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ENGINEERING

INNOVATION

IN HEALTH

Developing technical solutions to pressing health challenges

Co-development of Interdisciplinary Engineering Innovation in Health course by Engineering & Team Science Faculty to Accelerate Health Innovation from Bench to Bedside

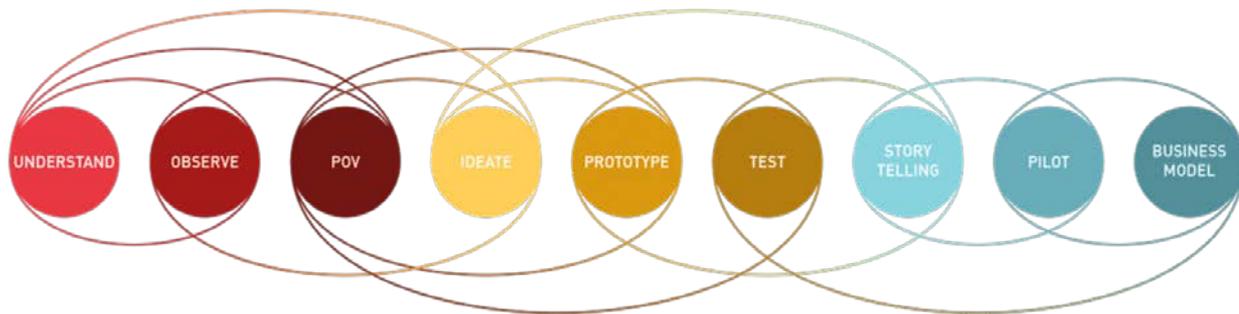
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Engineering Innovation in Health (EIH)

EIH promotes interdisciplinary collaboration between engineering & the health sciences with the **goal of developing technical solutions to pressing health challenges**



EIH

BY THE

NUMBERS

2013-2018



300+

students enrolled



140+

clinical partners



70/30

percentages
of undergraduate
and graduate student
participants



100+

projects introduced



10+

provisional patents



9

UW departments
represented through
student involvement



5

projects in early stage
commercialization

Partnering with ITHS Team Science faculty since Fall 2017

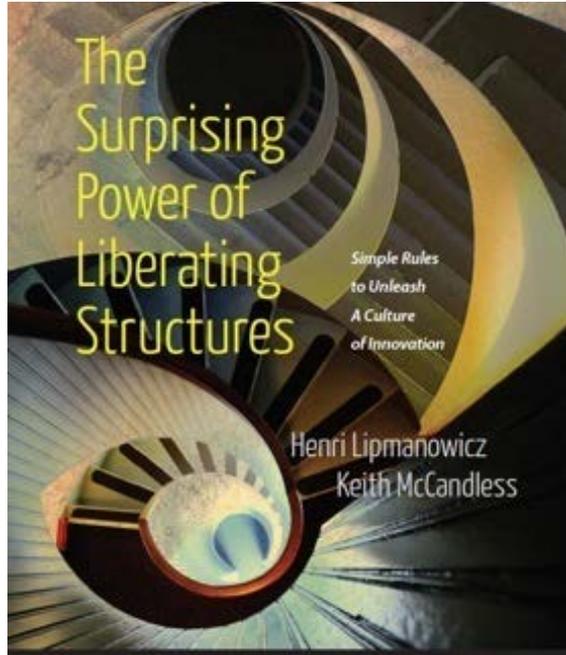
*“Throughout the program, we have learned that teams who function & communicate well **yield the best final product, are more satisfied with their work, & are more likely to stay together to continue their research.**”*

– Professor Jonathan Posner, EIH Teaching Faculty

- > Team Science team & the EIH teaching Team **co-develop & facilitate tailored team science training**
- > EIH faculty training at team science conferences, meetings, & workshops
- > Aim: accelerate health innovation from lab bench to bedside by improving team dynamics, communication, and program participant satisfaction



Tailored Team Science training to student-clinician teams



Liberatingstructures.com

- > Methods of enhancing how teams meet, plan, set goals, decide, & relate to each other
- > Little shifts can create big changes
- > Fosters inclusivity + psychological safety



Tailored Team Science training to student-clinician teams

Fall
Student-clinician team formation
Needs finding

Team Agreement +
Welcome Letter

Team Agreement

In order to work effectively and efficiently we have outlined some basic tenants we have all agreed to follow. Throughout this project we will adhere to the following:

1. Attend meetings at agreed times
2. Meet all deadlines
3. Have a positive attitude
4. Do not ignore group communication
5. Be honest and willing to ask for help
6. Do not assume someone else is doing the work, communicate, take initiative!

