Mentorship & Perseverance in STEM Projects & Research

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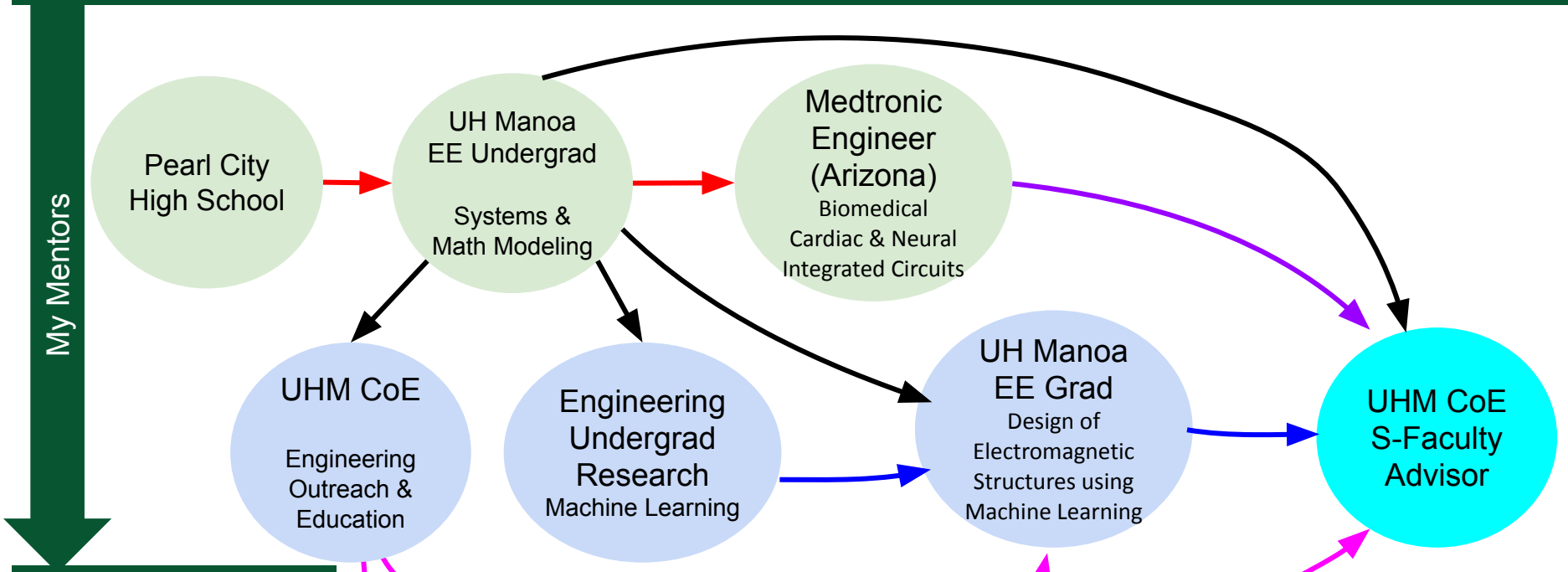
about me

I didn't know what I didn't know. Until I met someone (actually many someones) who opened up my view…



Primary/Secondary
Teachers, Counselors, Classmates
College & Professional
Professors, Advisors, Classmates
Supervisors and Research Advisors

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Obstacles & Resilience

Laboratory

- Introduce a Concept
- Learn and Follow a set procedure
- Come up with the correct solution
- Grade based on following procedure
- Grade based on getting the correction solution

As the teacher you…

- Know the lab procedure
- Know the right answers
- Know how to help them (expertise in the subject)

VS

Research Project

- Present a Problem (that isn't solved yet)
- Follow the design process
- There isn't really a set correct solution
- Grade based on going through the design process
- Grade based on effectiveness of the solution

As the teacher you…

- Know the design process
- Don't know the best solution
- Don't necessarily know how to help them (may not have expertise in the subject area)

It is okay to get things wrong AND to not know the right answer.

