Engineering Educators Bringing the World Together
2025 ASEE Annual Conference & Exposition
Palais des congrès de Montréal, Montréal, QC • June 22–25, 2025
Paper ID #45737

Work In Progress: A framework for evaluating student cognitive and affective reflections in BME studio learning

Stephanie Fuchs, Cornell University

Dr. Stephanie Fuchs is an Active Learning Initiative (ALI) Postdoctoral Associate in the Department of Biomedical Engineering (BME) at Cornell University. She received her Ph.D. in Biological Engineering from Cornell University, where she focused on developing glucose-sensitive materials for electronics-free insulin delivery devices. As an ALI postdoc, her work focuses on developing and implementing engineering studio modules for core BME courses and developing tools to support student learning in the studios via active learning techniques. She is particularly interested in researching the impact of the engineering studio environment on student learning, engagement, and motivation, and investigating how the new studio curriculum impacts student's perception of their engineering identity.

Mridusmita Saikia, Cornell University

Dr. Mridusmita Saikia is a Lecturer at the Meinig School of Biomedical Engineering (BME), Cornell university. She is an interdisciplinary scientist with expertise in biochemistry, molecular biology, and genomics. Dr. Saikia completed her PhD at the University of Chicago, where she developed quantitative and high throughput biochemical assays to analyze RNA modification levels in biological systems. Her work was supported by a fellowship from the Burroughs-Wellcome Trust. Following her PhD, Dr. Saikia conducted postdoctoral research at Case Western Reserve University and Cornell University. Dr. Saikia used single cell RNA sequencing technology to study human immune cell function, as well as human pancreatic beta cell pathology that can lead to diabetes. As a teaching faculty at Cornell BME, Dr. Saikia teaches courses in the fields of Biomaterials & Drug Delivery (BMDD), and Molecular, Cellular, and Systems Engineering (MCSE).

Prof. Jonathan T. Butcher, Cornell University

Work In Progress: A framework for evaluating student cognitive and affective reflections in BME studio learning

Introduction. Experiential learning immerses students in real-world scenarios and problem solving, enriching their understanding through active engagement [1]. In engineering studio environments, this approach is especially impactful as students collaborate on tasks mirroring professional practice [2-4]. Reflective practices, such as journaling, play a key role by connecting new content to prior knowledge, enhancing understanding and performance through metacognitive strategies [5-7]. However, the degree to which students engage with reflective activities after studio sessions remains underexplored [8, 9]. This work-in-progress paper introduces a framework to evaluate how BME students cognitively and affectively reflect on their studio experiences through peer observations and assessments. We address two research questions: (**R1**) What outcomes do students discuss when reflecting on their Engineering Studio experiences? (**R2**) What values or qualities do students identify in their peer's work? We demonstrate that the framework can be used to effectively capture students cognitive and affective responses and propose how student's value assignments of their peers' work align with their own motivation(s) for success. By examining student reflections on Engineering Studio experiences, we aim to identify participation drivers and strategies to enhance engagement and learning outcomes in these collaborative spaces.

Theoretical and Conceptual Frameworks. Our framework draws on the *Framework of Student Affect in Field Biology*, adapted and applied to the unique context of our BME studios [10]. Built on the *Model of the Affective Domain in the Geosciences*, it explores how motivation, emotion, and environmental connections impacts student engagement and motivation [11]. *Gee's Theory of Identity* [12] addresses student' perceptions of themselves within the scientific community while *Social Cognitive Theory* and the *Science Motivation Model* add layers of motivation, including self-efficacy and intrinsic and extrinsic motivators [13, 14]. Finally, *Pekrun's Control-Value Theory of Achievement Emotions* evaluates achievement emotions tied to both activities and outcomes [15]. Combined, these theories offer a multidimensional perspective on factors shaping student engagement in field biology. To fit BME studios, we focused on problem-solving at the interface of living and non-living systems, replacing nature-oriented constructs with connections to BME. Using this tailored framework, we developed a codebook incorporating these constructs and *Social Learning Theory* to examine how students internalize cognitive and affective insights from collaborative experiences in studios and apply them to enhance their own learning [16]. This integration of frameworks provides a platform for evaluating student cognitive and affective reflections in BME studio learning **(Figure 1).**