Welcome Letter

1. Who are we
2. Problem statement
3. Team agreement
4. Communication plan
5. Contingency plan
6. Team goals
7. Signed by all parties

Welcome Letter

Welcome to the Preceptor-Expanding Practice and team! As engineers, we are looking forward to both learning about and contributing to medical innovation throughout this project. In this letter we will introduce ourselves, briefly describe our experience and backgrounds, set up basic team structure to pursue this project for the whole year, we hope that this letter will be a useful resource and the start of a successful project.

Team's need

At this point in the design process, our understanding is that during winter, a patient's body may experience excessive pressure due to untreated pneumonia and without alleviation of the pressure, patients may experience complications such as apnea. Additionally, due to the limitations in also a cancer. We understand that these risks are preventable but there is no commonly applied solution. There is a need for a preventative engineering solution that addresses pneumonia patients are not subjected to prolonged intubation periods while in surgery. There is also the fact that our design process will be to identify the team most well suited to begin working towards an effective solution.

Who we are

We are all from different cultures and backgrounds, but currently we are all students of the mechanical engineering (ME) or biomedical (BME) fields. Each member of our team will contribute their own strengths to a strong group foundation, and we intend on learning from each other as well. Our basic information is shown in the following table.

Name	Contact	Background	Example
Clara Oswald	oswald@iit.edu	Undergraduate ME	Familiar with a mechanical design process, is taking a project from ideation to reality. Machine shop experience with CAD programming and engineering design software.
...

Team Agreement

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Communication

For communication between students, we will be in regular contact both digitally and in person. Students will meet together during the reserved class time and as often outside of class as necessary. Tentatively, students have determined entire groups' availability to be Monday, Wednesday and Friday from 3:30 to 5 pm, and will finally schedule weekly meetings in the Meff's building. For organization, students will keep all the files (assignments, meeting records, relevant papers, etc.) in a single centralized location (Google drive). Email will be our primary method for communicating with our clinical partner unless another method proves more convenient, and ideally students will meet in person at least once week with Dr. Rankiniker (because time and day depends on Dr. Rankiniker's schedule, this meeting time is not yet assigned).

Contingency plan

We understand that there may be unforeseen circumstances that would require us to deviate from our above plan. We agree that we will all try our best to be present and prepared, and that scheduling will be flexible in order to accommodate individual contingencies and our need to meet. We expect that all team members will complete their portions of the project regardless of whole team availability, and that a single team member's temporary unavailability will not prevent our progress. If progress is restricted because of absence or regular distractions, this will be noted on peer evaluations. Distractions during meetings will be minimized by using electronic technology as research and communication tools only. We will discuss and set meeting goals (including outlining the minutes). This will help us, the students, stay on track towards goal completion. Work on each assignment will be collaborative, unless the students determine that the participation of all members is not necessary. In such cases, the work will be coordinated on a voluntary basis (to exploit everyone's strengths) or by negotiation. The students will attempt



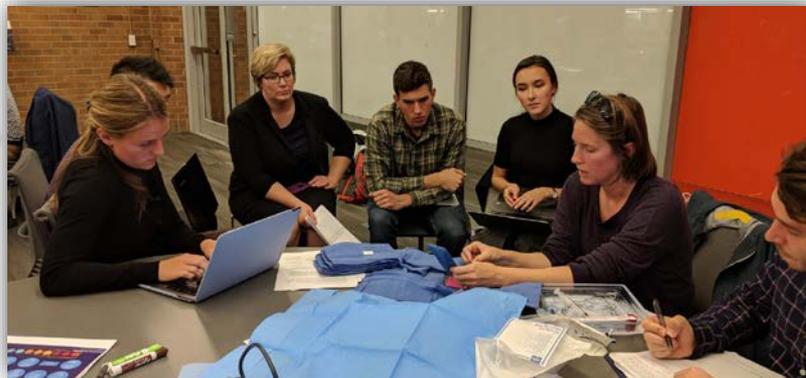
Tailored Team Science training to student-clinician teams