Engineering is about failure, figuring out what to do about it, and learning how to work toward a "righter" answer. (Engineering Failure Analysis)

Failure presents a teaching opportunity :

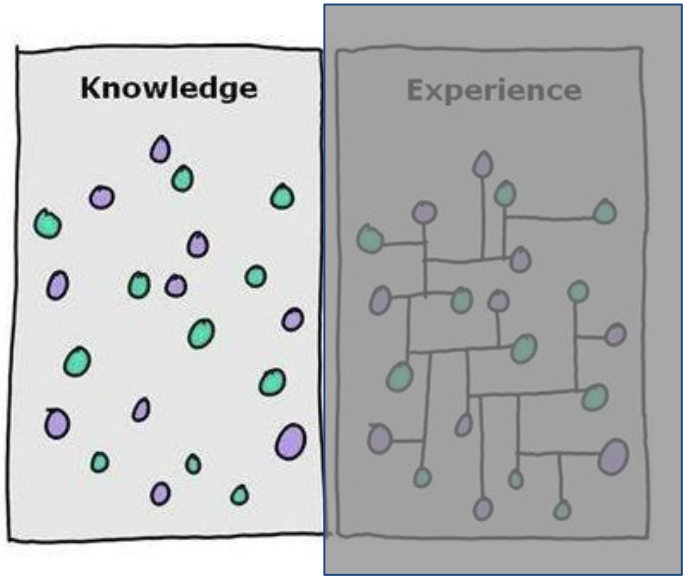
1) how to determine root cause and research a solution
2) how to come back from a setback

Help them **learn to connect** the ideas and **learn how to connect** with the right people to achieve success

Expose

Use the project to expose students to:

- an interesting problem
- how to apply scientific/mathematical/social concepts
- problem solving/critical thinking
- experts in a field



- They may find a interest they want to pursue.
- They may find a person or people that will help them on their way.
- They can identify their problems and how to get help with them.

Empower & Encourage

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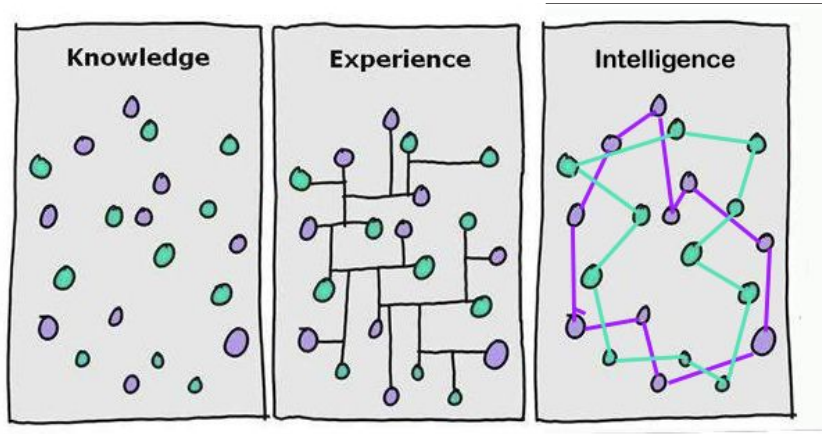

- Who helps them think through these things?
- Who helps them make these connections and learn how to connect these dots?
- Who helps them keep going when it gets tough?

Connecting the Dots

How do we solve the interesting problem?
- connect with the design process

How do we pursue this interest as a career?
- connect interest with careers and asking questions

How do we find an expert to help us?
- connect with someone who knows more or has more experience

How do we determine when we need help drawing these connects?
- connect with their own feelings, self-identifying what they don't know

Through experience students can practice doing these things…

… which will help them develop the intelligence/skill to connect these dots later in life as they face new challenges

Mentorship

Mentors help expose, empower, and encourage.

Happens on many levels:

Expert - Teacher
Expert - Student
Teacher - Student
Teacher - Teacher
Student - Student

Help with different subjects:

organizational skills
encouragement
talking out problems or ideas
technical concepts

Seeking help is not a sign of weakness

Not scolding

Sometimes you don't know what is wrong.
Talking it out with someone with more experience or more knowledge in an area can help:

1) identify what is wrong
2) provide advice on what to do
3) connect with resource to help

Expectations

Emphasize:

See evidence of the design process.
Failures that lead to Learning.

Outcome/Product effectiveness
Not just about how well the project deliverable works
Often with more time they will get there.

Value
Design Process → Thinking, Problem Solving
Failures → Identifying new areas to learn about
Failures → Resilience