Course Context. We analyzed the reflections of students in BME 3010: Cellular Principles of Biomedical Engineering, a core upper-level course in the BME curriculum that is taught annually during the fall semester. Across the semester, five studios provided students with hands-on opportunities to apply quantitative and analytical principles learned in lectures. Each three-hour studio session had students working in groups to tackle the cellular BME challenge presented, integrating theoretical knowledge with practical problem-solving skills. Each studio involves tasks such as problem analysis, developing engineering schematics, and applying mathematical models, with a strong focus on collaboration, iterative feedback, and reflection to refine skills and advance learning outcomes [4, 17]. The goal of the studios was to provide students with the experience of *being an engineer*: to deconstruct complex problems into manageable subunits, to operate and learn communally towards achieving goals, to communicate solutions and challenges effectively in a broad range of contexts, and to invite and integrate criticism into improved product outcomes. Additionally, following each studio, students were asked to submit a 1–2-page reflection detailing their experience, as outlined below.

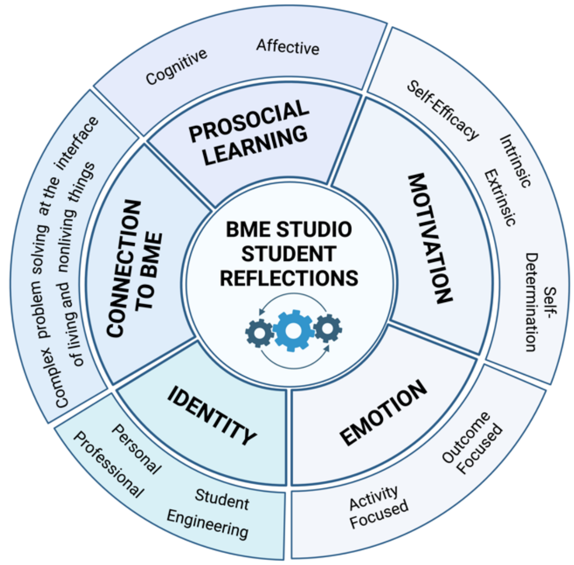

Figure 1. Conceptual framework used to evaluate student reflections after an experiential learning experience in BME studios. The figure was created in https://BioRender.com

Data Collection: Student Reflections. Students reflected on their studio experience through two sections: Observations of Other Teams' Work and Personal Reflections (Appendix List 1). The first section encouraged students to critically evaluate others' work, identifying best practices to enhance their own team's performance. In the second section, students reflected on their personal experiences, exploring what they found most interesting, challenges faced, and how they plan to apply their learnings. The assignment was graded for completion, but not content. We then employed deductive coding methods, guided by the *a priori* themes (e.g., motivation, emotion) derived from the *Framework of Student Affect in Field Biology* [10] to identify key themes and patterns emerging from the reflections (Figure 1). Following the initial deductive coding, we used inductive coding to add additional elements that capture emergent themes in student's reflections (e.g., distinctions in identity types and varying connections to BME (Appendix Table 1 and 3)). As a proof-of-concept for the use of the framework, herein we present a preliminary analysis of student reflections from the Fall 2024 semester following their first studio session, with a total of 69 unique reflections. This research has received Institutional Review Board Approval (IRB 014842).

