Hacking Entrepreneurship Pedagogy With Near-Peer Mentoring at UC Berkeley

A. Balaraman
University of California-Berkeley

J. Finalyson
University of California-Berkeley

K. Singer
University of California-Berkeley

D. Tang
University of California-Berkeley

G. Fakoukaki
University of California-Berkeley

The productivity of an entrepreneurship program is assessed by its socio-economic impact, not just graduation rates. A study at UC Berkeley used social cognitive measures to evaluate the program, focusing on ethics and near-peer mentoring. Students present innovations addressing social issues.

Social Cognitive Career Theory examines career development through social cognition, considering individual traits and environmental influences. The research employed pre- and post-program surveys to assess entrepreneurial self-efficacy and education effectiveness, with 25% and 34% improvements respectively. Adapted from prior studies, the measures for self-efficacy and learning were calibrated at the program's start and end. Entrepreneurial pedagogy should address ethics, risk-taking, and success/failure patterns with near-peer mentors like Innovators-in-Residence. This study aims to enhance entrepreneurship education for a more impactful transformation of capitalism and social entrepreneurship.

Keywords: entrepreneurship, pedagogy, mentorship embedded in instruction, student diversity, interdisciplinary, near-peer mentorship, innovators-in-residence

LITERATURE REVIEW

Innovation and entrepreneurship are vital to enabling sustainable development. (UNESCO, 2019; UNESCO, 2013; United Nations, 2020). However, today, entrepreneurship and innovation cannot be adequately taught by the current higher education system for a few reasons. Failure is not the outcome that

entrepreneurs strive for when they start their businesses, and neither in the classroom. However, thousands fail each year, making failure a natural part of finding product-market fit. In a compressed classroom environment, the urgency to find product-market fit leads to shortcuts in viable business models that consider value creation between a buyer and seller rather than the broader society or implementing emerging technology, leading to unintended consequences. Current knowledge on entrepreneurial pedagogy is therefore quite fragmented- the gap between pedagogy and practice in how 'failure' is viewed and rewarded (Androutsos & Brinia, 2019); the inability to connect 'shared value creation' across business, human needs, and public policy (Driver and Porter, 2012); and the rapid pace of impacts of new technologies—from nuclear power to genetic engineering. Today, the space between concept and commercial application is compressed more than ever- into a few years or even months (Byers, and Seelig, 2021). This gives little opportunity for aspiring entrepreneurs to develop the skills and competencies to understand the potential impacts of their inventions and make principled decisions. As a result, there is a growing entrepreneurship pedagogical urgency to connect the three largely disconnected spheres of entrepreneurial education today, consisting of (a) real-world problems and needs, (b) skills and competencies required by the economy and society, and (c) the skills and competencies provided by the higher education system (Androutsos & Brinia, 2019).

Driver and Porter (2012) argue that rethinking entrepreneurship education should include techniques that integrate education across curricula and topics. Rethinking the entrepreneurship curriculum would break capitalism's narrow boundaries, including using market principles and economic value thinking to solve social problems. Capitalism, Porter argues, is currently moving toward the creation of *shared value*, "which involves creating economic value in a way that also creates value for society by addressing its needs and challenges." Therefore, teaching entrepreneurship to reframe economic value from a narrow definition of buyer and seller can lead to transformation in entrepreneurship curricula that teach strategies to create value that benefits not just the company but also society and stakeholders throughout the comprehensive value chain of the enterprise.

In this paper, we explore how a design-thinking-inspired entrepreneurial pedagogy can connect the disconnected spheres of entrepreneurial education and transform how students frame innovation as a 'shared value' creation across the value chain. The pedagogical framework consists of real-life case studies to develop skills and competencies to develop an ethical framework for adopting such technologies into innovations and access to social capital through mentors to reframe 'failure,' and know "what does not work." The teaching method draws upon a design-oriented way of thinking known as double-diamond (Seitamaa-Hakkarainen et al., 2008; Leinonen, 2014). The double diamond is a problem-solving design process in this program that moves student teams through two phases: Divergent and Convergent Thinking for problem- space definition, leveraging customer discovery, and Divergent and Convergent Thinking for developing solutions leveraging customer validation.

