

Regulative Behaviors in Design-Based Learning

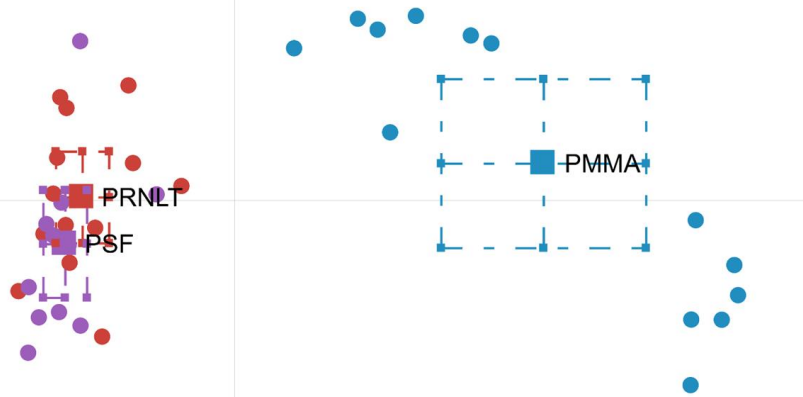
Mengchen Zhang, HKU

Siyou Wu, HKU

Wen Qi, HKU

Zhizi Zheng, EduHK

Mentor: Lukas Liu



uniqueuserid



Nephrotex

Chat data from the virtual internship Nephrotex. In this virtual internship, students worked as teams to design a biomedical device for dialysis machines. Discourse is in the **content** column. Important metadata columns include: **uniqueuserid** (unique ids for each student), **chatgroup** (the team students were in), **roomName** (the activity students were completing), **site_x** (the school to which students attended), **OutcomeScore** (score for a task toward the end of the internship) and **OutcomeBins** (high (1) or low (0) outcome designation).

<https://www.qesoc.org/coded-datasets/>

Context

RQ: What's the difference of learning patterns in different student groups in design based learning?

- We coded three groups of dialogue data in design-based learning
- The coding framework was adapted from Nguyen et al.'s (2021) work based on regulation theory

<https://doi.org/10.1016/j.learninstruc.2021.101443>

Nguyen et al.'s (2021) framework

Code	Definition	Example
Processes		
Task understanding	Activate prior knowledge. Discuss instruction. Think about tasks' purpose and value.	Mitchel: There probably is. What was the document that she told us to use where like she showed us oh this is how you communicate between the two? There are sample codes somewhere.
Strategic planning	Discuss available resources. Set timeline. Divide work. State goals to achieve within the current session or long-term goals.	Jake: We just need to connect everything right? Pam: Oh and you need to calibrate the naza. Andy: I can calibrate the naza from 3 to 4. Jake: You want to do it? Honestly, I can give you the naza right now and you can do it at home. Andy: No you can't because you need all the parts. Charlie: I wouldn't try to tighten it too hard because of the screwdrivers. Annie: Yeah no that thing sucks I'm worried.
Motivation	Share feelings and motivation beliefs regarding tasks. Discuss the group's capabilities, strengths, and challenges.	
Control & collaboration	Discuss tasks. Write/build together. Encourage group members. Ask for help from teaching assistants, instructors, or peers.	Mitchel: The best way is to push on the lid at the very end closest to there and push your fingers. Pat: And once we have the latch attached to it. It will be fine. Mitchel: You can push it. I am not looking for a lot, but if you push down onto this and forward then you pull it comes off easily.
Progress monitoring	Praise/evaluate an idea, a solution, or the group's progress regarding goals. Monitor progress regarding time.	Pat: How are we doing over here? Mitchel: We are looking good. Making some bus lines. We are almost done with the circuit that includes the barometer ...
Reflection	Evaluate if the group reached goals. Evaluate how the group solved a task. State what kinds of feelings the overall task aroused. Discuss challenges in the performance.	[After testing the quadcopter] Chris: It was really crazy. Charlie: I didn't record it because I actually was not expecting that. Annie: I just don't know why—what would have caused that. Charlie: last quarter it wasn't the motor. It was just like the direction of the propellers. Did you make sure the propellers are on the right way?
Off-task	Non-course related discussion	I am hungry.
Regulatory Types		
Self-regulate	Individuals ("I" perspective) about task perception, knowledge, goals, motivations.	<i>Example 1.</i> Valerie: Can you repeat that? This is really confusing, actually. <i>Example 2.</i> Chris: I forgot the actual wiring and it really depends on the code which I do have a meeting set up with my friends for. <i>Example 3.</i> Cam: It's actually not too far off, it's actually doable. A lot of it is going to be my battle this weekend with coding.
Shared regulate	"Our" perception of tasks; suggestions; actively constructing knowledge together.	Valerie: So do you guys want to calibrate it today? Annie: Yeah let's start connecting and calibrating stuff. Annie: Wait, so was it, we solder the esc or whatever, is that what we're soldering? Charlie: For some reason, I heard a TA from the open lab say you don't have to solder that. Cam: Yeah they said you don't have to. Annie: So we are not soldering anything? Cam: Yeah we don't have to worry about that yet.

