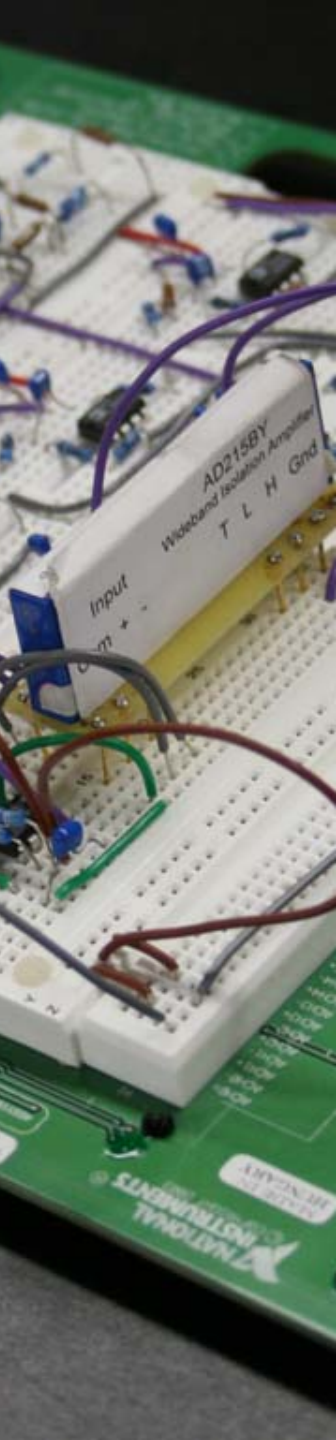# Agency
in
Framing
Design Problems

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Purpose

- How to facilitate Ill-structured problem framing, such as designing (Jonassen, 2000)
    - Too much instructor control
    - Unproductive struggle
    - Irrelevant effort
- Designers have agency to frame and reframe problems (Dorst & Cross, 2001; Harfield 2007)
- Learners make many decisions, but few are consequential (Gresalfi & Barab, 2011)

Having and taking opportunities to make decisions that are consequential to their learning and designing

FRAMING AGENCY

What kinds of student design team discourse differentiate between framing agency and other kinds of agency (e.g., deciding to disengage, making decisions that situate work as well-structured)?

Participants & setting

- 2-semester capstone engineering design course, industry-sponsored projects
- Tom's team, mentored by Shanti
  - maintained an opportunity structure for members to have agency over framing the design problem.
- Steve's team, mentored by Michelle
  - treated the problem as well-structured and their task as finding the right answer

Data collection

- Participant observation (Atkinson & Hammersley, 1994; DeWalt & DeWalt, 2010)
- Audio and video recordings
  - ~30 hours of data per team
  - re-transcribed

Data analysis

- Discourse analysis
- Adapted Agency Toolkit, a functional linguistics approach (Konopasky & Sheridan, 2016)
- Sociocultural approach (Gee, 2014)
  - Design context
  - e.g., Differentiate between I and we
- Identify differences in agency discourse

High agency marker. First person singular pronoun (I, I've, I'm, I'll)

Shared agency marker. First person plural pronoun (we, we're, we've, we'll)

Low agency marker. External person or situation as subject, generic you

Lower agency marker. Speaker modifies statement with diminishing hedge terms. (seem, like, a bit, almost, mostly, actually, a little, nearly, really, perhaps, maybe, kind of, somewhat, sort of, any, possibly, I believe, probably, might, apparently, some, just, sometimes, hardly, I mean, I think, guess)

Lower agency marker. Verbs that show potential control (could, might, should, can, going to, would, will, shall, may, want to, gonna, wanna, 'd, 've, 'll)

Low agency marker. Verbs that indicate a lack of control (told to, needed to, instructed to, have to, need to, instructions, must, needs to, has to, had to, required, supposed to, had to)

Low agency marker. Mitigation via subordinate clause that offloads agency

TOM'S TEAM

Vignette 1: Feb 11

Addai: Instead of taking measurements in three dimensions, this is this is like maybe a first draft. //

Tom: //hm!//

Addai: //You throw away the position information.