Enrollment in the program was extended to various undergraduate and graduate specializations besides business and engineering to permit the development of broad social entrepreneurship canvases. The teaching method additionally explores the near-peer mentoring concept through the 'Innovators-in-Residence' [IIR] concept to effectively and scalably bridge the gap in skills and competencies with students from various majors and specializations. Mentoring, therefore, was incorporated via structured pedagogy, rather than opt-in, industry mentor models. Students enrolled in the supplemental credit-bearing course as IIRs desired to further their entrepreneurial understanding and gain valuable leadership experience and experiential knowledge to increase the likelihood of success in their entrepreneurial journey.

IIR is an adaptation of the concept of an Entrepreneur in residence [EIR], commonly used in startups and venture capital. EIR is a person who joins businesses to provide expertise and guidance in entrepreneurial endeavors and is typically an experienced entrepreneur with a history of successful ventures. However, unlike an EIR, an IIR is a near-peer student and/or alumni mentor with entrepreneurial or learning experience. A history in ventures and/or entrepreneurial education was necessary to become an IIR.

The measure of pedagogical effectiveness was adapted from recent literature (Bremner et al., 2022), where students' mindsets of self-efficacy, self-regulation, occupational identity, and social skills

(Hazenberg et al., 2014) were assessed as determinants of their ability to recognize and exploit opportunities to innovate and make a difference in their communities.

CONTENT

At the University of California, Berkeley (UCB), the Sutardja Center for Entrepreneurship & Technology (SCET) teaches the study and practice of technology-centric entrepreneurship and innovation with their inductive learning methods to provide students with the critical thinking and observational skills necessary to succeed. The design of the entrepreneurial pedagogy in the course— "Designing Innovations to Transform Society"— engaged its student groups in the following:

(a) Identifying Real-World Problem spaces: Students collaboratively determine and define an authentic, real-world issue to address. [See TABLE 1 for examples of innovations developed by student teams]

(b) Ethics-based entrepreneurship case studies: Through cases and ethics-focused conversations, we can ensure that all students gain exposure to ethical frameworks and vital opportunities to practice ethical decision-making.

(c) Experimental Thinking and Prototyping: Through an iterative process of observing, customer discovery, thinking, experimenting, creating prototypes, and customer validation, students design potential solutions to the identified problem.

(d) The goal is for students to develop viable solutions to real-world phenomena through 'shared value creation' across the value chain, and pitch their innovation through creative story-telling.

This study evaluates techniques to measure entrepreneurial education, entrepreneurial intention, and the mediating effect of their access to social capital in entrepreneurial pedagogy for a 15-week program using the design methods mentioned.

TABLE 1
EXAMPLES OF INNOVATIONS DEVELOPED BY STUDENT TEAMS AND HOW THEY MAP TO U.N. SUSTAINABILITY DEVELOPMENT GOALS

Team	Innovation Focus	UN SDG Goals
1.	Thrifting Reimagined: a platform that offers accessibility (in terms of price and time), transparency, and quality options for Gen-Z to become more conscious fashion consumers.	#12, #11
2.	Peer Mentoring: A service that helps teachers offer exploration classes aligned to California Common Core State Standards and other standards, bringing teachers to grant opportunities, lower workloads, and college student perspectives	#4, #5
3.	A digital platform that connects CROs (Clinical Research Officers) from pharma and biotech companies to find community hubs by underrepresented demographics for clinical trials.	#3, #10
4.	A mobile app that boosts student attendance for better education with community-based mobile carpooling innovation	#4, #11
5.	A mobile app that makes the college social scene more inclusive, accessible, fun, and safe	#16, #17
6.	A digital hub for small and medium-sized farmers to access financing and find sustainable alternatives to traditional farming methods to reduce their environmental impact and costs.	#17, #13

7.	A one-stop shop platform of all resources and tools caregivers may need by providing personalized recommendations based on their specific needs and reducing overall stress and complications with navigating them.	#3, #9
8.	A new platform and services for homeowners to be well informed about their financial outcomes before switching to green energy.	#13, #12
9.	Transforming supply chain management and drug distribution through predictive analytics for hospitals in Kenya	#3, #8, #10
10.	A machine-learning platform for sustainable, affordable access to musical equipment for professional musicians, students, and hobbyists alike.	#9, #8

METHOD

The program was designed for 'shared value creation' across multiple constituencies. The 15- week program/course consisted of students from majors across the UCB campus- undergraduate and graduate students with little to no past entrepreneurial experience. Their academic majors and specializations ranged from American Studies, Society and Environment, Public Health, Cognitive Science, Bioengineering, Computer Science, and Data Science, to Interdisciplinary Studies. See FIGURE 1 below.