Preliminary Results and Discussion. In response to R1, we examined what factors students highlighted about their studio experience, starting with how students discussed their identities in relation to the studio. Our findings indicate that many students presented their identities through a diverse array of lenses, ranging from more personal identities such as being a student to more professional identities such as seeing themselves as engineers or researchers (**Appendix Table 1**). Interestingly, many students went beyond simply identifying themselves as engineers to further specify what type of engineer they see themselves as or envision for their future careers and discussed how the studio aligned with their interests in the context of these subdisciplines of BME. This may be because, as primarily junior-level students, they are currently in the semester where they can declare their BME major concentrations within their program, which allowed them to start aligning their identities with specific fields and career paths. Considering the varied career aspirations expressed by students through their identity alignments, it is essential to be mindful of the diversity of student interests and provide opportunities for them to explore and develop their unique passions and career goals. This awareness can help support the growth of a wide range of student pursuits within the BME undergraduate programs while equipping students with a collective, robust foundation in BME engineering principles, empowering them to excel in their future endeavors [18].

In terms of motivation factors, intrinsic motivating factors emerged as the dominant driving factor for engaging in the studios, with students particularly drawn to opportunities that allowed them to engage in practical/real-world activities aligned with problems they could envision themselves addressing in their future careers **(Appendix Table 2)**. The studio model enabled students to experience being engineers by allowing them to analyze, develop, and deliver practical solutions that tangibly addressed real-world challenges. Many students emphasized that the real-world connections made through the quantitative analysis performed in studios reinforced their understanding of the field as being deeply concerned with improving patient outcomes, creating innovative technologies, and tackling complex problems in collaborative and interdisciplinary environments **(Appendix Table 3).** The findings are consistent with previous research, which has also shown that engineering students' engagement and motivation with problem-solving processes are influenced by their future-oriented motivations [19].

In response to R2, we explored the types of prosocial learning opportunities that students experienced while participating in BME studios, including both cognitive and affective aspects. The results revealed that students highly valued intuitive, precise/detailed visuals and creative approaches in presented by their peers. Specifically, they focused on their peers' block diagram schematics and final engineering solutions, which significantly enhanced their understanding of cellular principles involved in the BME challenge and demonstrated diverse, creative ways to solve the same problem **(Appendix Table 4).** Additionally, affectively, students emphasized the significance of communal learning, both within their own teams as they worked together to overcome challenges and across the class as a whole, where they witnessed diverse approaches to problem-solving from other teams. Students highlighted the importance of sharing ideas, receiving constructive feedback, and engaging in collaborative discussions with peers (**Appendix Table 4**). The findings suggest that students recognize the studio environment as an incubator for creative exploration, fostering a culture where they appreciate collective knowledge and creativity.

Conclusions and Future Work. This research highlights a proof-of-concept use of our tool for capturing and analyzing students’ cognitive and affective responses during semester-long studio experiences. Preliminary findings show that students actively shape their professional identities, particularly aligning with BME subdisciplines as they refine career aspirations. Intrinsic motivation, driven by real-world applications, emerged as a key engagement factor, reinforcing their understanding of BME as an applied, interdisciplinary field. Additionally, students highly value collaborative learning, emphasizing peer feedback and diverse creative approaches.Our next steps include monitoring how students' reflections evolve, refining our framework through expanded datasets and interrater validation, and linking reflections to measurable learning outcomes. We will analyze how students' identities develop over time, assess how motivation influences engagement and learning, and explore the impact of specific teaching interventions on student experiences. To achieve these goals, we will conduct longitudinal studies, integrate mixed methods approaches combining qualitative and quantitative analyses, and collaborate with instructors to develop targeted interventions. By providing instructors with actionable strategies, this framework will support scalable, evidence-based teaching practices adaptable across various experiential learning contexts.

References.

[1] D. A. Kolb, *Experiential learning: Experience as the source of learning and development*. FT press, 2014.

[2] C. Gonsalvez and M. Atchison, "Implementing studios for experiential learning," in *Proceedings of the Australasian conference on Computing education*, 2000, pp. 116-123.

[3] G. Tembrevilla, A. Phillion, and M. Zeadin, "Experiential learning in engineering education: A systematic literature review," *Journal of Engineering Education,* vol. 113, no. 1, pp. 195-218, 2024.

