

# **The effectiveness of AI-based support for engagement during video-based learning**

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# Why Video-based Learning (VBL)?

MOOCs

Flipped  
classrooms

Informal  
learning

You**Tube** *vimeo*

# Problems with VBL

- Passive learning
- Low engagement
  - Lack of feedback
  - Lack of interaction with teachers/students

# How to Scaffold VBL?

- Strategies
  - Classroom discussion
  - Interactive activities (quizzes, problems)
- Require additional effort from teachers
- Our approach:
  - Interactive note taking
  - AI-based personalised support

# AVW-Space: Private Space

## AVW-Space

Logged in as: UCstudyID491 (Student) | Edit account | Logout


Student actions

[Student Actions](#) » [Space: Presentation Skills](#) » Watch Video: TUTORIAL 2: How to open and close presentations?

### Watch video: TUTORIAL 2: How to open and close presentations?

Presentation lesson from Mark Powell, Cambridge University Press ELT, 7 min.

How to open and close presentations? - Presentation I...



MORE VIDEOS ^

5:47 / 7:36

Add Comment

What does it relate to?

- ☐ I am rather good at this
- ☐ I did/saw this in the past
- ☐ I didn't realize I wasn't doing this
- ☐ I like this point

Save comment Cancel

#### Your previous comments

01:54 Strong use of Adjectives in opening  
Aspect: I like this point

03:16 Less use of specific details, shorter sentences. Easier to follow  
Aspect: I like this point

07:29 "Always give priority to the first and last 3 minutes"  
Aspect: I did/saw this in the past

# Social Space

## AVW-Space

Logged in as: UCstudyID491 (Student) | Edit account | Logout

### Student actions

[Student Actions](#) » [Space Instance: Presentation Skills](#)

» Review video comments: EXAMPLE 1 - Abraham Heifets: How can we make better medicines? Computer tools for chemistry

### Review video comments for "EXAMPLE 1 - Abraham Heifets: How can we make better medicines? Computer tools for chemistry"

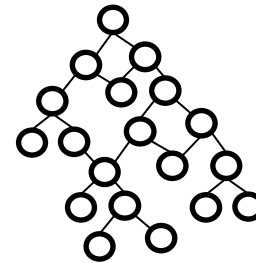


### Comments

- 00:00 Finished with a clear summary of what his research is for. The finish linked nicely with his opening statements.  
Aspect: Speech  
Commenter: Other  
Your response:
- 00:28 Good silence  
Aspect: Delivery  
Commenter: You  
Your response:
- 00:30 'Story' in intro  
Aspect: Delivery  
Commenter: You  
Your response:
- 00:34 Give the audience a story and lead them on it, even if the story is only a short one as a motivation  
Aspect: Structure  
Commenter: Other  
Your response:
- 00:38 No. Don't like it. A meaningless slide at this point dominates my view and the speaker is shoved of the the edge.  
Aspect: Visual aids  
Commenter: Other  
Your response:
- 00:44 Good opening, straight into the topic in an accessible way  
Aspect: Speech  
Commenter: Other

# Experimental Studies

- YouTube Videos on presentation skills: 4 tutorials and 4 examples
- Micro-scaffolds: Aspects and Ratings
- 20+ studies: 2,000+ students
  - 2 with postgraduate students; 7 in ENGR101



Presentation skills  
ontology

**Phase 1: Personal Space**  
(video watching and note taking)

**Phase 2: Social Space**  
(comment browsing and rating)

**Survey 1:**

- Demographic data
- Conceptual knowledge

**Survey 2:**

- Conceptual knowledge
- Usability (TAM)
- Cognitive load (NASA-TLX)

**Survey 3:**

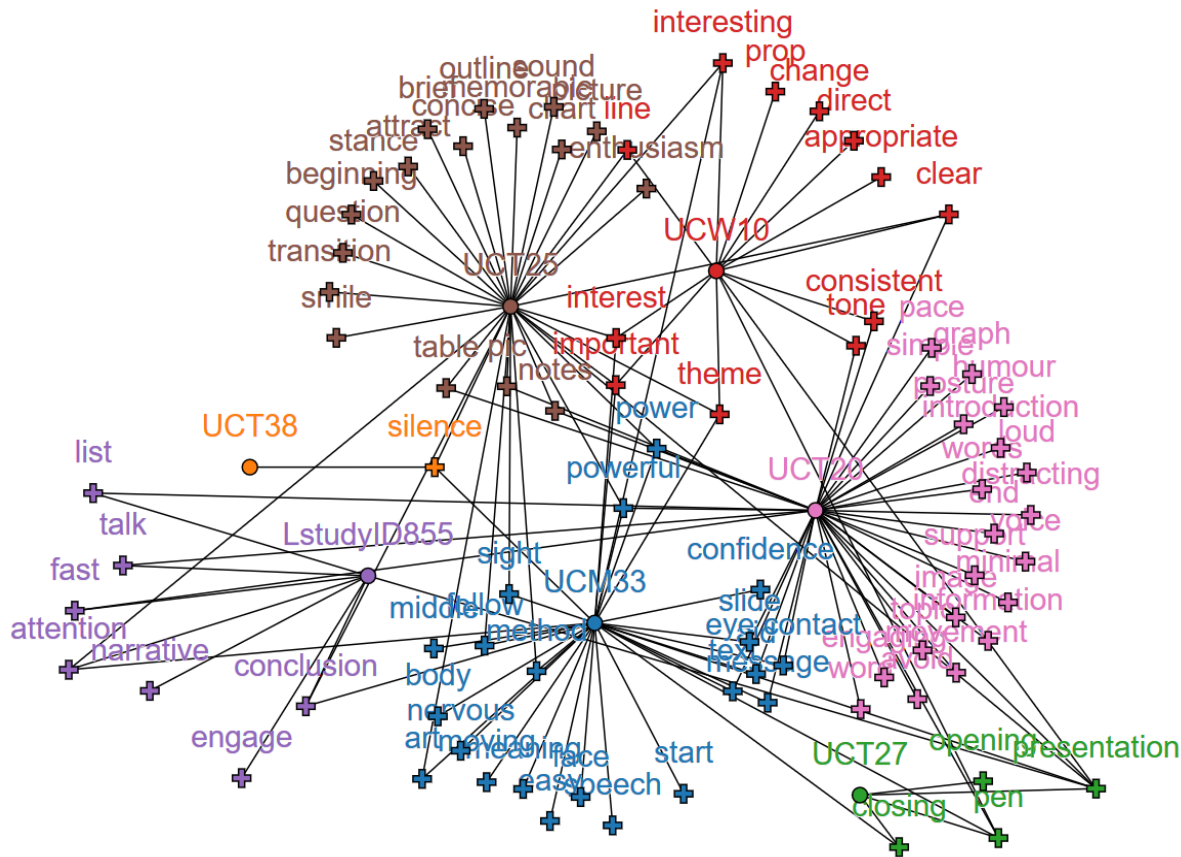
- Conceptual knowledge
- Usability (TAM)
- Cognitive load (NASA-TLX)