FIGURE 1
DISTRIBUTION OF STUDENT SPECIALIZATIONS/MAJORS IN THE PROGRAM, SPRING 2023
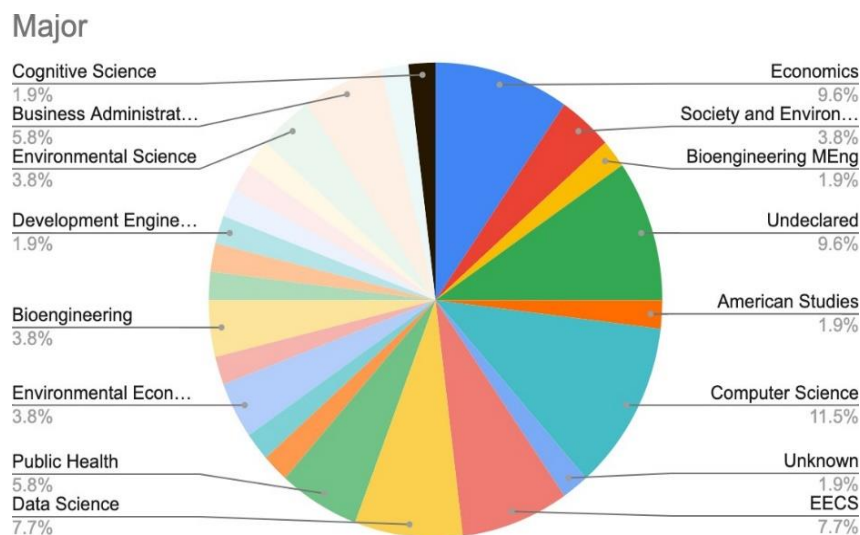
The 15-week program students were given an initial pre-program survey [Control] to evaluate their entrepreneurial self-efficacy, entrepreneurial knowledge and education, teaming, and access to social capital. A paired questionnaire was designed to measure the student responses at the end of the course [Test]. In addition, informal focus groups and reflections were captured from the students and IIRs towards the end of the 15 weeks to permit a deeper understanding and evidence of factors that may help explain the quantitative survey data.

This study adapted and evaluated existing entrepreneurial self-efficacy and entrepreneurial education effectiveness measures from past literature (Wardana et al., 202; Brunette et al., 2020). The responses

gathered were on a 5-point Likert scale; a sample of the questions is presented below for illustrative purposes in TABLE 2.

TABLE 2
PAIRED QUANTITATIVE MEASURES USING A LIKERT SCALE

Measure Type	Sample Question
"Entrepreneurial Self-efficacy" [ESE]	"How confident are you about working in the field of entrepreneurship, as a founder or an early-stage company?"
Entrepreneurial Education [EE]	"'How familiar are you with concepts such as scientific thinking, 'systems thinking,' 'design thinking,' 'lean methodology,' 'customer discovery' and validation, and their connection to entrepreneurship?"
Occupational Identity [OI]	"I and/or people in my immediate family have experience/know-how to being successful entrepreneurs."
Entrepreneurial mindset [EMS]	"If you encounter challenges in preparation for your entrepreneurial activity (the main activity), how likely are you to… a) Exert more effort into preparing for your activity. b) Seek advice/feedback from others. c) Give up on your activity. d) Focus your energy on something other than your activity.…"
Teaming [T]	"I feel supported in the pursuit of my personal goals in team projects by my team."

RESULTS AND DISCUSSION

The teaching team analyzed qualitative data from focus groups and quantitative data from the surveys to answer the following research question:

Research Question #1: *Can entrepreneurial pedagogy incorporating ethics and social entrepreneurship increase self-efficacy?*

Research Question #2: *Does mentorship, in the form of IIRs, increase self-efficacy and occupational identity as an entrepreneur?*

Entrepreneurial ideas focused on the 17 UN Sustainable Development Goals (SDGs), from alleviating poverty and homelessness to clean energy and sustainability to gender equality and quality education. Each student team had access to personal mentorship via the IIRs, which were customized and scaled to reach the student teams designing unique innovations within the programmatic constraints of an in-person classroom.

With a little over 60% response rate [n= 65] for completion of the control and test responses, the following table represents the aggregate difference calculated between the control and test data.