Notes. Student names are pseudonyms.

Our coding framework

维度	Code	定义	典型语言特征	例子
Regulation Type	Self-regulation	个体调节自己的认知/行为/动机	I, my, let me	"I need to figure this out."
	Shared regulation	群体共同调节目标/策略/执行	we, our, let's	"Let's test both versions first."
Process	Task Understanding	理解任务、需求、约束、说明	what, requirement, instructions	"Do we know the requirements?"
	Strategic Planning	制定计划、策略、步骤、方案	let's, should we, plan	"Let's divide the tasks."
	Collaboration	执行任务、协作操作、共同推进工作	pass me, connect, build	"Can you connect the sensor?"
	Motivation Beliefs	表达信心、挫败、兴趣、困难感受	I feel, confusing, good	"This is confusing."
	Progress Monitoring	检查状态、进度、理解、错误	are we done, did we, missing	"We still need the spreadsheet."
	Reflection	回顾、反思、总结效果或原因	learned, next time, worked	"That approach worked better."
	Off-task	与任务无关的闲聊	unrelated talk	"What are you eating later?"



ENA setting

Review

Please review your model selections below. Once you click finish, ENA will construct an initial model. Afterwards, you can make changes to your model, fine tune your selections, plot networks, and more.

Units Selected: ChatGroup, uniqueuserid

ENA will construct networks for the following units

PRNLT, 17 iowa2015a
PRNLT, 16 iowa2015a
PRNLT, 20 iowa2015a
PRNLT, 18 iowa2015a
PRNLT, 4 iowa2015a
PRNLT, 19 iowa2015a
PRNLT, 21 iowa2015a

Comparison Selected: ChatGroup

ENA will compare networks between the following groups of units

PRNLT, 17 iowa2015a
PRNLT, 16 iowa2015a

Conversation Selected: ChatGroup

ENA will divide your data into the following conversations

PRNLT
PMMA
PSF

Stanza Window

ENA will use the following method for modeling connections within conversations

Moving Stanza: 8

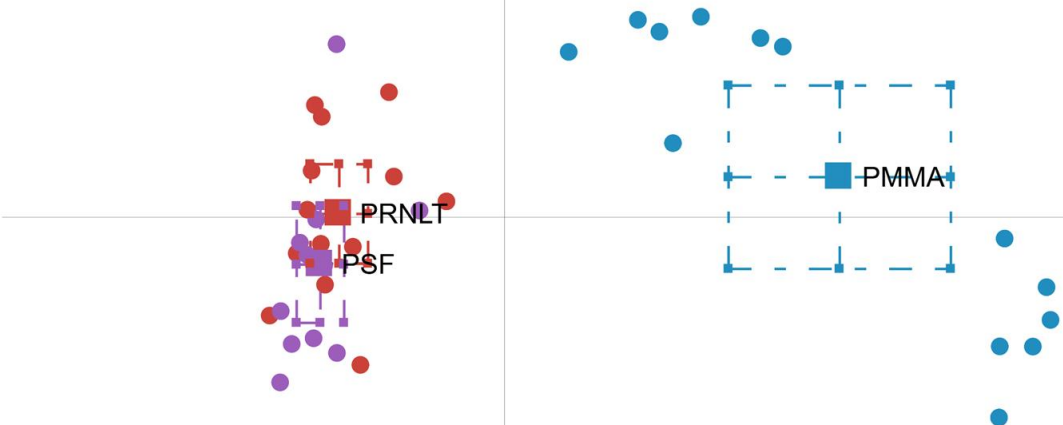
Codes

ENA will represent connections between the following codes as networks

Self.Regulation
Shared.Regulation
Task.Understanding
Strategic.Planning
Collaboration
Motivation.Beliefs
Progress.Monitoring
Reflection
Off.task



Findings



Units: ChatGroup > uniqueuserid
Conversation: ChatGroup

X Axis: SVD1

U=96.50
p=0.33

i

Effect Size:
r=-0.24

	PRNLT	PSF
Median:	-0.26	-0.27
N:	13	12

Write Up

Along the X axis (SVD1), a Mann-Whitney test showed that **PRNLT** (Mdn=-0.26, N=13) **was not** statistically significantly different at the alpha=0.05 level from **PSF** (Mdn=-0.27, N=12 U=96.50, p=0.33, r=-0.24).