# Findings from Early Studies

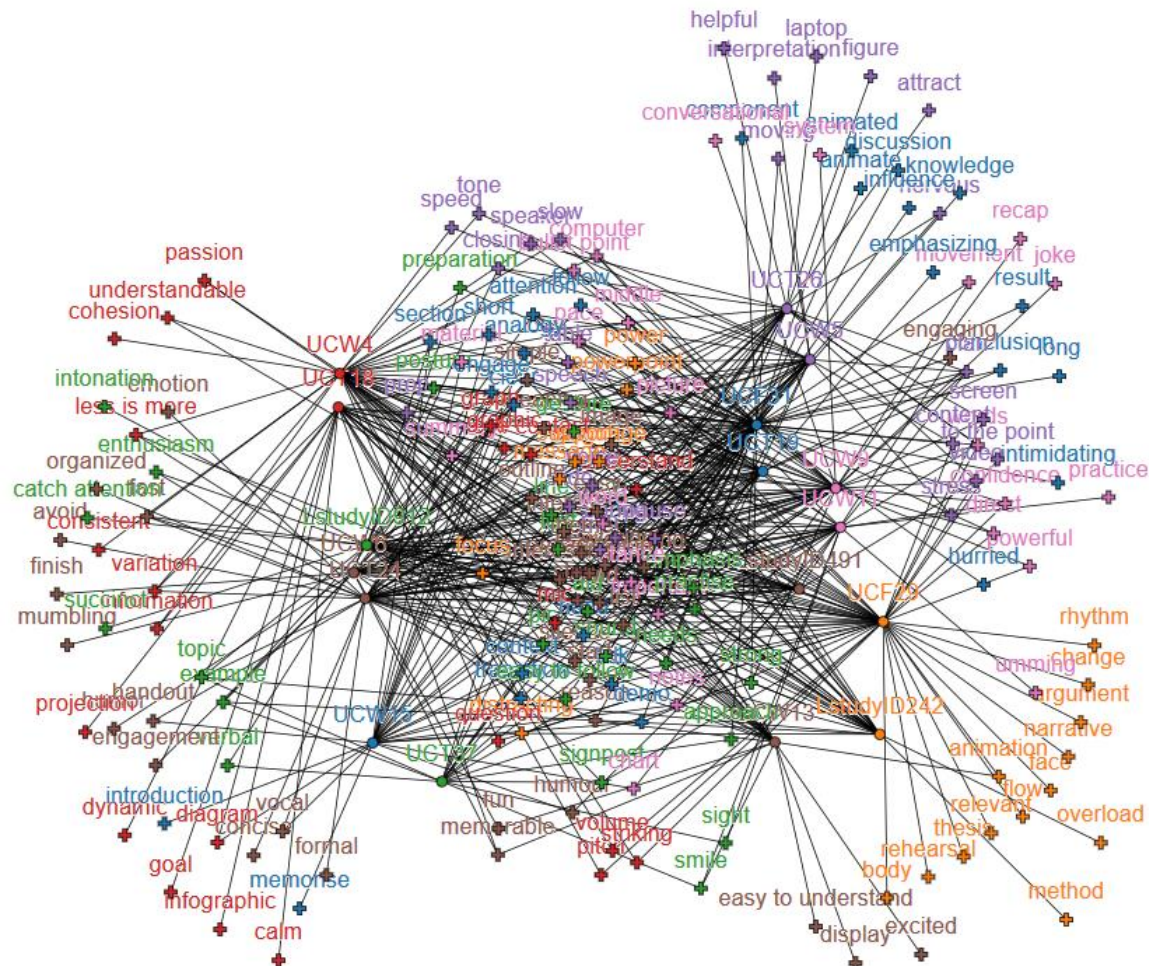
- ➔ Writing comments and rating comments led to increased conceptual knowledge
- ➔ Micro-scaffolds have positive effect on learning
- ➔ Writing comments is demanding (where to look, what to write?)



# Habitual Video Watchers



# Self-Regulated Learners



HOW to help  
users engage  
more

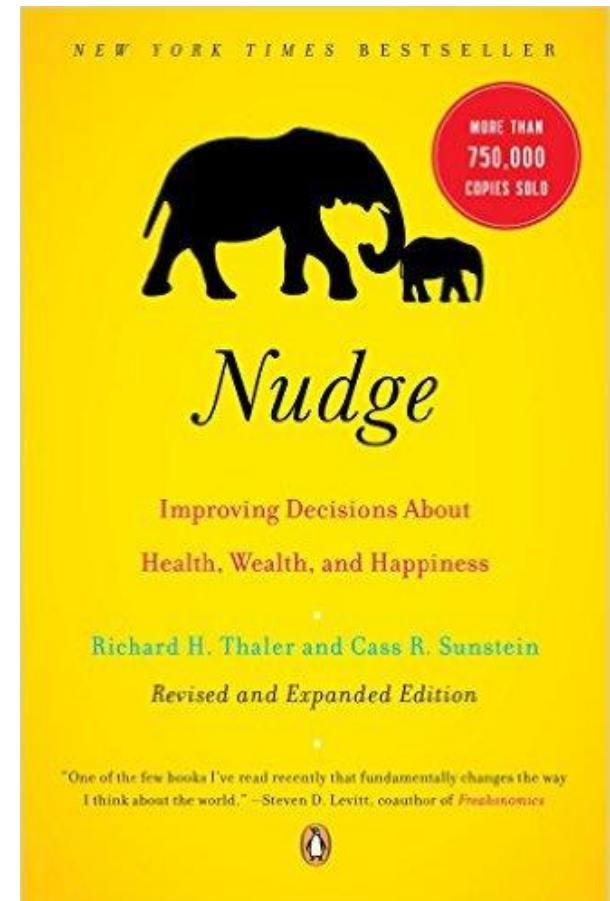


**NUDGES**



# Nudges and Choice Architecture

- Libertarian paternalism
- Do not restrict freedom to choose
- But nudge towards good decisions



# Reminder Nudges (RN)

- No comment reminder
- No comment reference point
- Aspect underutilized
- Diverse aspects



## Watch video: TUTORIAL 2: How to open and close presentations?

Presentation lesson from Mark Powell, Cambridge University Press ELT, 7 min.



