

A Vertically Integrated Portfolio Process to Foster Entrepreneurial Mindset in an Undergraduate Biomedical Engineering Curriculum

Cristi Bell-Huff, Todd Fernandez, Kali Morgan, Paul Benkeser, Joseph LeDoux

STELAR

*Studio for Transforming
Engineering Learning And
Research*



Wallace H. Coulter
Department of
Biomedical
Engineering

Georgia Tech College of Engineering
and Emory School of Medicine

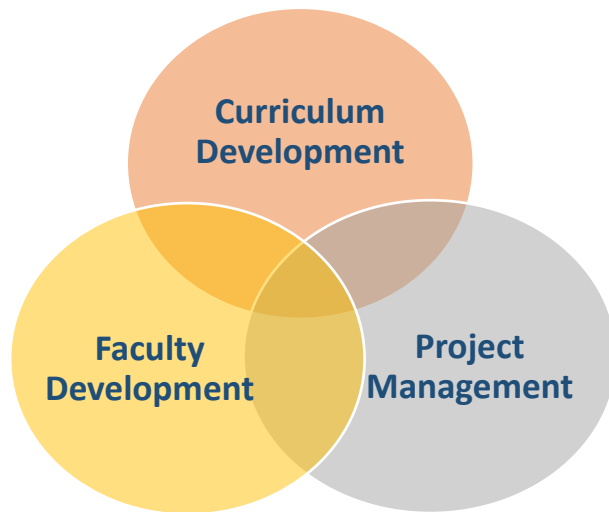
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A Vertically Integrated Portfolio Process to Foster Entrepreneurial Mindset in an Undergraduate Biomedical Engineering Curriculum



What?

- ☐ Purpose
- ☐ Curricular Framework
- ☐ Implementation

So what?

- ☐ Assessment
- ☐ Impact

Now what?

- ☐ Future Work

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PORTFOLIO COMPONENTS



ARTIFACTS



REFLECTIONS



STORIES

Students will tell the story of their growth into entrepreneurially minded engineers.



Embark

Experience

Explain

1st Year Launcher Course

- Build foundation of EM
- Practice design thinking
- Reflect as an engineering skill
- Folio thinking

*Learn about it, try it out,
habitually reflect*

BME Core Courses

- Have EM experiences
- Build a library of experiences and artifacts

*Practice behaving like
an EM engineer*

3rd Year Storytelling Course

- Integrate and reflect on experiences
- Create and curate unique stories of EM growth
- Story-Driven Learning (SDL)

*See yourself as
an EM engineer*

CURRICULUM STRUCTURE

FRESHMAN LAUNCHER COURSE



- The course title: “Design Your BME”
- Establishes a culture of EML and portfolio thinking
- Students apply design thinking skills to technical content and to their future learning experience

1000 – Intro to BME

MIDDLE YEARS’ COURSES



- The 3Cs will be emphasized in all required courses
- Experiences and achievements will be documented
- Students will write, share, and store reflections and artifacts about their most significant experiences

2210 – Conservation Principles in BME
2250 – Problems in BME
2310 – Intro to BME Design
3100 – Systems Physiology
3110 – Quant. Eng. Physiology Lab I

PORTFOLIO CAPSTONE COURSE



- This will be a collaborative storytelling course
- Students will generate and share multiple creative non-fiction stories about their journey to become an engineer with an entrepreneurial mindset

4000 – The Art of Telling Your Story

What is a signature assignment?

“Signature assignments require students to demonstrate and apply their proficiency in one or more key learning outcomes. This often means synthesizing, analyzing, and applying cumulative knowledge and skills... Signature assignments may also follow a theme across curricular and co-curricular experiences ...allowing students to apply their growing knowledge and abilities to meaningful questions over time.

At some institutions, all signature assignments must include specific components, such as a “real-world” application, reflective writing, or collaborative work.

The most distinctive feature of signature assignments is the way programs integrate them across the educational pathway to help students demonstrate their growth, make connections across the curriculum and co-curriculum, and apply their knowledge to real world problems.”