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Welcome Letter

Structured initial
meeting with clinical
partners

Introductions, review
Welcome Letter, stakeholder
mapping exercise, need
statement, action items to
follow up on



Meeting with the clinical partner(s)
Diving into the challenge

1 Introduce yourselves! (15 min)

2 Review the challenge and ask questions! (15 min)

3 Stakeholder mapping exercise (15 min)

4 Mapping of clinical stakeholders and your design team (15 min)

5 Need Statements (15 min)

6 Action Items

7 Diving Deeper

PROBLEM	POPULATION	OUTCOME

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meeting with clinical
partners

Giving/Receiving
feedback,
assumptions/biases

Peer Critique

Through peer critiques, we learn to appreciate one another's work and to improve our own work.



Be Kind

All comments should focus on the work not the person.
There should never be sarcasm or put downs.
The comments can be challenging but the recipient should feel that the feedback is about the work and how it can be better.



Be Specific

Comments should identify exactly what needs to be worked on (like a set of instructions) which we can take away and use or do.



Be Helpful

If the comments don't benefit the work, don't share it.
Every piece of feedback is there to help improve the work.

Tailored Team Science training to student-clinician teams



Team Agreement +
Welcome Letter

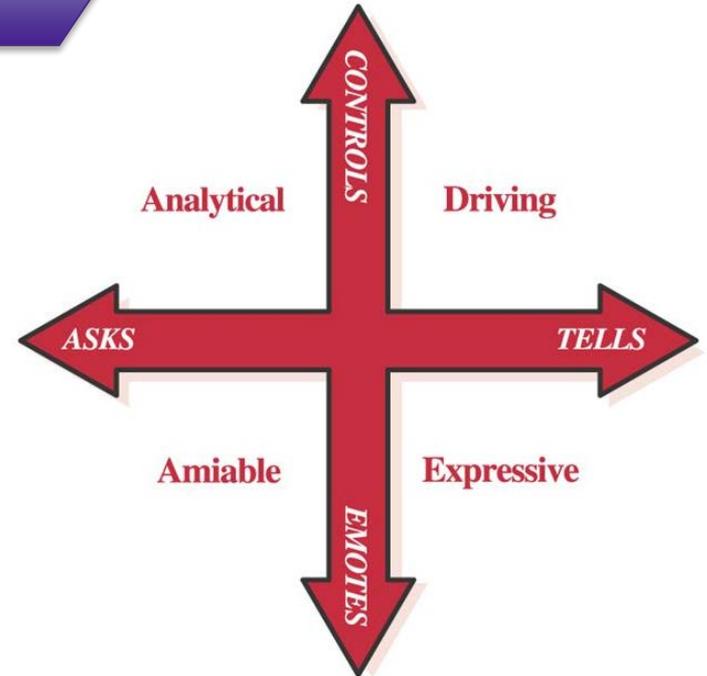
Structured initial
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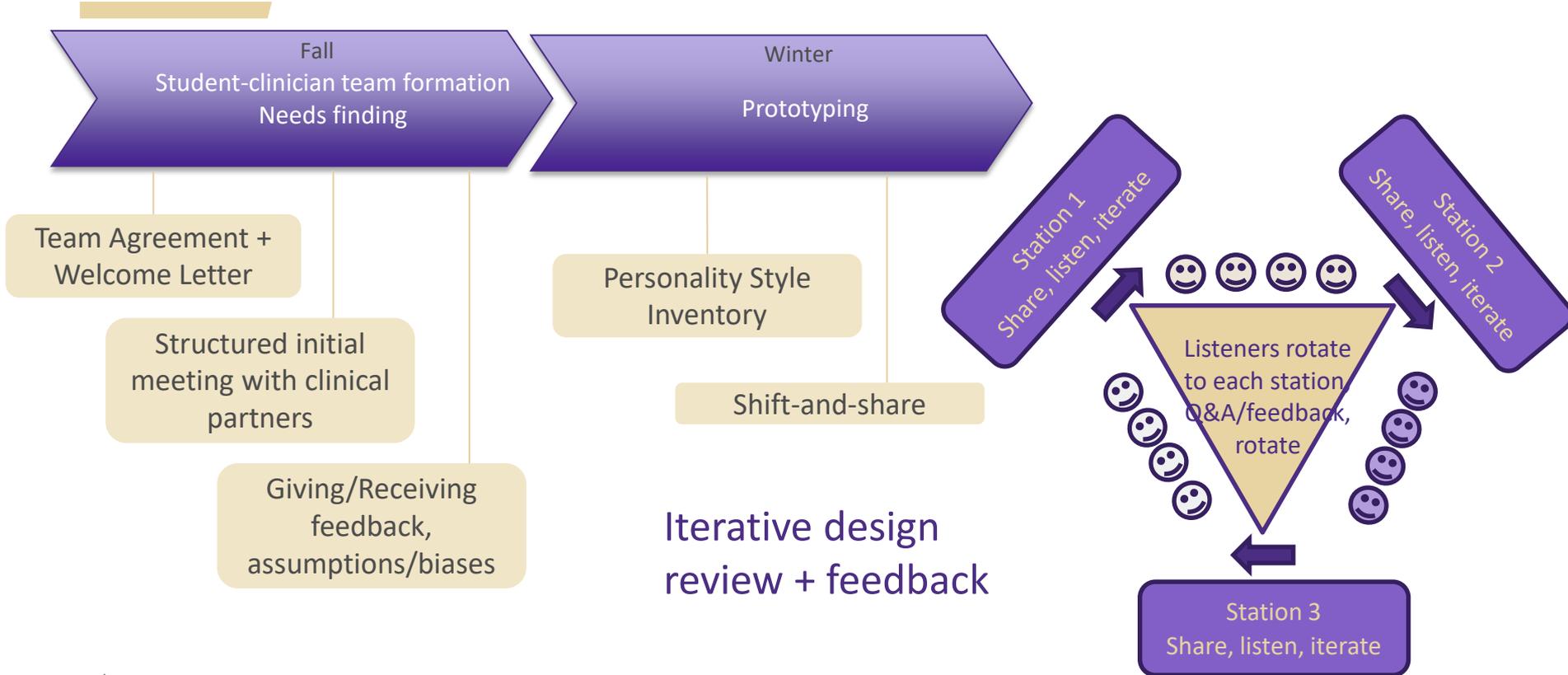
Personality Style
Inventory