### Learned anything new?

Are there techniques in the tutorial video that are new to you?

Share your thoughts with the class by making a comment using the "I didn't realize I wasn't doing this" aspect.

### Your previous comments

00:00

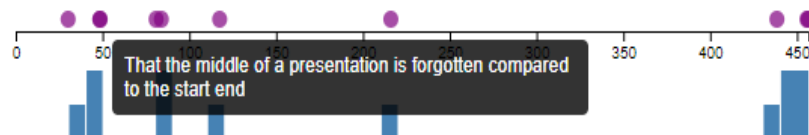
Good info about how to start and make the content clear to the audience

Aspect: I like this point

02:58

Really helpfull

Aspect: I like this point



Add comment

- I am rather good at this
- I did/saw this in the past
- I didn't realize I wasn't doing this
- I like this point

# Effects of reminder nudges

- More comments
- Higher learning
- Less passive watching of videos
- More even use of aspects

# ICAP Framework

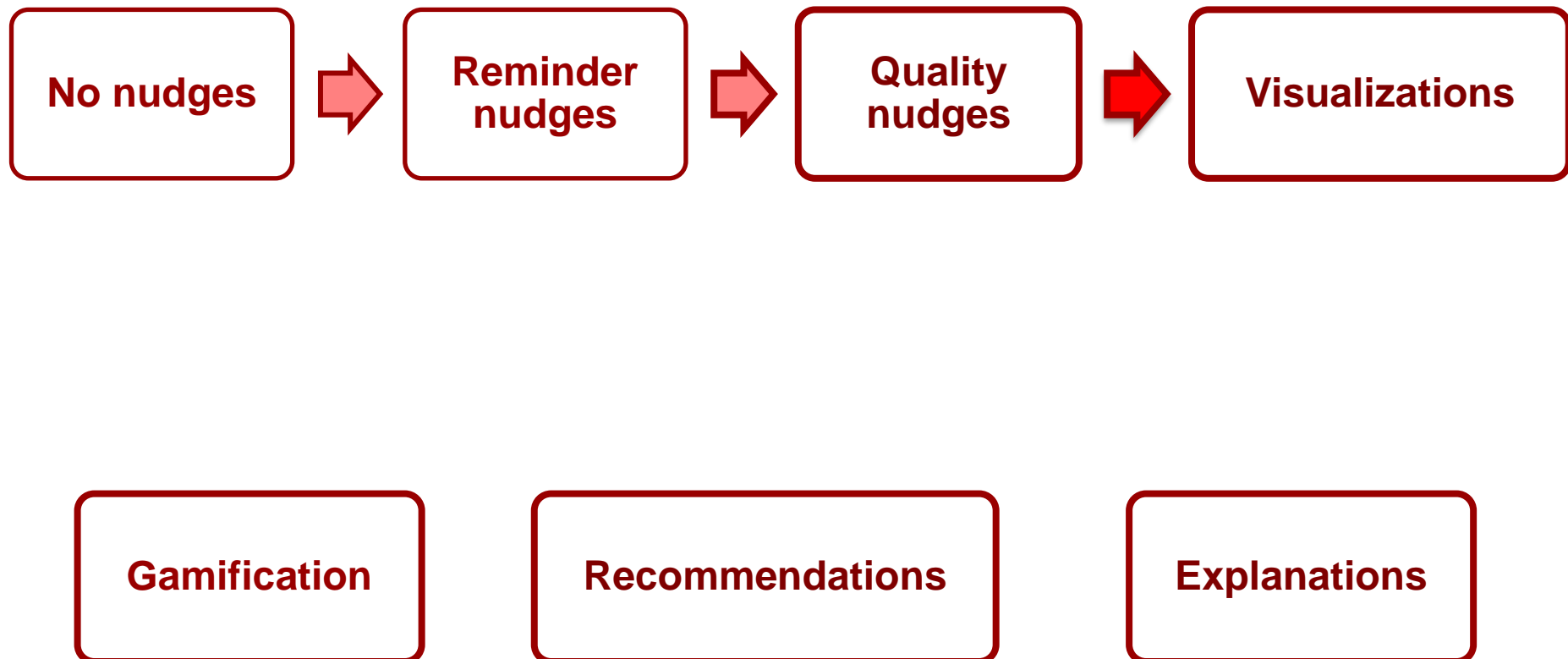
Overt behaviours can reveal students' level of engagement

- Passive (Receiving)
- Active (Manipulating)
- Constructive (Generating)
- Interactive (Dialoguing)

$I > C > A > P$



# 30+ Studies



# Summary – ENGR101

Year	Intervention	n	Passive	Active	Constructive
2017	No nudges	303	50.5%	39.3%	10.2%
2018	E1: No nudges	180	59.4%	31.4%	9.2%
	E2: RN	165	36.4%	44.2%	19.4%
2019	RN	171	37.4%	45.6%	17.0%
2020	RN+QN	294	25.5%	38.8%	35.7%
2021	RN+QN+DB	351	7.1%	40.2%	52.7%
2022	RN+QN+DB	241	8.3%	42.3%	49.4%
2023	RN+QN+DB	645	6.2%	57.2%	36.6%
2024	E1: Gamification	223	8.9%	2.7%	88.3%
	E2: Recommendations	235	2.9%	35.7%	61.3%
2025	E1: Recommendations	275	5.1%	48%	46.9%
	E2: XAI	261	4.2%	37.5%	58.2%

# Comment Quality Scheme

## Category 1



### AFFIRMATIVE, NEGATIVE, OFF-TOPIC

Comments which are  
**irrelevant, merely  
affirmative, or  
negative** with **no  
explanation**

## Category 2



### REPEATING

Comments which  
**only repeat** the  
video content.

## Category 3



### CRITICAL AND ANALYTICAL

Comments which  
**mention points that  
are implicitly covered**  
in the video or **show  
critical thinking** on the  
content of the video.