~ Excerpt from AAC&U Signature Assignments Tool
(<https://www.aacu.org/sites/default/files/Signature-Assignment-Tool.pdf>)

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**Providing the
Tools to Succeed:**

**Important
Features of
Implementation**



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Gateway Course	Signature Assignment Description	Potential artifacts for portfolio from signature assignment	Topic for outside experiences pulled into the signature assignment or course	Social pedagogy incorporated into signature assignment
1000 – Intro to BME	Creating the BMED 1000 portfolio focused on EM growth over first semester	<ul style="list-style-type: none"> • Reflections • BME Insider Activity • Two design projects 	<ul style="list-style-type: none"> • Practical competence 	<ul style="list-style-type: none"> • BMED 1000 showcase with feedback from showcase attendees
2210 – Conservation Principles in BME	Raise curiosity of bias in engineering and use this to identify opportunities to create value for others	<ul style="list-style-type: none"> • Reflections 	<ul style="list-style-type: none"> • Interpersonal experiences 	<ul style="list-style-type: none"> • Peer feedback • Compile all products into a public collection to share
2250 – Problems in BME	At least one design project			<ul style="list-style-type: none"> • Peer feedback on final reflection • Peer feedback on work feedback discussions
2310 – Intro to BME Design	Team collaboration project			<ul style="list-style-type: none"> • Peer feedback on videos • Peer feedback from peers and
3100 – Systems Physiology	Non-case study analysis	Over the course of the semester		<ul style="list-style-type: none"> • Peer feedback from solving studio format with case discussions
3110 – Quantitative Eng. Physiology Lab	Learning from difference working on teams to create value with 3Cs in a journal club	<ul style="list-style-type: none"> • Reflections and video 	<ul style="list-style-type: none"> • Learning from differences-forming a team to create the most value 	<ul style="list-style-type: none"> • Sharing their experiences across groups and peer feedback
Academic Office Workshops/Activities	Various topics depending on workshop, internship reflections, research experience reflections	<ul style="list-style-type: none"> • Pitch • Portfolio • LinkedIn 	<ul style="list-style-type: none"> • Professional development 	<ul style="list-style-type: none"> • Practice at workshops, presentations with feedback
4000 – The Art of Telling Your Story	Creating the EM growth portfolio (a collection of autobiographical stories)	<ul style="list-style-type: none"> • Anything from their library of artifacts and stories 	<ul style="list-style-type: none"> • SUMMATIVE 	<ul style="list-style-type: none"> • Story Showcase

So What ? How are we doing so far?

Assessing Development of Reflective Ability* in BMED1000

		<u>Level of Reflection</u>		
	<i>Habitual Action</i>	<i>Understanding</i>	<i>Reflection</i>	<i>Critical Reflection</i>
Initial Reflection	8	37	46	41
Final Reflection	3	14	49	95

* Based on D. Kember, J. McKay, K. Sinclair, and F. K. Y. Wong, "A four-category scheme for coding and assessing the level of reflection in written work," *Assess. Eval. High. Educ.* , vol. 33, no. 4, pp. 369–379, Aug. 2008, doi: 10.1080/02602930701293355

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Assessing Entrepreneurial Mindset Development



<i>Curiosity</i>	<ul style="list-style-type: none">● Demonstrate constant curiosity about our changing world● Explore a contrarian view of accepted solutions
<i>Connections</i>	<ul style="list-style-type: none">● Integrate information from many sources to gain insight● Assess and manage risk
<i>Creating Value</i>	<ul style="list-style-type: none">● Identify unexpected opportunities to create extraordinary value● Persist and learn through failure

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Assessing Entrepreneurial Mindset Development

BMED 1000	BMED 4000
<ul style="list-style-type: none">• Students gained a good understanding of design thinking, including the importance of empathy and understanding stakeholder needs in order to create value.	<ul style="list-style-type: none">• Richer, more specific discussions of mindset growth with detailed examples from experience.
<ul style="list-style-type: none">• Students also displayed good foundational understanding of the concepts related to entrepreneurial mindset.• Connection to artifacts chosen not always clear.	<ul style="list-style-type: none">• Stories focused on transformation and change in perspective (growth).• More meaningful artifacts as evidence for their growth.
<ul style="list-style-type: none">• Similar misconceptions around curiosity, connections, and creating value	<ul style="list-style-type: none">• No misconceptions around 3C's present in sample.

Now What? Future Work

- Continuously improve, integrate, and align signature assignments
- Expand impact to other engineering departments within Georgia Tech
- Expand impact to other universities both inside and outside KEEN
- Further develop story-driven learning pedagogy
- Develop assessment tools for evaluating impact on growth of e-mindset

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At Home with
Engineering Education



Thanks for listening!

Want to keep the conversation going?



Dr. Cristi Bell-Huff

cristi.bell-huff@bme.gatech.edu



Wallace H. Coulter Department of
Biomedical Engineering
Georgia Tech College of Engineering and Emory School of Medicine



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