificial intelligence". By choosing broad, familiar themes that the vast majority of students could relate to, first-time hackers were less intimidated by such an event.

While the event certainly had an impact on students, the JMU team also leveraged the hackathon as an opportunity to begin gaining notoriety with prominent administrators and stakeholders across campus and the community. The school president spoke at the opening announcements, most of the deans were present, as was the provost. As sponsoring companies, such as Cisco, Capital One, and Target, lined the walls, this short-notice event put the team on administration's

radar, who was surprised and impressed with the student ability to move quickly and effectively to begin making a difference. The first annual Bluestone Hacks served as a launching point for the movement, proving the team's value to and credibility with top administrators.

The team leveraged the event to establish their first strategic partnership with key university stakeholders, and to introduce the student voice into developing the larger innovative and entrepreneurial landscape of JMU. In the following weeks, the team arranged and held an hour-long meeting with the university president and his wife which broke the ice between parties and established an open line of communication from the team directly to the university's top administrator. He pledged his continued support for the University Innovation Fellows program, and shared his perspective with the team. In that initial meeting, the JMU Fellows delivered a win-win value proposition to the president by offering to help push his initiatives forward from the relatively agile student perspective in return for his continued support of the initiative.

The same approach to shared value must be applied to all strategic partnerships, whether with corporate sponsors, faculty, or students. There must be a clearly defined value proposition for stakeholders by entering into such a partnership. This may be marketing for sponsors, increased lab hours for students, or national recognition for administration. The basic rule is that all strategic partnerships must be built on a win-win value proposition, so both parties leave happy and have a reason to continue working together.

The JMU Fellows team built strategic relationships with not only the university president, but also the Board of Visitors, department heads, deans, and most importantly- faculty. Students must find the faculty members who are going to open doors for and empower them. They must find the ones interested in helping the team, and avoid the ones who say something is not possible, or that they cannot help. Primarily, a strong faculty sponsor is key to the success of a movement, as they can make connections with key personnel across campus. They also understand the way academia functions, and can help students navigate through the institutional resistance found in academia. As more faculty get involved with the movement, students begin developing traction and credibility throughout different departments on campus, and the movement begins to take root at a more sustainable level. For example, to deal with the lack of cross-disciplinary collisions and courses, the JMU Fellows partnered with faculty to pioneer several pilot-courses, co-led by professors in five or six different departments. Interdisciplinary teams of students were formed, and they were tasked with solving problems using their relative expertise. Course topics have included Drone Design, Bio-Medical Innovations, Hack4Defense, and Real-World Application of Drones- to name a few. These are unlike any other course at JMU, and their status as pilot courses means they are much easier to get on the enrollment books as electives. Professors are allowed to test out courses without making them an official part of the curriculum, so pilot courses provide a route to start offering a certain class while waiting on its official approval into the curriculum. These courses helped to introduce younger students to innovation and

entrepreneurship, and were based largely around experiential learning. Students conducted field research, met with industry professionals, and prototyped their ideas. Furthermore, courses like these have started to break down silos across campus, as professors are developing relationships with their peers in other departments, and are working together to enhance the student-experience. As more professors begin to operate with a mindset of collaboration instead of separation, the barriers between departments will begin to diminish.

To continue pushing the movement forward, JMU Fellows launched a series of Pop-Up Courses directed at students. These courses occur every week at the same time, for two hours. Participants work with each other to learn and test out new skills and knowledge not found in a traditional classroom setting. Past topics have included laser cutting, LED design and programming, glass blowing, virtual reality, and even DIY electric skateboards, and many more. This strategy dealt with several gaps, as it allowed students from all majors to come learn and collaborate in a hands-on experiential manner. Additionally, this initiative helped build more partnerships in different areas of campus through its win-win value proposition: professors got to test out new topic ideas or share a hobby with students, and the JMU team gained talented educators to help lead the courses.

Over the year, momentum of the movement surged, and led to the team presenting to JMU's Board of Visitors, hosting a UIF regional meetup for fellows from surrounding schools, and presenting at SXSWedu. These types of events bring value to administration, as they improve the national public image of the school,

which in-turn improves administrative support for student initiatives. Additionally, presenting to the governing board allowed the student perspective to be heard by top decision makers, and allowed the team to see the top-down perspective. This presentation brought students into the conversation and decision making regarding the future of the school.