## Category 4



### SELF-REFLECTIVE

Comments in which the  
learner reflects on their  
behaviour and previous  
experience or knowledge  
on giving presentations

## Category 5



### SELF-REGULATING

Comments where the  
learner decides what they  
would do to improve  
themselves in future.

# Comment Quality Scheme - Examples



**AFFIRMATIVE, NEGATIVE,  
OFF-TOPIC**

"Agree"



**REPEATING**

"listen to the  
speaker"



**CRITICAL AND ANALYTICAL**

"Presentations can be  
boring and long  
whereas stories are  
more enjoyable and  
can have clear  
direction if formulated  
properly"



**SELF-REFLECTIVE**

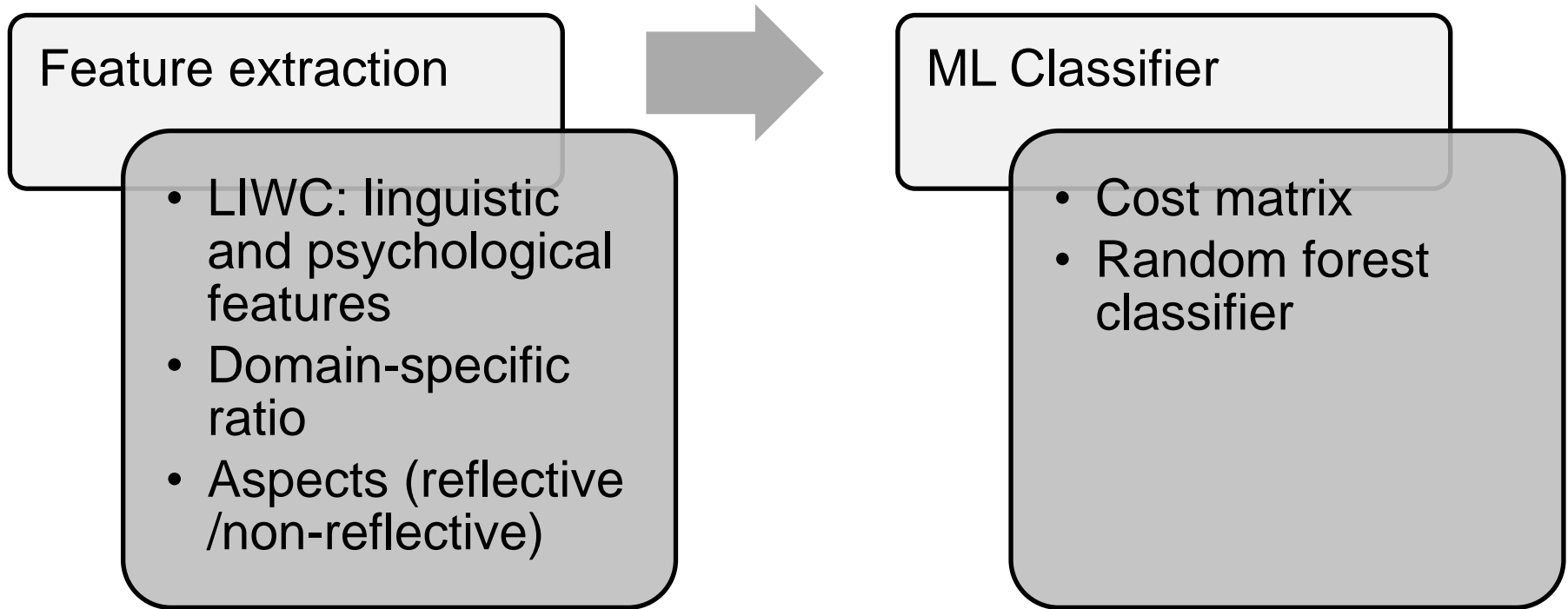
"My past speeches  
have had very  
interesting  
beginnings"



**SELF-REGULATING**

"I will definitely be  
trying to smile more  
throughout my next  
presentation."

# Automating quality assessment with ML



# Quality Nudges (QN)

- Elaborate more
- Think more critically
- Good critical comment
- Final reflection
- First / Frequent reflective comment (tutorial videos)
- First / Frequent high-quality comment (example videos)

# Summary – ENGR101

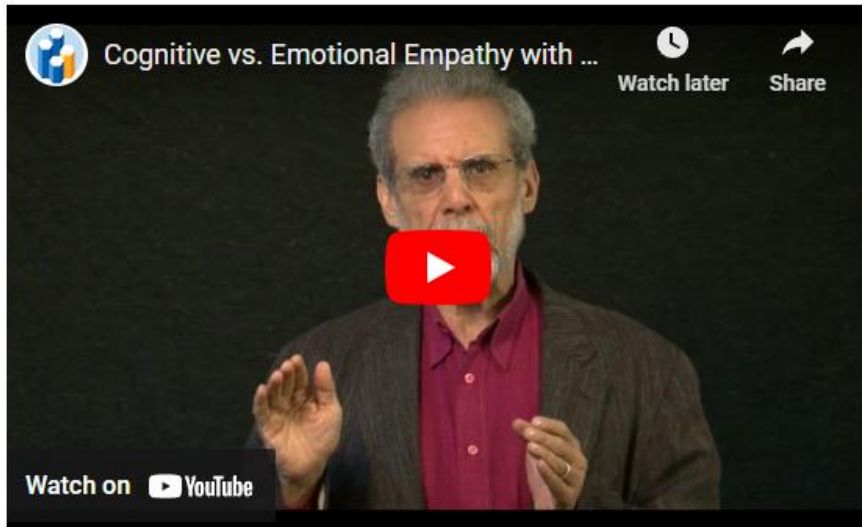
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# Visualizations

Student Actions » Space: ADDU 2nd Sem 2024 - Empathy » [Watch Video: Cognitive vs. Emotional Empathy](#)

## Watch video: Cognitive vs. Emotional Empathy

Cognitive vs. Emotional Empathy - 1:31 mins



Add comment

### Your previous comments

- 00:00 ☒ Empathy as a predictor of job performance - that is very interesting. When I think about it, it seems logical. If someone is empathetic, they will be better at communication, and communication is the foundation.  
Aspect: I like this point
- 00:27 ☐ There are two kinds of empathy - both are important  
Aspect: I realise that this impacts my team



# Visualizations

## AVW-Space

Logged in as: tanja (Admin) | [Edit account](#) | [Logout](#) | [Contact us](#)