TABLE 3
AVERAGE CHANGE IN STUDENT SELF-ASSESSMENT MEASURED AT THE BEGINNING AND END OF THE 15-WEEK PROGRAM

Average % change in student entrepreneurial self-efficacy	25.5%
Average % change in student perception of the value of entrepreneurial education	34.2%
Average % change in occupational identity	28.7%
Average % change in team effectiveness	3.3%

Preliminary theoretical conclusions indicate an increase in self-efficacy, the student perception of their entrepreneurial education, increasing occupational identity as an 'entrepreneur', and higher team effectiveness at the end of the program, vs the beginning of the program. The average change in student self-efficacy and perception of education indicates strong directionality- the strength of the correlation to mentorship by IIRs specifically or the ethics component of pedagogy is challenging to tease apart. The student focus groups and reflections provide essential information to draw some conclusions. Significant themes and quotes explored via written reflections and focus group responses are used to infer student and IIR experiences. The themes reflect the experiences of the students and IIRs from the 15-week program. A few representative quotes are provided below for each theme:

Theme: Ethics in Entrepreneurship

"One interesting reference in the case study was the CCTV surveillance cameras in China. As a native-born and raised Chinese, I reflected on why this action never triggered me. I do not feel violated or upset. Instead, I feel safe. I am assured that if anyone did anything inappropriate or wrong, there would be a way to prove or record it; I feel safe because only the police and government have this information and would not sell it or use it against me. Then I went further to ask myself, why am I so certain about it…"

"As an individual designing these algorithms, it is critical to understand that ensuring accuracy and fairness within these algorithms is reliant on not only collecting relevant and unbiased data but also making it accessible so individuals can self-test source code on their whim, examining whether any of the decision-making algorithms appear to discriminate against any group of people. These questions are ideas I will consider as I enter the start-up space, ensuring that I attack these issues when I start building my product."

Theme: Mentorship and Social Entrepreneurship

"Meeting with our IIRs reminded our team how to have social impact at the back of our startup idea. I learned how to code in this course- I am not an engineer, but the IIRs councils pointed us to the resources needed for successful tech review."

"The labs are practical sessions where explaining a certain concept; it allowed us to practice and implement with our IIR mentors has been most helpful… Meeting with the different IIR councils was valuable- allowed us to get real-time feedback and improve our ideas."

"Alkelink has made significant progress. We have implemented several changes and are now in the process of building the product. Thanks to the mentorship, we are still working on it a year later."

Theme: Reframing and Learning (IIR Perspectives)

"Being an IIR, gave credit to my personal experiences (failures) in entrepreneurship. Being an IIR was an immense confidence-building activity. Before this course, I did not think there were many SDG-viable business ideas!"

"I saw how a journalism major can be very relevant to entrepreneurship, like other disciplines- engineering or business; I learned as much from my fellow IIRs and the teams I coached. It is the only course where I have not missed a class."

CONCLUSION

This research adds important insights into the contribution of pedagogical instructional *design* - from incorporating ethics to incorporating near-peer mentoring, significantly when expanding innovations through capitalism. Innovation and Entrepreneurship, like technology, can be powerful paths to an end. They are inherently goal-driven: finding reusable, low-resistance, innovative paths to achieve an end or goal. Such technological innovations have a way of advocating their use and prioritizing specific paths and necessarily neglecting others, like social impacts and unethical consequences. Current entrepreneurship courses need more ethical and societal impact exercises and attract students from majors outside of engineering and business. While it is important to note that not all dimensions of social issues may be addressable by the corporate shared value principle, there is evidence for developing a significantly extensive portfolio of innovations with a bias for creating a revenue model to generate economic profits and value in the process of improving the environment or reducing homelessness.

Creating this transformation in startup value creation begins in the classrooms of higher education institutions. It is vital to train many aspiring entrepreneurs from different disciplines and majors and offer a near-peer mentorship with built-in incentives for mentors and mentees to persist in the entrepreneurial path of value creation. Such pedagogy can construct value creation and distinguish it from CSR (corporate social responsibility) and philanthropy.

Designing pedagogy for startups to transform society- social entrepreneurship today may appear to be a deceptive decoy where students come at it from a "we are entrepreneurial", rather than "we are social" standpoint; however, with pedagogical hacks, that may soon become redundant and mainstream.