While students are able to move faster and initiate different types of change than administration can, it is important to realize that change has to come from both parties. Administration can create permanent change from a planning perspective, and their decisions ultimately determine the direction of the school and control the funding of initiatives. Students must understand their goals, while also selling administrators on the need for changes to enhance the innovative and entrepreneurial landscape. Ultimately, the students' goal should be to have their initiatives institutionalized to ensure they will continue to exist and make an impact long after those students leave. Administrative support is key to making student initiatives a formalized part of the school, and the JMU Fellows used the methods taught by UIF to make a difference, gain notoriety with key individuals, and institutionalize their initiatives.

Conclusion

Today, James Madison University is quickly becoming a regional hub for innovation and entrepreneurship, and will soon develop stronger awareness at a national level. Students outside of the University Innovation Fellows program have been inspired to take it upon themselves to host TEDx events, launch the nation's first virtual reality program, develop accelerators, and start their own businesses. The movement has taken root as a shared entity, owned by no one group, yet contributed to by many. Over the past three years, JMU has developed a reputation for success, innovation, and a shared community of students. Students certainly cannot take all the credit for the changes in the landscape and culture, as change comes from both ends of the higher-education spectrum. Yet, this movement was sparked, fostered, and spread by passionate students determined to leave their mark on the university for future generations to enjoy.

Students at all schools can catalyze similar changes in their innovative and entrepreneurial landscapes by following the guidelines above and using the resources mentioned in this paper. Students have tremendous power for change when they learn to navigate the system properly and form partnerships with the right people. Change in academia has traditionally taken years to trickle down from the decision-makers to the student level. With that in mind, students must realize if they want to make the most of their four years, they themselves need to instigate the change they desire. Through student empowerment, a thorough understanding of the landscape and stakeholders, and strategic partners who value and encourage

the students, higher education can be changed for the better, and it starts at a grassroots, student level.

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Appendix A

The Landscape Canvas

Mapping the Innovation & Entrepreneurship (I&E) Landscape

This resource was created by the University Innovation Fellows Program.

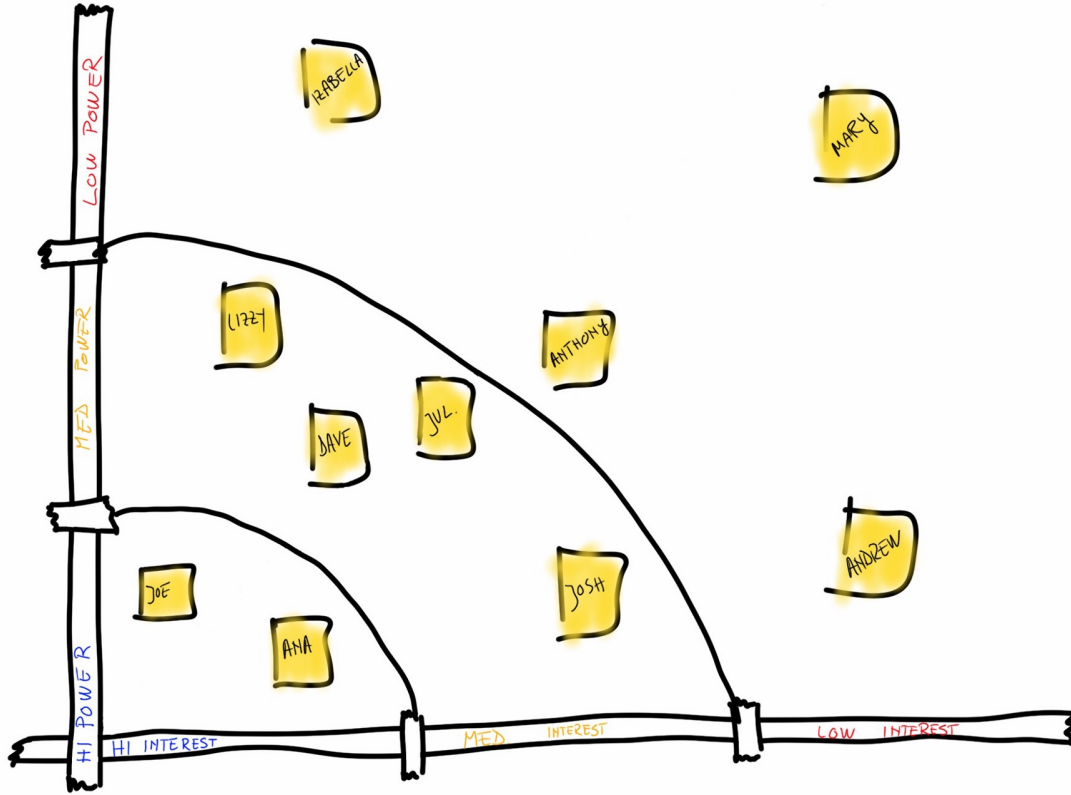
Directions:

- 1) Research campus assets on the web and by interviewing students, faculty and administrators. Enter relevant program name, club, course or item in relevant boxes. Include estimated enrollment numbers, key contacts & websites.
- 2) Get feedback. Don't worry about capturing everything before 'Getting out of the building' and interview stakeholders.
- 3) As your institution adds new courses, programs, resources and mechanisms that advance I&E on campus, update your Landscape Canvas.