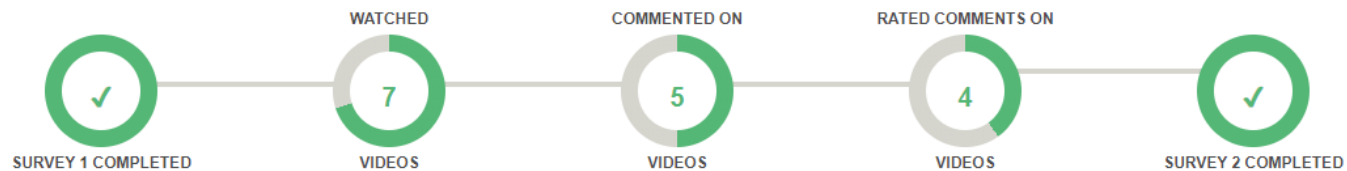
**Student actions**

**Teacher actions**

**Admin actions**

Student Actions » [Space: Face-to-face Communication in Software Development Meetings](#)

### Space: Face-to-face Communication in Software Development Meetings



#### TUTORIAL 1: The 7 Cs of Communication

Using the 7 Cs of Communication to communicate more effectively, make your message more engaging, and increase your productivity. 3 min.

[Watch & Comment](#) [Review Comments](#)

#### TUTORIAL 2: Body Language

Using body language to identify and interpret the nonverbal signals people use to communicate their true intentions and emotions. 3 min.

[Watch & Comment](#) [Review Comments](#)

#### TUTORIAL 3: Improve Your Listening Skills with Active Listening

The act of using active listening techniques to become a better listener during meeting participation. 3 min.

[Watch & Comment](#) [Review Comments](#)

#### TUTORIAL 4: Giving feedback

How to make the process of giving and receiving feedback a more positive experience for you and your teammates. 2 min

[Watch & Comment](#) [Review Comments](#)

#### TUTORIAL 5: How to effectively contribute to team meetings

Key techniques to make a solid contribution during your team meetings. 4 min.

[Watch & Comment](#) [Review Comments](#)

#### TUTORIAL 6: How Google builds the perfect team

Insights gathered from a study conducted on Google software development teams to investigate what makes a perfect team. 2 min

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# Gamification


## AVW-Space

Logged in as: student1 (Student) | Edit account | Logout | Contact us

Student actions

### Watch video: TUTORIAL 4: The five secrets of speaking with confidence

by Christine Clapp, Spoken with Authority, 6 min.



Share

#### Welcome

Tips will appear here to help you get the most out of AVW-Space.

You can mouse over the dots below to see what others have said about the video and compare with your comments.

Others commented:

You commented:

0 50 100 150 200 250 300 350

- I am rather good at this
- I did/saw this in the past
- I didn't realize I wasn't doing this
- I like this point
- Your Comments

#### What does it relate to?

- ☐ I like this point
- ☐ I did/saw this in the past
- ☐ I didn't realize I wasn't doing this
- ☐ I am rather good at this

#### Write Comment

Save comment Cancel

#### Your comments

00:00 **Comment Quality: 3 (High Quality)**

Aspect: I didn't realize I wasn't doing this

I realized that I am doing the gestures she mentioned when I present.

05:40 **Comment Quality: 2 (Medium Quality)**

Aspect: I like this point

This is a very good point.

### Badge Profile

#### Watching

- VIDEO NOVICE  
DEBUT VIEWER
- VIDEO PRO  
HALFWAY ACE
- VIDEO MASTER  
MASTER OF VIDEO-WATCHING

#### Commenting

- COMMENT NOVICE  
NOVICE COMMENTER
- COMMENT APPRENTICE  
INTERMEDIATE COMMENTER
- COMMENT PRO  
COMPETENT COMMENTER
- COMMENT EXPERT  
REVENGED COMMENTER
- COMMENT MASTER  
MASTER OF QUALITY COMMENTS

#### Rating

- PEER REVIEW MASTER  
MASTER OF RATINGS

#### Overall

- LEARNING LUMINARY  
ULTIMATE MASTERY POLYGLIT

# Recommendations

## Review video comments for "TUTORIAL 3: Make a presentation like Steve Jobs"



### Your own comments

### Comments to rate

[Show more comments](#)

04:07

Area of Recommendation: Delivery ★NEW★

Aspect: I am rather good at this

I like the idea of contextualising figures with analogies that are easily understandable. This can make complicated information more relevant for the audience.

Total Ratings:



Your rating:

No response

[Reply](#)

[\[+\] Show replies \(0\)](#)

04:14

Area of Recommendation: Delivery ★NEW★

Aspect: I didn't realize I wasn't doing this

The idea of providing context to numbers and figures using analogies is important as your audience may not have the same background knowledge as you to compare these values. This ties into the idea of wowing the audience, which can also be achieved by consistently using words with positive connotations in relations to your findings.

Total Ratings:



Your rating:

No response

[Reply](#)

[\[+\] Show replies \(0\)](#)

# Explanations

## Your comments

00:00

**Comment Quality: 1 (Low Quality)**

Show Explanation

Aspect: I like this point  
interesting

00:08

**Comment Quality: 2 (Medium Quality)**

Hide Explanation

Aspect: I didn't realize I wasn't doing this  
Stance is important when giving presentations

### Explanation of Comment Quality



This comment is a quality 2 (medium-quality) comment because you made a comment that lacks context or information.

You can make this comment better by relating it to your or your team's experience. For example:

*I have been told this so many times. I am much better at just looking at the back of the room instead of making eye contact. I should practice maintaining eye contact comfortably for more than a split second.*

00:11

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# Communication in Face-to-Face Meetings

Student Actions » Space: Face-to-face Communication in Software Development Meetings  
» [Watch Video: TUTORIAL 3: Improve Your Listening Skills with Active Listening](#)

## Watch video: TUTORIAL 3: Improve Your Listening Skills with Active Listening

The act of using active listening techniques to become a better listener during meeting participation. 3 min.



### Make a comment

Don't forget to make a comment on the techniques for Communication Skills mentioned in the video.