X Axis: SVD1

U=0
p=0.00*

i

Effect Size:
r=1.00

	PSF	PMMA
Median:	-0.27	0.39
N:	12	13

Write Up

Along the X axis (SVD1), a Mann-Whitney test showed that **PSF** (Mdn=-0.27, N=12) **was** statistically significantly different at the alpha=0.05 level from **PMMA** (Mdn=0.39, N=13 U=0, p=0.00, r=1.00).

X Axis: SVD1

U=0
p=0.00*

i

Effect Size:
r=1.00

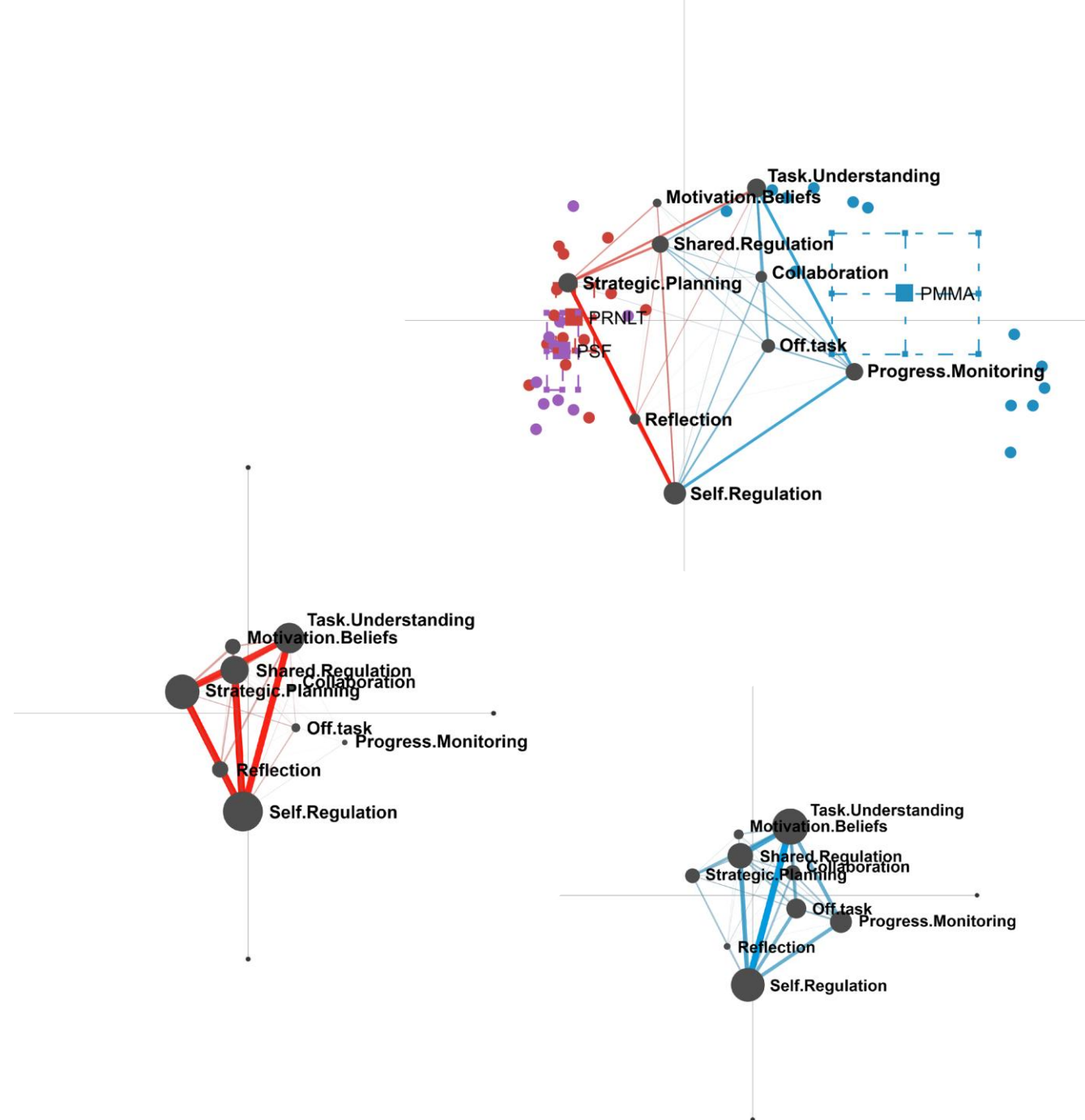
	PRNLT	PMMA
Median:	-0.26	0.39
N:	13	13

Write Up

Along the X axis (SVD1), a Mann-Whitney test showed that **PRNLT** (Mdn=-0.26, N=13) **was** statistically significantly different at the alpha=0.05 level from **PMMA** (Mdn=0.39, N=13 U=0, p=0.00, r=1.00).