Inner: Expand
understanding of your own
personal/social style

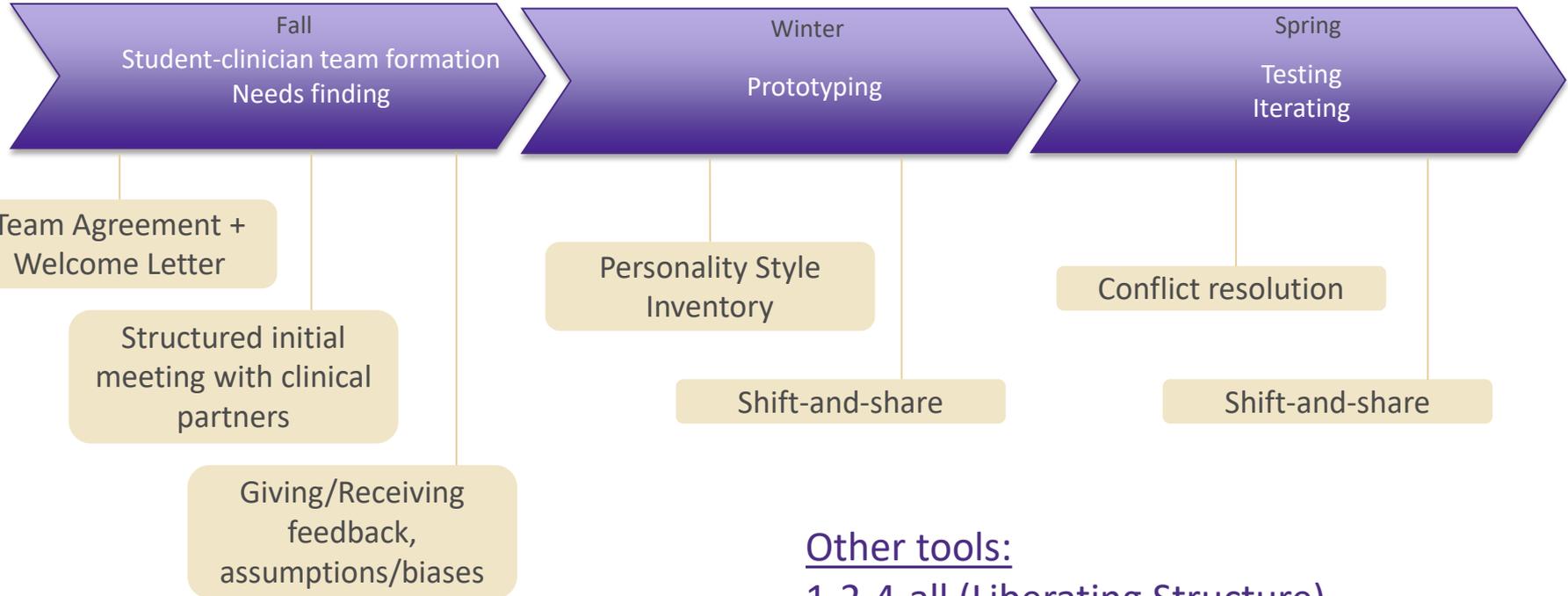
Outer: Enhance
effectiveness in working
with other styles



Tailored Team Science training to student-clinician teams



Tailored Team Science training to student-clinician teams



Other tools:

1-2-4-all (Liberating Structure)

PolLEV.com (live polling)

CATME.com (peer evaluation)

Method: surveys administered to EIH cohorts

- > Survey about experience working in EIH project team in order to improve course content about effective teamwork
 - EIH cohort surveyed Fall 2017 (baseline year, no TS implementation)
 - EIH cohort surveyed Fall 2018 (after TS implementation)
- > Preliminary comparison of results shown

Goal: Improve team dynamics, communication, & program participant satisfaction

Self-efficacy before and after participating in EIH

2. Based on your **past experiences** working on group projects or teams (prior to enrolling in EIH), please rate how capable you are (in general) to...

1 (not at all capable) 2 3 (neither capable nor incapable) 4 5 (very capable) N/A

2a Speak up in team meetings

Speak up in team meetings

Effectively contribute in team meetings

Recognize team member's strengths

Resolve conflicts with peers and other collaborators

Advocate for multiple points of view

Have your voice heard in meetings

Collaborate with team members with different working styles

Clarify language differences across disciplines/backgrounds

7. Based on your **current experience** working this term with your EIH project team, please rate how capable you are to...

1 (not at all capable) 2 3 (neither capable nor incapable) 4 5 (very capable)

7a Speak up in team meetings

Psychological safety and beliefs about EIH project team

8. Based on your current experience working this term with your EIH project team, please rate your agreement with the following statements:

	1 (strongly disagree)	2	3	4	5 (strongly agree)
8a Our project team has been successful working together	<input type="radio"/>				