[4] S. Fuchs, A. Werth, and J. T. Butcher, "Work in Progress: Evaluating the impact of student cognitive and emotional responses to real-time feedback on student engagement in engineering design studios," in *2024 ASEE Annual Conference & Exposition*, Portland, Oregon, 2024, doi: 10.18260/1-2--48357.

[5] D. N. M. Lew and H. G. Schmidt, "Writing to learn: can reflection journals be used to promote self-reflection and learning?," *Higher Education Research & Development,* vol. 30, no. 4, pp. 519-532, 2011/08/01 2011, doi: 10.1080/07294360.2010.512627.

[6] M. Harvey, D. Coulson, and A. McMaugh, "Towards a theory of the ecology of reflection: Reflective practice for experiential learning in higher education," *Journal of University Teaching and Learning Practice,* vol. 13, no. 2, 2016.

[7] A. R. McCrindle and C. A. Christensen, "The impact of learning journals on metacognitive and cognitive processes and learning performance," *Learning and Instruction,* vol. 5, no. 2, pp. 167-185, 1995/01/01/ 1995, doi: https://doi.org/10.1016/0959-4752(95)00010-Z.

[8] D. McClean and N. Hourigan, "Critical Dialogue in Architecture Studio: Peer Interaction and Feedback," *Journal for Education in the Built Environment,* vol. 8, no. 1, pp. 35-57, 2013/12/01 2013, doi: 10.11120/jebe.2013.00004.

[9] O. Ioannou, "Opening up design studio education using blended and networked formats," *International Journal of Educational Technology in Higher Education,* vol. 15, no. 1, p. 47, 2018/12/24 2018, doi: 10.1186/s41239-018-0129-7.

[10] K. A. Treibergs, D. Esparza, J. A. Yamazaki, M. Goebel, and M. K. Smith, "How do introductory field biology students feel? Journal reflections provide insight into student affect," *Ecology and Evolution,* vol. 12, no. 11, p. e9454, 2022, doi: https://doi.org/10.1002/ece3.9454.

[11] K. J. van der Hoeven Kraft, L. Srogi, J. Husman, S. Semken, and M. Fuhrman, "Engaging Students to Learn Through the Affective Domain: A new Framework for Teaching in the Geosciences," *Journal of Geoscience Education,* vol. 59, no. 2, pp. 71-84, 2011/05/24 2011, doi: 10.5408/1.3543934a.

[12] J. P. Gee, "Chapter 3: Identity as an analytic lens for research in education," *Review of research in education,* vol. 25, no. 1, pp. 99-125, 2000.

[13] A. Bandura, *Social foundations of thought and action: A social cognitive theory* (Social foundations of thought and action: A social cognitive theory.). Englewood Cliffs, NJ, US: Prentice-Hall, Inc, 1986, pp. xiii, 617-xiii, 617.

[14] S. M. Glynn, P. Brickman, N. Armstrong, and G. Taasoobshirazi, "Science motivation questionnaire II: Validation with science majors and nonscience majors," *Journal of research in science teaching,* vol. 48, no. 10, pp. 1159-1176, 2011.

[15] R. Pekrun, "The Control-Value Theory of Achievement Emotions: Assumptions, Corollaries, and Implications for Educational Research and Practice," *Educational*

Psychology Review, vol. 18, no. 4, pp. 315-341, 2006/12/01 2006, doi: 10.1007/s10648-006-9029-9.
[16] A. Bandura, "Social-learning theory of identificatory processes," *Handbook of socialization theory and research,* vol. 213, p. 262, 1969.
[17] V. S. Vasudevan, S. M. Fuchs, and J. Butcher, "Engineering Studio Pedagogy – First Experience in Integrating Novel Studio Sessions in Biomedical Engineering Courses," in *2024 IEEE Frontiers in Education Conference (FIE)*, 13-16 Oct. 2024 2024, pp. 1-9, doi: 10.1109/FIE61694.2024.10893377.
[18] C. S. E. Jamison, A. A. Wang, A. Huang-Saad, S. R. Daly, and L. R. Lattuca, "BME Career Exploration: Examining Students' Connection with the Field," *Biomedical Engineering Education,* vol. 2, no. 1, pp. 17-29, 2022/01/01 2022, doi: 10.1007/s43683-021-00059-8.
[19] A. Kirn and L. Benson, "Engineering Students' Perceptions of Problem Solving and Their Future," *Journal of Engineering Education,* vol. 107, no. 1, pp. 87-112, 2018, doi: https://doi.org/10.1002/jee.20190.