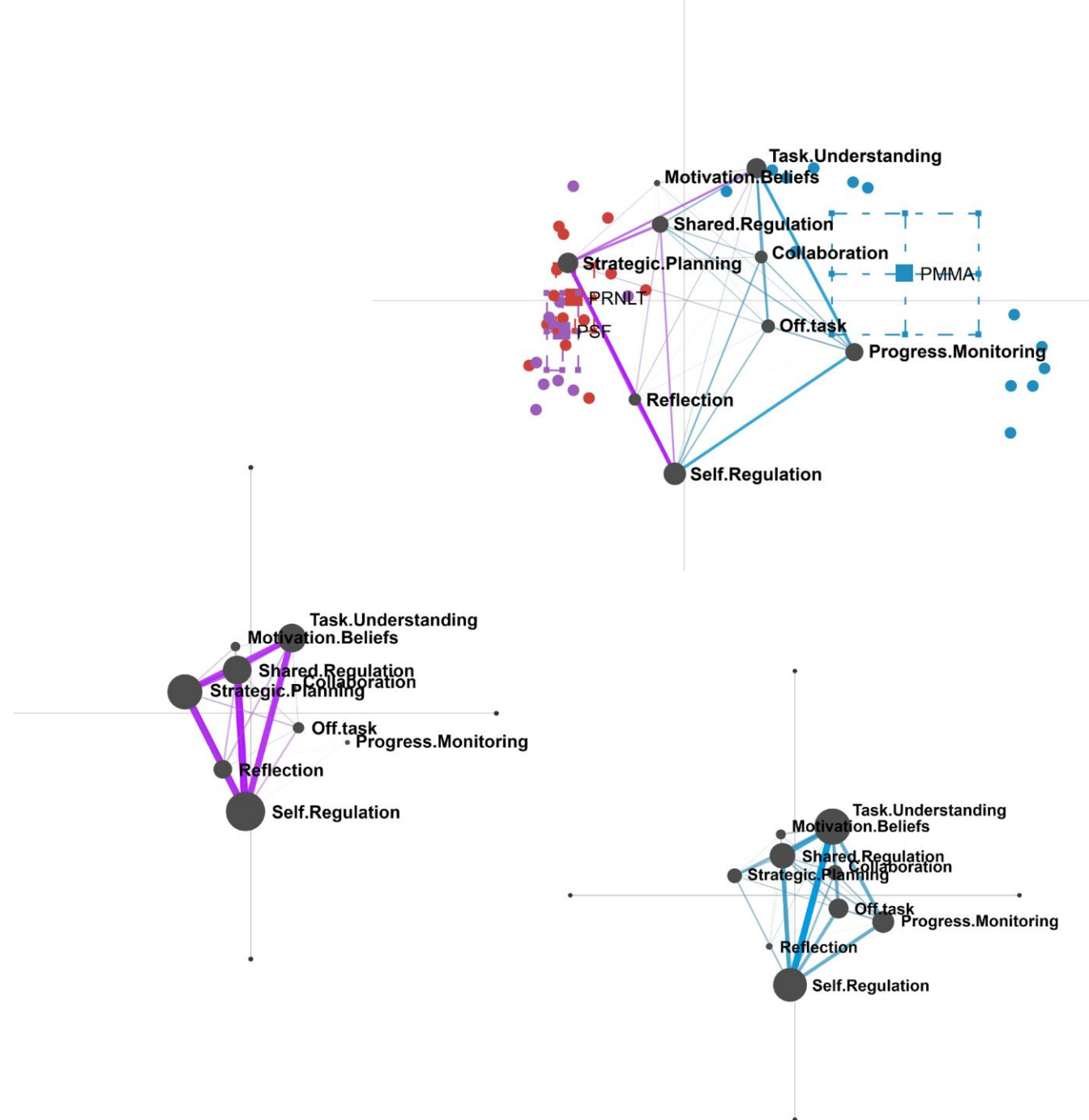
PRNLT vs. PMMA

significant difference



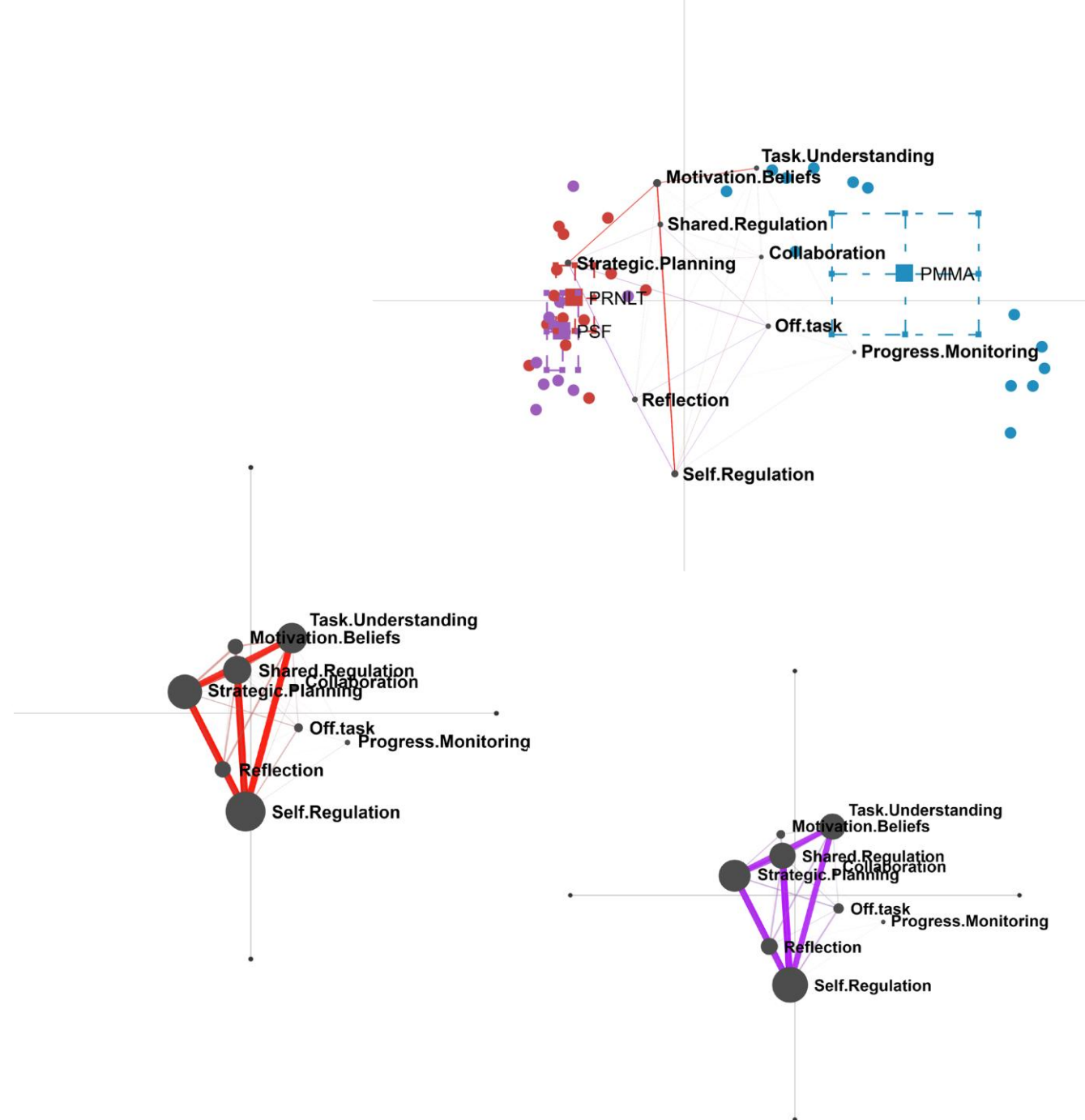
PSF vs. PMMA

significant difference



PRNLT vs. PSF

no significant difference



Unsolved questions

1. How to make three groups of data appear in the same “comparison” picture? -- No
2. For our coding, it’s a two-level coding but I mixed them during analysis. Is there other way to set up ENA analysis? -- Do sperate analysis for both parent and child levels, but think of the reason.
3. For data with more than maybe five codes, would some less frequent co-occurrence relationships undervalue? -- Closing the loop using qualitative data.
4. For the data like this, would it possible for submit it to the QE conference? -- Seek the data author for permission.