Our project team has been successful working together

Our project team has a climate of collaboration and trust

I felt comfortable giving my team members feedback

I felt comfortable receiving feedback from my team members

Team members on my project had a high level of mutual trust

I had a desire to know my teammates on a personal level

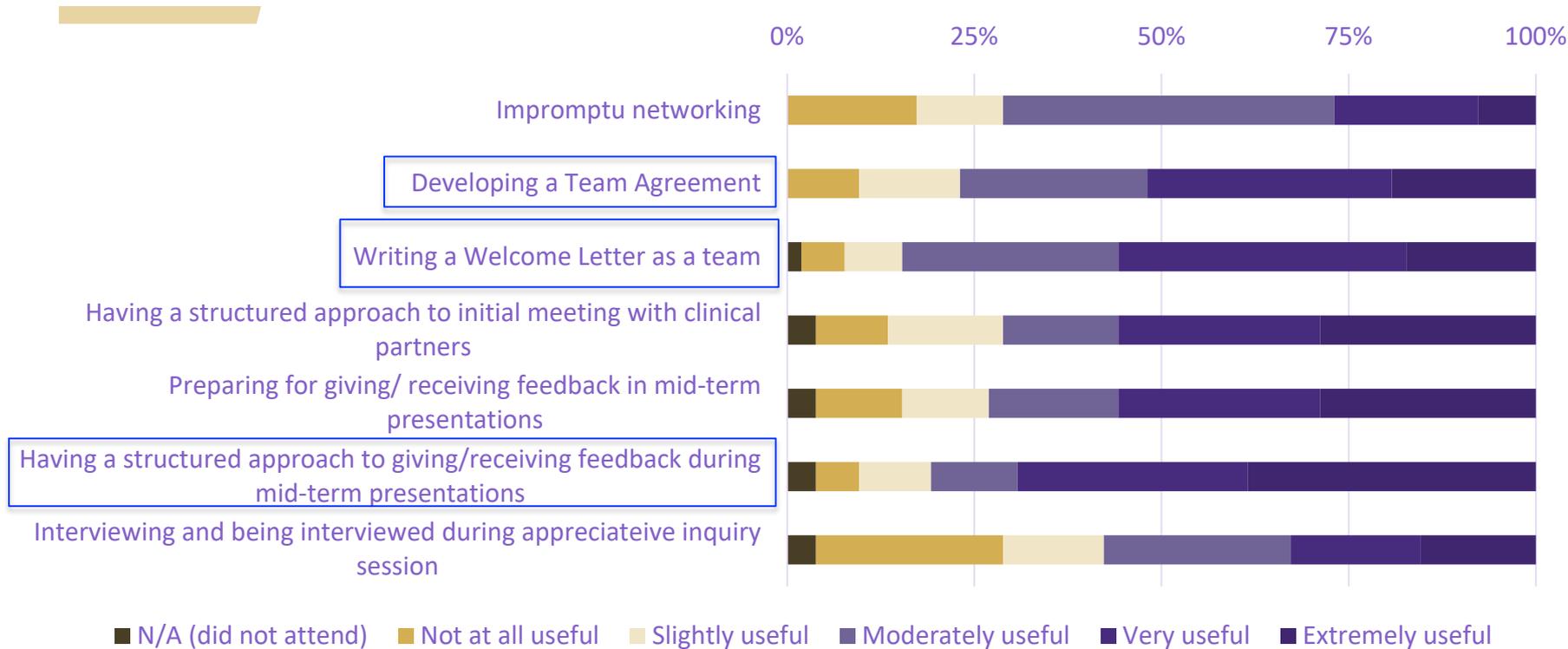
Having a successful project was a priority for me