Tom: Right.

Addai: And we roll the XYZ coordinates into just one combined vector and that way we've always accounted for your full gravitational contribution.

Shanti: That's a good idea!

Cynthia: Yeah.

Shanti: Like a magnitude (.) of all three of them like a//

Addai: //Exactly. Exactly. So if you roll them all together you can still figure out//

Shanti: //That's a good idea.

Vignette 2: Feb 11, 5 min. later

Addai: Like I said I'm still not sold on it, but. I'm not sold on it, but I like the way it looks.

Tom: mmhmm [positive]

Shanti: Yeah anyway try it out it might work I don't know.

Addai: [quietly] You do lose, uh I think you do lose your position because you rolled all of your axes. [louder] But it would be a much easier way also to keep track of your overall change

Vignette 3: Apr 21

Addai: We calibrated the accelerometer and by doing a square root of sum of

Addai: squares. He says that it works the way it should.

Shanti: Okay.

Addai: And we subtract out gravity and then we'll stay at zero in a non-moving
orientation.

Shanti: So you're taking the sum of squares? Uh:: and then you're subtracting out
gravity how?

Addai: Yeah we're doing the square root of sum of squares first what we do is we
convert each of those channels by the calibration curves to the units per
second squared // Shanti: Okay // And then we have, so then we have three
axes where there's 100% square root values and then we do sum of squares
square rooted

Shanti: Okay

Addai: [quieter] And then we would just subtract 9.8 (.) [quieter still] 'cause 9.8
meters per second per second is the value of g (.)

Tom: It's basically getting a. (.) uh net. (.) acceleration. uh (.) magnitude.

Shanti: [looks concerned] Right.

Tom: and uh (.) which is one contribution of gravity and then mechanical
contributions from movement

Shanti: And we don't anticipate any situations like we talked about where the two
components would // cancel out

Tom: //Oh yeah like moving around, uh we // only transiently//

Addai: //We don't. // We don't anticipate it, we're gonna look at it.

STEVE'S TEAM

Daniela: I just thought that something bothers me the fact that (.) yeah we're gonna put the sensor on the stomach (.) right? During surgery? (.) But then (.) we're gonna, the surgery only lasts like one::: to two hours and we're gonna take it off and the patient is gonna be, (.) um well the surgery is gonna be over and there's not gonna be any monitoring afterwards, and I'm thinking (.) Well there's higher chance of sepsis or shock appearing after surgery. So::: should we think about leaving the sensor? or::: (.) 'cause I don't really think it's//

Dillon: //Seriously, that could be like, the next step.

Steve: Yeah.

Dillon: Right.

Steve: I think that—are you talking about like for like in real life? like

Daniela: Yeah. Like what what's the use of it if // you're just gonna

Steve: //I think

Bob: //I thought [increasing volume] // I thought the problem—the project was to do an internal sensor that it could be left there.

Steve: I would think that would be something left up to a surgeon or something to be honest I mean likelikeliek our project. I think it's kinda outside the scope of our project our project is//

Bob: //If we left it up to the surgeon and whoever actually designs the sensor.

Steve: Yeah whoever is really doing this.

Bob: 'cause we're not supposed to be designing anything.

Steve: Yeah we're just seeing if we can do it. We just have two types of sensors and we're gonna see if we can do it. We're gonna see if a shock patient whether or not the CO2 levels if it can be measured or changed to a measurable degree enough to be able to detect shock or the on—the //oncoming shock

Bob: //using currently available sensors

Comparisons

Tom's team

- Tom and Shanti maintained opportunities for others to reframe the problem

Steve's team

- Steve & Dillion closed the problem space when new ideas were put forth
- Bob's efforts maintained an external locus of control
- TA Michelle offered no scaffolding

Insights & implications

- Framing agency
  - Shared
  - Hedgy, tentative quality
  - Maintains control or potential control in verb choices and pronoun usage
- Framing agency is a tool
  - Articulate their rationale

thanks!
questions?
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the
FRAME
project