LIMITATIONS AND FURTHER RESEARCH

The current exploratory mixed-method research applied in-class convenience sampling with limited respondents. Future research should examine the findings with larger samples, using probabilistic sampling and covariance models to evaluate entrepreneurial self-efficacy, occupational identity, social capital, team cohesion, and longitudinal value creation metrics. The extent of variability with first-generation, underrepresented, and international students will substantially add to the pedagogical knowledge base of higher education institutions. Follow up longitudinal studies can add significant new insights by comparing short-, medium-, and long- term development patterns of entrepreneurial metrics. These insights may alter how social entrepreneurship can provide a new opportunity for shared value creation.

REFERENCES

Androutsos, A., & Brinia, V. (2019). Developing and piloting a pedagogy for teaching innovation, collaboration, and co-creation in secondary education based on design thinking, digital transformation, and entrepreneurship. *Education Sciences*, *9*(2), 113. https://doi.org/10.3390/educsci9020113

Bremner, P., Perkins, J., & Davidson, A. (2022). The Scottish Innovative Student Award (SISA): Preparing students to tackle wicked problems in 3 Es for wicked problems: Employability, enterprise, and entrepreneurship: Solving wicked problems. In S. Norton, & A. Penaluna (Eds.), *3 Es for Wicked Problems: Employability, Enterprise, and Entrepreneurship: Solving Wicked Problems*. Retrieved from https://www.researchgate.net/publication/362775141_The_Scottish_Innovative_Student_Award_SISA_preparing_students_to_tackle_wicked_problems_in_3_Es_for_Wicked_Problems_Employability_Enterprise_and_Entrepreneurship_Solving_Wicked_Problems_Stuart_Norton_

Brown, S.D., & Lent, R.W. (2015). Social cognitive career theory: A theory of self (efficacy) in context. In F. Guay, H. Marsh, D.M. McInerney, & R.G. Craven (Eds.), *Self-concept, motivation, and identity: Underpinning success with research and practice* (pp. 179–200).

Burnette, J.L., Pollack, J.M., Forsyth, R.B., Hoyt, C.L., Babij, A.D., Thomas, F.N., & Coy, A.E. (2020). A growth mindset intervention: Enhancing students' entrepreneurial self-efficacy and career development. *Entrepreneurship Theory and Practice*, *44*(5), 878–908. https://doi.org/10.1177/1042258719864293

Driver, M., & Porter, M.E. (2012). An interview with Michael Porter: Social entrepreneurship and the transformation of capitalism. *Academy of Management Learning & Education*, *11*(3), 421–431. Retrieved from http://www.jstor.org/stable/23412374

Hazenberg, R., Seddon, F., & Denny, S. (2014). Investigating the outcome performance of work integration social enterprises (WISEs): Do WISEs offer 'added value' to NEETs? *Public Management Review*, *16*(6), 876–899.

Leinonen, T., & Durall, E. (2014). Design thinking and collaborative learning. *Media Education Research Journal*, *XXI*, 107–116.

McMullan, W.E., & Long, W.A. (1987). Entrepreneurship education in the nineties. *Journal of Business Venturing*, *2*(3), 61–275.

Seitamaa-Hakkarainen, P., Viilo, M., & Hakkarainen, K. (2008). Learning by collaborative designing: Technology-enhanced knowledge practices. *Int. J. Technol. Des. Educ.*, *20*, 109–136.

UNESCO and Sustainable Development Goals. (2019). *United Nations Education Science and Culture Organization*. Retrieved from https://en.unesco.org/sdgs

UNESCO. (2013). *Towards universal learning*. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000219763/PDF/219763eng.pdf.multi

UNESCO. (2019a). *Guiding principles for learning in the twenty-first century*. Retrieved from http://www.ibe.unesco.org/sites/default/files/resources/guiding_principles_brochure_eng.pdf

UNESCO. (2019b). *Intercultural competences framework*. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000219768/PDF/219768eng.pdf.multi

United Nations. (2030). *Agenda for sustainable development. United Nations Education Science and Culture Organization*. Retrieved from https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

Wardana, L.W., Narmaditya, B.S., Wibowo, A., Mahendra, A.M., Wibowo, N.A., Harwida, G., & Rohman, A.N. (2020). The impact of entrepreneurship education and students' entrepreneurial mindset: The mediating role of attitude and self-efficacy. *Heliyon*, *6*(9), e04922. https://doi.org/10.1016/j.heliyon.2020.e04922