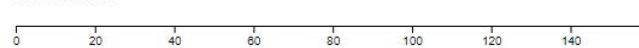
### Your previous comments

00:02   
01:45   
02:11   
00:37

Others commented:



You commented:



- I am rather good at this
- I did/saw this in the past
- I didn't realize I wasn't doing this
- I like this point
- Your Comments

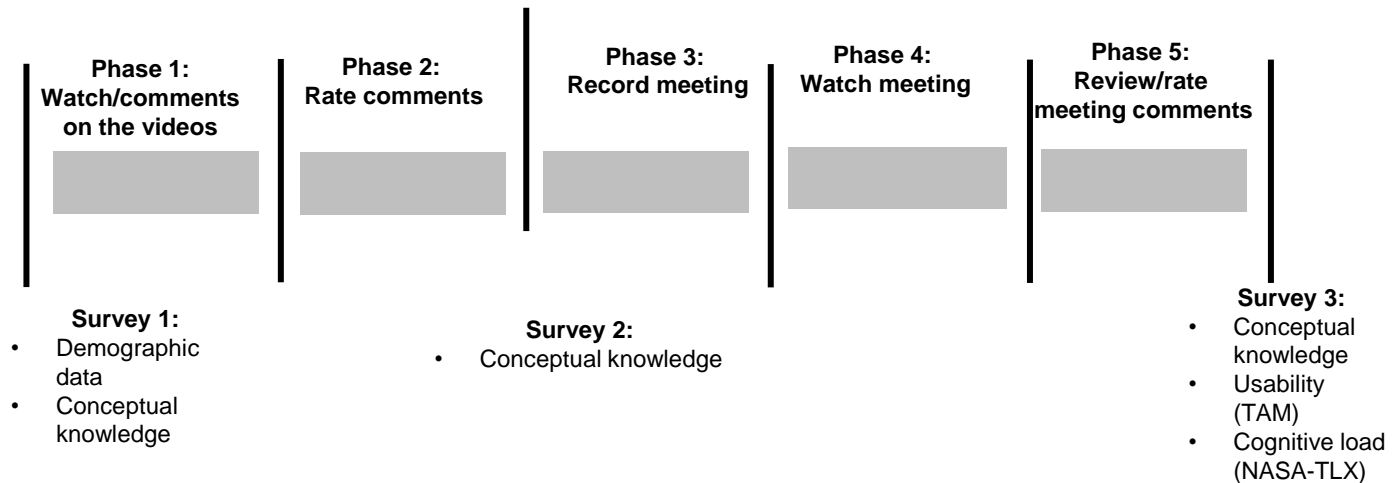
### What does it relate to?

- ☐ I did/saw this in the past
- ☐ I didn't realize I wasn't doing this
- ☐ I am rather good at this
- ☐ I like this point

### Write Comment

# Experimental Design

- YouTube Videos on communication
  - 6 tutorials and 4 examples
- Micro-scaffolds:
  - Aspects and Ratings
- 3 studies in SENG202





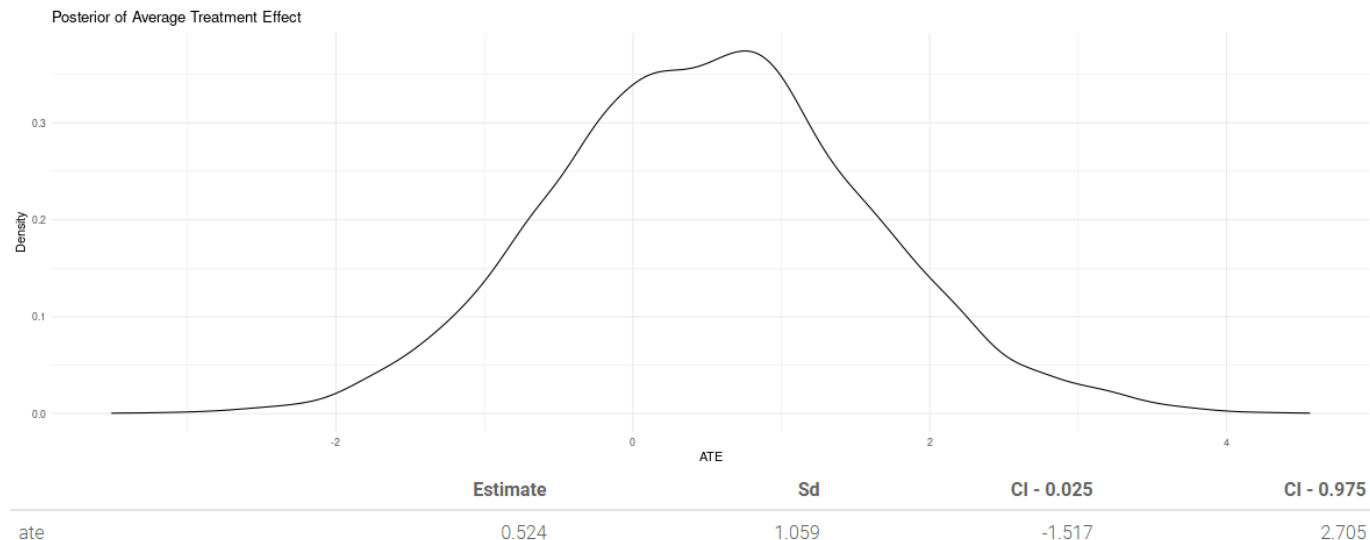
# Summary – SENG202

	Study	n	Passive	Active	Constructive
<b>2020</b>	No nudges	47	16	9	22
<b>2021</b>	Nudges + Visualizations	49	0	3	46
<b>2022</b>	Nudges + Visualizations	47	0	1	46

Mitrovic, A., Galster, M., Malinen, S., Holland, J., Lumapas, R. V., Mohammadhassan, N., Musa, J. (2023) Effectiveness of video-based training for communication skills: evidence from a three-year study. ACM Transactions on Computing Education, 23(4), 1-25.