Appendix.

List 1. Prompts given to students for post-studio reflections.

In your reflections, be sure to address the following sections:

Observations of Other Teams' Work: Take a look at other teams' studio submissions (available in the shared Google Docs/Google Slides)

- What were some things you observed other teams do well? Please be specific in listing which teams you are referring to and their contributions.
- How can you incorporate these best practices into your team's work in future studios?

Personal Reflection:

- What aspects of the studio did you find most interesting?
- What challenges or limitations did you encounter?
- Do you see yourself applying what you learned in this studio to help you succeed in this class and/or in your future career(s)? If so, in what way? If not, why not?

Table 1. Examples of common identity themes used by students in their post-studio reflections, the number of mentions, and exemplar quotes.

IDENTITY THEME	# OF MENTIONS		EXEMPLAR QUOTES
ENGINEER	7	A	Although in an engineering major, I felt that many classes did not involve as much problem-solving components that required us to think like Engineers. Therefore, I found these exercises particularly helpful for practicing thinking like an Engineer and considering the limitations and constraints when designing and coming up with solutions for a particular problem under specific conditions.
		B	Overall, this studio was very beneficial to my learning and growth as a biomedical engineer.
		C	As an engineer, I must be able to communicate my findings to people with varying scientific backgrounds.
BME-SPECIFIC CONCENTRATION	12	A	As someone who is interested in drug delivery and pharmacology, I really appreciated that this studio was centered around engineering constraints and the design process of making a drug for a specific medical concern.
		B	I do not see myself using the content of the studio in my career as much, as I hope to go into biomedical imaging and instrumentation.
		C	As a BMDD concentration, this drug delivery studio is very applicable to me since I will probably encounter similar scenarios in future jobs.
ENGINEERING STUDENT	3	A	I can definitely see myself applying what I learned in this studio to help succeed in BME 3010 in the future due to the broader application of it. In BME 3010 and another class I am taking, CHEME 5430 (Bioprocess Engineering), we discuss the use of bioreactors and how to utilize bioreactors such that we can most efficiently produce some sort of product. I feel as if the entire thought process of today's studio could be beneficial as it highlights the typical process of bioprocess engineering.
		B	As a BME student that is very interested in medical technology, I think drug delivery is such an essential area to understand since medicine is constantly improving. This studio gave me a better idea of modeling drug volume distribution and its mechanisms, which helps me, as a student, grow in a desire to learn more about these topics because maybe someday I can improve actual drugs and help more individuals.
		C	As an engineering student, I always find class the most rewarding when the subject matter can be related to a real life situation, which helps me process information
RESEARCHER	7	A	I found it very engaging to be engineering a solution for a crossover related disorder, since my research focuses so heavily on the various proteins recruited during crossover formation.
		B	I am currently working in a lab, and I think this could absolutely be applied to my experiments regarding islet growth and implantation.
		C	After graduating with my bachelors, I hope to continue my education by attending graduate school and conducting research. I find that tasks such as identifying constraints, understanding biological processes, writing related governing equations, conducting experiments, and collecting and analyzing data are what I will be expected to do during my time in school.
STUDENT IDENTITY	6	A	Having hands-on experience with a specific example such as the BCR-ABL protein helps me better remember cell signaling pathways and Michaelis Menten kinetics, which will allow me to complete assignments faster and perform better on the exams
		B	I study biological sciences, so I am used to a more qualitative and objective study of biomedicine
		C	I do see myself applying what I learned in this studio in other classes to succeed. I learned about new processes that can be used in drug delivery systems as well as how important mathematical modeling can be in biomedical engineering.
OTHER PROFESSION	5	A	As for my career, even though I plan to pursue the business side of biomedical engineering—specifically in pharmaceuticals, immunotherapy, or drug delivery—having this technical knowledge will make me a valuable asset to the companies I hope to work for.
		B	As someone very interested in medicine, I learned a lot about how many viewpoints there can be when it comes to drug efficiency. I undoubtedly can see myself applying these problem-solving strategies within many of my future classes and my future career in medicine
		C	I also think it is useful for my future career since I hope to pursue a PhD in biomedical engineering or biological engineering and we definitely need a good understanding of cellular pathways and have these problem solving skills.