Discover	Learn	Experiment	Pursue	Spin Out
<p>"Students, I&E is important. Make it a priority."</p> <p>Generating awareness, importance and fundamental elements of I&E to students.</p>	<p>"So, you want to learn more."</p> <p>Student realize I&E is important and want to get involved in deeper way.</p>	<p>"You want to apply your knowledge to a specific project."</p> <p>Student applies knowledge of I&E to a specific challenge/ problem. Form design team or work solo to explore potential.</p>	<p>"You have effectively engaged in I&E."</p> <p>Student(s) commits to opportunity. Student(s) license a technology, forms or joins venture startup, and/or attains legal status.</p>	<p>"You have fine-tuned your understanding of I&E and reframed your approach to your education and career."</p> <p>Commercialized entity continues and pivots further (3-10 years out) and adapts innovation to marketplace needs. (5. Spin Out)</p>
<p>Non I&E courses imparting importance of I&E in the context of larger subject area.</p>	<p>Courses (theory, case and/or discussion-based) conveying I&E concepts.</p>	<p>Experiential courses (senior design, Lean LaunchPad, and/or course requiring applied skills development).</p>	<p>Incubator, venture accelerator, bootcamp or startup venture space.</p>	<p>Technology, industrial park, manufacturing and/or wet lab space.</p>
<p>ENG200 Principles of Engineering BIO200 Biomimicry BUS200 Business Development</p>	<p>ENT100 Introduction to Entrepreneurship</p>	<p>BME400 Senior Design Capstone BUS 300 Lean LaunchPad</p>	<p>Off-campus incubator targeting campus innovators providing space, legal and grant-writing assistance.</p>	<p>Regional Technology Park providing office, industrial, manufacturing and biomedical space.</p>
<p>Inspiration (ie. TEDx or similar speaker event).</p>	<p>Extracurricular clubs and program offerings.</p>	<p>Infrastructure (ie. maker, prototyping, or innovation space; engineering lab offering access outside of class, etc.).</p>	<p>Seed funding sources.</p>	<p>Regional sources of capital (angel, VC, state or institutional funds).</p>
<p>Annual TEDx event</p>	<p>Design for America NAE Grand Challenges Scholars Engineering World Health Kairos Society CEO IE Student Club</p>	<p>Maker space off-campus Engineering Lab open to students outside of engineering and also those not formally enrolled in class</p>	<p>Seed fund managed by Office of the Vice-Provost of Research; grants of \$200 for materials & prototyping.</p>	<p>Syndicated angel network. One venture capital firm specializing in health-related technologies.</p>
<p>How-to workshops (day-long or short-term, speaker series).</p>	<p>Competitions (pitch, business plan or business model competitions).</p>	<p>Extracurricular formation and nurturing of design teams, vetting of opportunities.</p>	<p>Tech transfer office, standard and /or express policies and related offerings.</p>	<p>Mentoring, advisory or business networks.</p>
<p>Invention to Venture workshop teaches I&E basics in day-long workshop, BME department offers weekly speaker series.</p>	<p>Ten Thousand Pitches Competition, Business Model Competition, Startup Weekend, 3-Day Startup, or other engagement catalyzing formation of venture team in pursuit of a specific opportunity.</p>	<p>I&E Student Club forms design teams and curates group taking of a MOOCs (for instance, Lean Launchpad on Udacity, or Design Thinking Action Lab on NovoEd), internship, co-op opportunity or business plan projects with external partners. BME students spend one semester of Junior year at co-op Biomedical Engineering Company.</p>	<p>Student-friendly IP policy and processes; grant-writing, legal and/or other venture assistance (for instance, SBIR grant writing assistance offered by SBA, or free incorporation and patent counsel offered by law school).</p>	<p>Mentor network based on MIT Venture Mentor Service recently started.</p>
<p>Marketing and communications strategies</p>				
<p>Column in student paper, startup internship desk at Career Center, e-mail newsletter, profiles of successful entrepreneurs in alumni magazine.</p>				

*This canvas has been filled in with examples of resources in each category. Clear out each white cell in the canvas and fill with your school's resources.

Appendix B



*This map was created by Dan Toma

Appendix C