# Causal Modeling – Communication skills

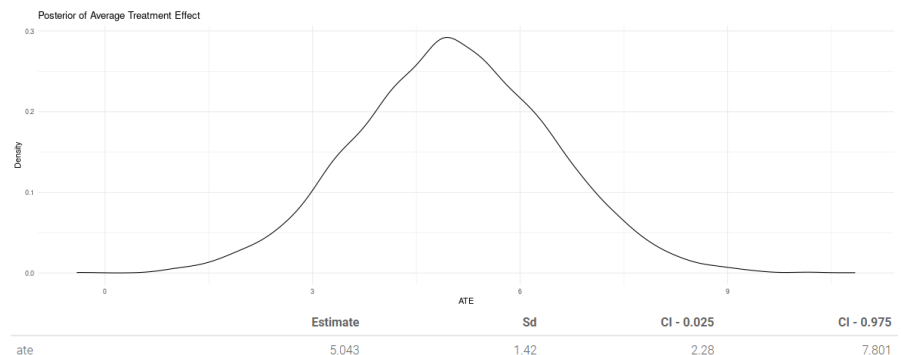
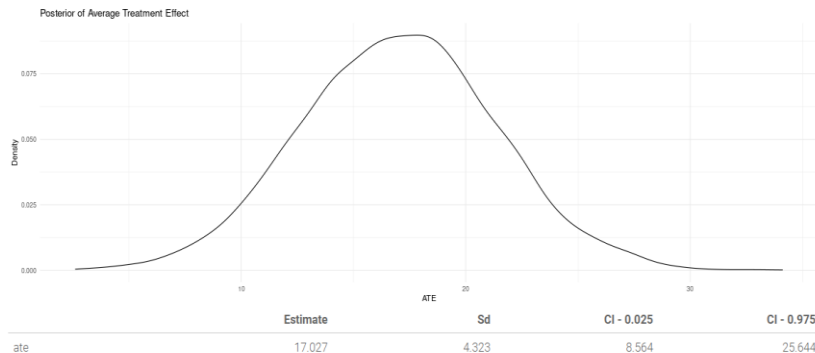
Receiving nudges led to an increase of 0.52 in the knowledge score compared to what would have happened if students did not receive nudges.



<https://apsta.shinyapps.io/thinkCausal/>

# Causal Modeling – Communication skills

Receiving nudges led to an increase of 17.03 comments and an increase of 5.04 of High-quality comments, compared to what would have happened if students did not receive nudges.



# Examples comments on the team video

- *Could have better followed an agenda - meeting seems less purposeful*
- *For myself, if I was to have a meeting with someone and they had the same body language as I did in this meeting (at least in the first 10 minutes), I would get an impression that they are not interested, disengaged, or not paying attention*
- *I need to construct/deliver my ideas clearer*

# Feedback on the team video

- *Very useful as an outsider's perspective allowed me to see things (good and bad) that I did in the meeting more clearly*
- *You're able to see your meetings from an outside perspective, which enables you to see things you might've missed in the moment such as team members not contributing as much or not paying attention*
- *I could communicate to the team what I believe needed to be worked on, and what we were doing well*
- *Understanding your team members views, feelings, and opinions, leading to better communication and teamwork*

# Current/Future Work

- Developing new spaces
- Extending AVW-Space to support direct collaboration between students
- Developing instruments for assessing soft skills
- Studies with software professionals

# Acknowledgements

Thanks to all team members!

- University of Leeds: Vania Dimitrova, Alicja Piotrowicz, Ludia Lau
- University of Adelaide: Amali Weerasinghe
- University of Canterbury: Matthias Galster, Sanna Malinen, Jay Holland, Matt Gordon, Negar Mohammadhassan, Ja'afaru Musa, Pasan Peiris, Ehsan Bojnordi, Raul Vincent Lumapas, Sreedevi Iyer

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- EU-FP7-ICT-257184 ImREAL grant
- Ako Aotearoa Southern Hub grants
- University of Canterbury Teaching development grants
- NZ Ministry of Business, Innovation and Employment Smart Ideas grant





Please email me if you would like to use AVW-Space

Tanja.Mitrovic@canterbury.ac.nz

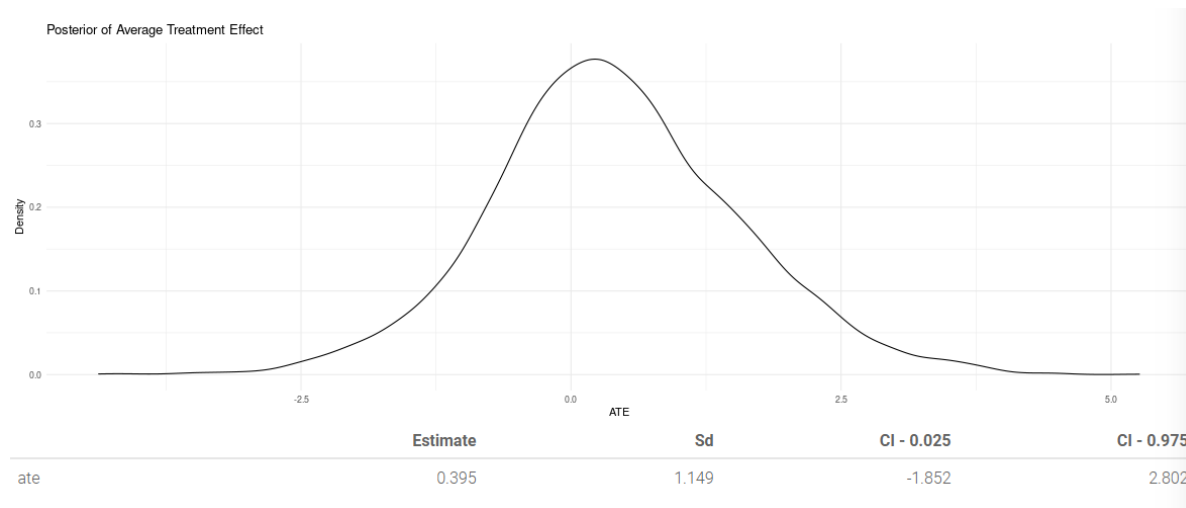
# Engagement – SENG202

	2020	2021	2022	Significance
Participants	47	49	47	
Sessions	5.55 (2.06)	6.67 (3.83)	9.00 (9.01)	F = 4.39, p < .05
Days	4.77 (1.67)	5.49 (2.60)	6.83 (3.05)	F = 8.19, p < .001
Videos	11.77 (3.54)	44.33 (18.08)	13.85 (3.95)	F = 132.35, p < .001
Comments	9.62 (13.21)	29.55 (17.81)	29.81 (18.54)	F = 22.76, p < .001
Nudges	N/A	44.33 (18.08)	45.94 (18.28)	
HQ comments	1.87 (2.58)	9.10 (6.30)	9.13 (6.25)	F = 28.89, p < .001
Ratings	104.47 (154.16)	145.24 (280.88)	58.77 (62.35)	no

# Causal Modeling – Presentation skills

	2017 (231)	2020 (147)
Pre-test	13.51 (6.63)	13.14 (5.09)
Post-test	13.45 (6.47)	13.55 (5.71)