Table 2. Examples of different motivations found in student reflections post-studio participation.

MOTIVATION THEME		EXEMPLAR QUOTE
INTRINSIC MOTIVATION	A	Because I liked differential equations, being able to apply it to biological problems was really interesting and it made me feel like I was able to apply previous knowledge and practice engineering. I generally came to the understanding that I sincerely appreciate the quantitative aspect of engineering (especially biomedical engineering).
	B	I enjoyed this studio very much. Seeing such a realistic, medically complex application of our class material was interesting. It is an example of a current, real-world problem and our task was very reflective of the design problems and considerations that biomedical engineers face; I enjoyed stepping into these shoes
	C	I enjoyed thinking through the cell signaling pathway and connecting the rate constants from compound to compound. I find it fun to figure out how to showcase the block diagram in a way that is intuitive to understand.
EXTRINSIC MOTIVATION	A	As for my career, I think a critical thing we learn in studio is the process of listing out engineering considerations and constraints. It is easy to forget what the engineering solution is all for when in the throes of it, but constraints/ considerations keep us grounded and let us think holistically. I think I will carry on the procedures we take in studio for my greater career: constraints/ considerations, block diagrams, equations, and finally prototypic/ design.
	B	I am currently working in a lab, and I think this could absolutely be applied to my experiments regarding islet growth and implantation.
	C	I can see myself applying this methodical type of thinking of translating biomedical problems into prioritized needs, developing an engineering block diagram, utilizing mathematical equations, applying equations to graphs, and thinking about potential improvements into diagnosing future dental problems and providing treatment as a dentist.
SELF-DETERMINATION	A	I had a bit of a slow start to the equations task, as it seemed like a lot to tackle at first. However, I took the time to slowly break it down for myself as well as other group members, and we were able to solve all of them, including the one we were assigned to present. This was definitely the most challenging task, but also the most rewarding, because it was really engaging to learn about! I would love to encounter more tasks like this one in future studios :)
	B	I found the block diagram to be the most difficult for me to do, as I never imagine the process in a linear, block-diagram-like fashion. In order to overcome this, I tried to discuss what should be put in the diagram, rather than actively putting them into boxes and using the arrows. This is something that I want to take more of a leadership role in in future studios, as I feel that it is one task that I am not as able to easily conceptualize
	C	While I am satisfied with my level of contribution, I aim to bring this knowledge post-studio 1 as a learning experience for myself; going forward, I will do a much deeper dive into the studio material beforehand, and ask myself individually to think ahead – even if on a basic level – about the prospective discussion questions regarding constraints, diagram building, etc. I believe doing this will strengthen my role and contributions in the group further and I look forward to improving in this area!
SELF-EFFICACY	A	One of the key challenges I faced during this studio was setting up the correct ODEs to describe the rate of STAT-5 and STAT5-P, which were my assigned ODE's. I asked [student name] in my group to explain how to solve these/set them up. He was super helpful and simplified the explanation into something I was able to learn, and then I set up my equations correctly after that!
	B	I also really enjoyed discussing things within our group first and then discussing it as a class. I think talking in a small group first allowed us to gain confidence in our thoughts and made it much easier to share to the entire class.
	C	Moreover, I found that applying concepts like Michaelis Menten equations on a real system helped me understand how to use the equations and what they mean. By manually writing out the individual equations that play a role in the BCR-ABL pathway, I could visualize which intermediate molecules are formed and where the enzyme kinematics equations apply to.