Building effective relationships with my team members was a priority for me

I was comfortable showing gaps in my knowledge with my team

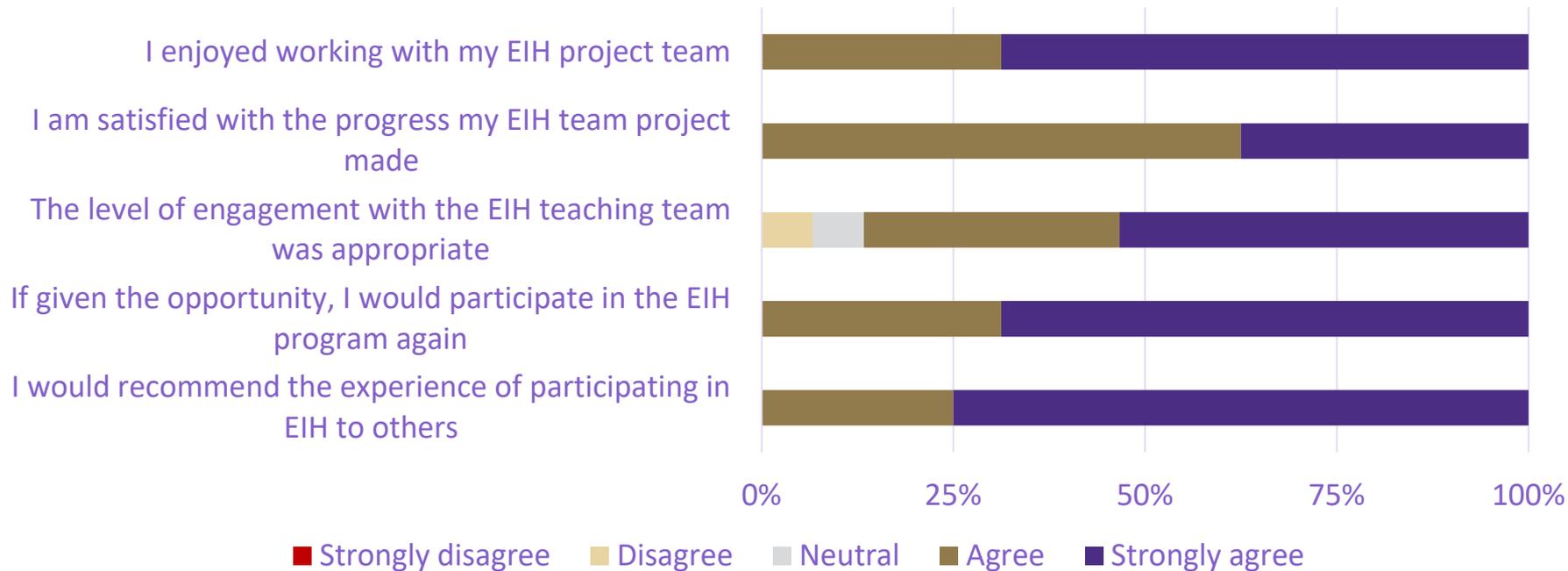
Communication with my team members outside of class was easy

Usefulness of Team Science modules



*“The **Welcome Letter** was useful for laying foundations for team dynamics and team expectations. It also helped the clinician get on-board with meeting the team and understanding course/project expectations.” – EIH student, 2018*

Clinical partner experience with EIH



*only results after TS implementation shown

“Great class and example of a great interaction between the medical community and the engineering school.” – EIH clinical partner, Fall 2018

Summary

- > **Co-development of EIH program by Engineering & Team Science Faculty**
 1. Tailored team science training to student-clinician teams
 2. Self-efficacy before & after EIH: Large improvements in collaborating with team members with different working styles & recognizing team members' strengths
 3. Psychological safety: improved climate of collaboration & trust among project teams
- > **Areas of continued improvement**
 - Time management and conflict resolution



Outcomes

	Avg 2013-2018	2019 (after TS)
Provisional patents filed	2	5
Prototyping funds raised	\$1000-\$2000	\$12,000+
Participating teams in UW innovation and entrepreneurship challenges	1-2	4
Startups formed	1	3-4



EIH Teaching Team



Jonathan Posner, PhD
Professor, Mechanical and
Chemical Engineering
Adjunct, Family Medicine



Jonathan Liu, PhD
Associate Professor,
Mechanical Engineering
Adjunct, Pathology



Eric Seibel, PhD
Research Professor,
Mechanical Engineering
Adjunct, Bioengineering



Kat Steele, PhD
Associate Professor,
Mechanical Engineering



Soyoung Kang, PhD
Lecturer, Mechanical
Engineering



Brenda Zierler, PhD, RN, FAAN
Professor, School of Nursing



Erin Blakeney, PhD, RN
Research Assistant
Professor, School of Nursing



Jennifer Sprecher
Director, Lean Performance
ITHS



Nicole Summerside, MHA
School of Nursing

Other team members:

- Per Reinhall (ME)
- Keith Chan (Radiology)
- Ken Myer (Foster School)
- David Tan (Foster School)
- Katrina Henrikson (ME)

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ITHS

Institute of Translational Health Sciences
ACCELERATING RESEARCH. IMPROVING HEALTH.

Thank you!

For more info, visit eih.uw.edu
or email soyoungk@uw.edu

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