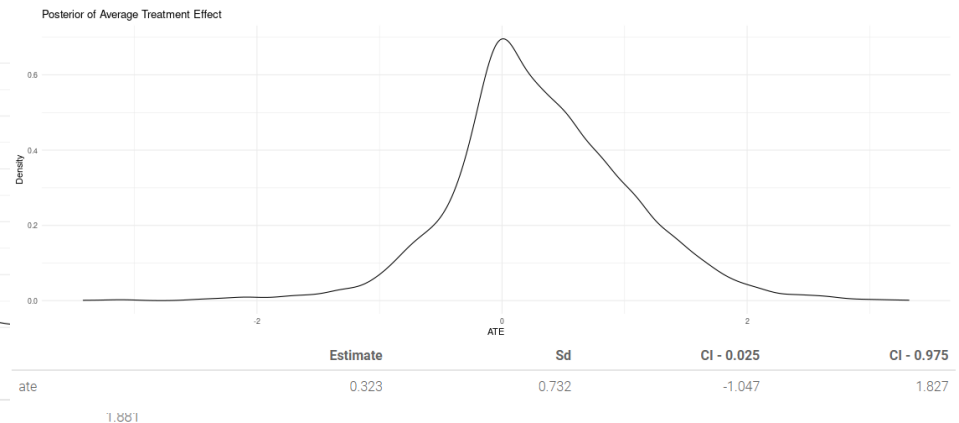
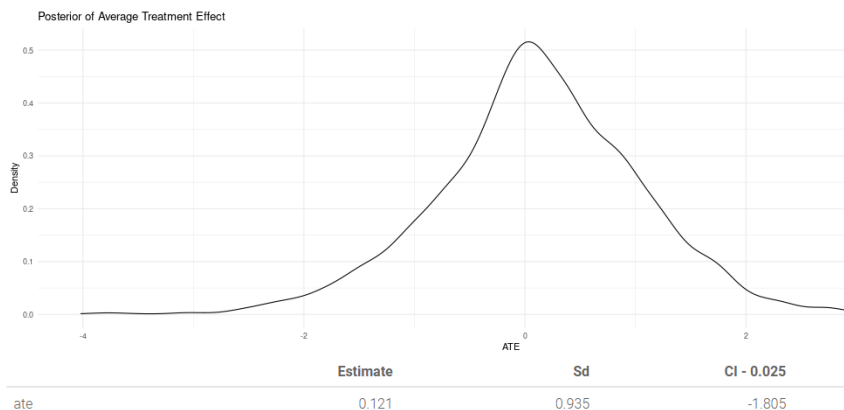
Receiving nudges led to an increase of 0.39 in the knowledge score compared to what would have happened if students did not receive nudges.



# Causal Modeling – Presentation skills

	2017 (303)	2020 (296)
Comments	1.96 (3.97)	5.66 (7.20)
High Quality	0.72 (1.37)	2.89 (4.14)
Low Quality	1.25 (3.24)	2.76 (3.98)

Receiving nudges led to an increase of 0.12 of low-quality comments and an increase of 0.32 of High-quality comments, compared to what would have happened if students did not receive nudges.



# Engagement with the team video

	2020	2021	2022
<b>Participants (total)</b>	47	49	47
<b>Watched</b>	43	25	43
<b>Team comments</b>	5.05 (5.65)	4.79 (2.49)	5.54 (3.63)

# Empathy Study 2023

	<b>All (58)</b>
Sessions	[2,33], 8.93 (4.81)
Days	[2,17], 7.41 (3.13)
Videos	[1,6], 5.74 (.98)
Comments	[2,28], 10.50 (5.46)
Nudges	[4.42], 23.47 (6.50)
Ratings	[0,100], 41.69 (37.64)
<b>CK1</b>	<b>[2,23], 8.47 (3.92), n = 58</b>
<b>CK2</b>	<b>[1,21], 9.26 (4.74), n = 57</b>
<b>CK3</b>	<b>[2,28], 10.96 (5.27), n = 51</b>
Comments on team video	[0,18], 4.83 (4.14)
Avg Specificity of Team Comments (n = 55)	[1, 4], 1.58 (0.65)
Ratings on team comments	[0,23], 9.40 (6.57)

# Comments on the Team Video

Valence	#TeamComm	Quality	Specificity
Positive	265	2.72 (.45)	1.42 (.62)
Negative	33	2.97 (.17)	2.06 (.83)

# Comments on the Team Video

Subject	#Comments	Positive	Negative	Specificity	Quality
Team	223 (74.8%)	202 (90.6%)	21 (9.4%)	1.48 (.66)	2.75 (.44)
Peer	64 (21.4%)	57 (89.1%)	7 (10.9%)	1.41 (.58)	2.72 (.45)
Self	11 (3.7%)	6 (54.6%)	5 (45.4%)	2.00 (1.10)	2.91 (.30)



# Example Team Comments

- *(Self) Here I interrupted one of my team mates to make sure everyone had recapped their week before we moved onto holiday plans. I think it was good to keep the meeting structure but i shut down the idea too harshly*
- *(Self) Probably the thing I'm most embarrassed about rewatching this (barring my appearance) is how much I fail to actively listen to the people around me, focussing more instead on typing away. I recognize that it can appear rude and apathetic of me*
- *(Team) Often we end up having more than one conversation happening at once, which divides our attention and means people may miss things that are important. This can be helpful as a method of getting more done, but we could be more intentional about it.*
- *(Team) I think that it is good that we are speaking one at a time. It allows everyone to get a chance to share their voice.*

# Perceptions of AVW-Space

- Writing comments
  - *The videos were thought-provoking and had enough information that I could pick up on relatively quickly and write my thoughts about them.*
  - *The ability to learn soft skills, which cannot usually be taught*
  - *Watching cool videos!*
  - *When all the circles are green and we close the tab*
- Reviewing/rating comments:
  - *It is useful as you can see other people's perspective on the videos shown*
  - *I think this is very important to see what others took from the videos. Maybe I missed some key ideas and then I can see what others have written.*
  - *This simulates a discussion-like environment with others and provokes deeper thoughts about the subject.*

# Reviewing/Rating Team Comments

- *It make you reflect on your behaviour. You can learn something about yours and your teams actions.*
- *Very useful - because it gave me an insight into how we are working as a team and individuals in the context of empathy that we normally wouldn't think about whilst having the meeting*
- *It is a good tool to see how others perceived you as a team member*
- *I didn't enjoy this due to personal anxiety/body image issues, and instead it caused me some amount of stress.*

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