Table 3. Examples of student connections to BME, specifically to complex problem solving at the interface of living and non-living things in student reflections post-studio participation with exemplar quotes.

CONECTION TO BME: complex problem solving at the interface of living and non-living things	EXEMPLAR QUOTE	
MEDICAL DEVICE DEVELOPMENT	A	In breaking down a complex problem into a quantifiable engineering approach, I saw how this aligned well with my interests in medical device development.
	B	Being introduced to the process of design and what considerations go into choosing a product is very helpful. This same process will then be applied in future industry jobs relating to the production of BME devices.
	C	I plan to go into the medical device industry, and similar to drug delivery, medical device development requires careful consideration of design constraints and mathematical modeling.
TREATING DISEASES	A	I do see myself applying the knowledge from the studios to the larger class, because the knowledge we learn here is in depth and hands-on, which provides us with quasi-real-world-experience on how signaling systems are exploited to treat diseases like cancer.
	B	I see myself applying what I have learned in this studio to succeed in the class with a better understanding of why the concepts we learn in class are important to treating diseases
	C	These are the foundational concepts and mathematical understanding that I'll need to develop and research new types of drugs for different types of illnesses.
CREATING OR DESIGNING NEW SOLUTIONS	A	This studio teaches us how to effectively use the design process to improve and create new valid solutions.
	B	I specifically think it will be helpful in future careers to help think through new ideas for improvements of drugs or any sort of BME tools.
	C	The studio gave me a better idea of what someone in healthcare and research might spend their time doing when researching drug delivery!
TEAMWORK & COLLABORATION	A	Throughout this studio, I learned many useful ideas and ways to work as a team and I can definitely see myself applying the things I learned into my future career. In any engineering project, it is important to work smoothly and efficiently as a team with good communication to resolve conflict easily, and have a streamlined process of iterating through multiple tests to have the best solution possible.
	B	I also like the collaborative nature of the studios, because it provides an avenue for discussion and gives me a feel of what collaboration in engineering would look like in the future.
	C	The studio put me in a situation where I was working with people that I had never worked with before, so we all had to learn how to best work as a team. This is obviously something very important for any engineer.
COMMUNICATION	A	As an engineer, I must be able to communicate my findings to people with varying scientific backgrounds
	B	The class taught me how to synthesize information from my colleagues and how to prioritize things under pressure.
	C	I feel I can apply the team communication skills in future career, since nowadays working individually in industry or academic community is no longer possible, and innovative and original works more and more requires inter-disciplinary cooperation

Table 4. Examples of cognitive and affective prosocial learning opportunities highlighted in student reflections post-studio participation with exemplar quotes.

PROSOCIAL LEARNING	EXEMPLAR QUOTE	
COGNTIVE	A	Taking a look at the other teams' studio submissions, our team was really impressed with the detail of their block diagrams, and felt that those that used Google Drawings/a collaborative software had more detailed diagrams.
	B	One team's engineering block diagram provided clarity by using color-coded arrows and labels to differentiate between many cellular signaling pathways and reactions. This visual organization made it easier to follow the complex interactions involved in BCR-ABL signaling.
	C	One thing I think other teams did well was making their constraints and considerations very specific. Several groups used the real numbers from the information sheet and prompt that we read before the studio and including these details allowed for their list to be very specific to the studio.
AFFECTIVE	A	Another thing I enjoyed was that we were able to look at other teams' work and gain some inspiration and ideas from their work.
	B	I also really enjoyed discussing things within our group first and then discussing it as a class. I think talking in a small group first allowed us to gain confidence in our thoughts and made it much easier to share to the entire class.
	C	I also noticed that the group sitting next to us made a group chat just as they sat down at the table, this is something that my group incorporated into our studio and we also created a group chat.