Towards Personalised Support for Learning Transferable Skills via Active Video Watching

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MOOCs

Flipped classrooms

Informal learning

Video Watching for Learning

YouTube   vimeo

How to Scaffold VBL?

- Strategies
  - Classroom discussion
  - Interactive activities (quizzes, problems)
- Require additional effort from teachers
- Our approach:
  - Interactive note taking
  - Students already familiar with commenting on videos
  - Use aspects as reflective prompts

ICAP Framework

Overt behaviours can reveal students' level of engagement

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

I > C > A > P

Chi, M. T., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist, 49*(4), 219-243.

AVW-Space

- Controlled video-watching environment
- Similar to YouTube
- AVW platform (Leeds)[*]
- https://ictg.cosc.canterbury.ac.nz:8009
- Two phases:
  - Personal: watch & comment on videos
  - Social: explore and rate comments by others

*The AVW platform was a component of the ImREAL grant (EU-FP7-ICT-257184)

Materials

ó **Videos**
– Four tutorials
– Four examples

ó **Aspects and Rating categories**

Tutorials	Examples
I am rather good at this	*Delivery*
I did/saw this in the past	*Speech*
I didn't realize I wasn't doing this	*Structure*
I like this point	*Visual aids*

ó **Presentation skills ontology**

Personal 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.

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

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

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: Other
Commenter: Other
Your response: No response / This is useful for me / I hadn't thought of this / I didn't notice this / I don't agree with this / I like this point
00:28 Good silence at ...
Aspect: Delivery
Commenter: You
00:30 'Story' in intro in ... on of listeners
Aspect: Delivery
Commenter: You
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: You
Your response: No response
00:38 No. Don't like it. A meaningless slide at this point dominates my view and the speaker is shoved of the edge.
Aspect: Visual aids
Commenter: Other
Your response: No response
00:44 Good opening, straight into the topic in an accessible way
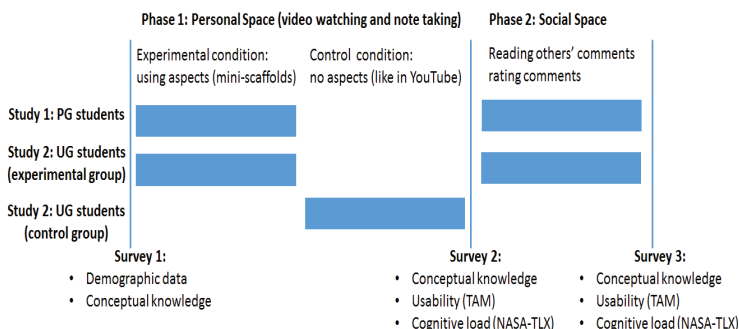Aspect: Speech
Commenter: Other

Research Questions 2017

ó **Q1: Does AVW support learning?**
– Which behavior increases knowledge?

ó **Q2: Do micro-scaffolds help?**
– Are there any notable usage patterns?

ó **Q3: Do learner profiles differ?**
– What are the important differences?

ó **Q4: What is learners' experience with AVW?**
– Are there any critical difficulties?

Mitrovic, A., Dimitrova, V., Lau, L., Weerasinghe, A., Mathews, M.
Supporting Constructive Video-based Learning: Requirements Elicitation
from Exploratory Studies. AIED 2017

Studies 1 and 2

Phase 1: Personal Space (video watching and note taking)   **Phase 2: Social Space**

Experimental condition: using aspects (mini-scaffolds)   Control condition: no aspects (like in YouTube)   Reading others' comments rating comments

Study 1: PG students

Study 2: UG students (experimental group)

Study 2: UG students (control group)

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)

Data

ó **Survey data**
– Demographic (S1)
– Motivated Strategies for Learning (MSLQ) (S1)
– Conceptual knowledge (S1, S2, S3)
– Action plans (S1, S2, S3)
– Perceived usefulness (TAM) (S2, S3)
– Cognitive load (NASA-TLX) (S2, S3)

ó **Interaction traces**
– Video watching
– Comments
– Ratings

PreSOn
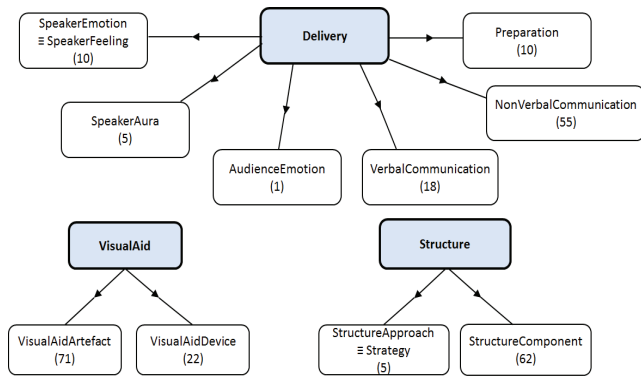
Abolkasim, E., Lau, L., Mitrovic, A., Dimitrova, V.(2018) Ontological Approach for Making Sense of Domain Diversity in Learner Comments on Videos. Proc. AIED 2018, pp 3-8

Assessing Conceptual Knowledge

- Three questions (1 min per question)
  - Structure
  - Delivery and Speech
  - Video Aids
- 3 markers: Krippendorff's alpha
  - Study 1: 0.894
  - Study 2: 0.907
- Majority vote or re-marking
- Extended in later studies

Participants

- Study 1
  - 48 PG students recruited
  - 38 commented/completed surveys
- Study 2:
  - 37 UG engineering students recruited
  - Control group (13 males, 5 females)
  - Exp. group (17 males, 2 females)

Q1: Did AVW support learning?

Conceptual Knowledge Scores

	CL Study 1	CL Study 2	P/AL Study 2	IL Study 2
Survey 1	12.89 (6.44) n = 38	13.62 (4.03) n = 13	11.63 (2.97) n = 8	10.63 (4.95) n = 16
Survey 2**	13.74 (6.46) n = 38	17 (4.52) n = 10	11.2 (5.45) n = 5	10.13 (4.82) n = 8
Survey 3	15.86 (6.18) n = 35	18.4 (3.72) n = 5	7.5 (9.19) n = 2	9.5 (6.36) n = 2
significant	p = .003 η^2 = .15	p = .02 η^2 = .67		

Q1 - Finding

- Only constructive behaviour led to increased learning

- R1: Enhance for Personal/Social space with intelligent support to foster constructive behaviour

Q2: Did micro-scaffolds help?

- Study 1: 790 comments

- Study 2: 239 comments

- Constructive Learners:
  - Study 1: 19.58 (13.19)
  - Study 2: 18.38 (16.59)

Engagement (Study 1)

Video	Length	Comments [Personal Space]	Comments without ratings	Ratings [Social Space]
Tutorial 1	2.54'	89	2	603
Tutorial 2	7.37'	110	1	382
Tutorial 3	6.55'	120	3	402
Tutorial 4	6.22'	90	3	261
Example 1	3.23'	79	0	272
Example 2	8.28'	93	2	281
Example 3	6.48'	100	3	283
Example 4	3.25'	63	4	222
Total		744	18	2,706

CL engagement in Social Space

	Rating category	Study 1	Study 2
Trigger Learning	This is useful for me	349	122
	I hadn't thought of this	260	23
	I didn't notice this	241	30
Induce Opinion	I do not agree with this	213	29
	I like this point	1643	128

Study 2: two students providing 150 ratings (73 and 77)

Q2: Did micro-scaffolds help?

Study 2

	Constructive Learners		Passive/Active Learners	
CK scores	Control (5)	Exper. (5)	Control (3)	Exper. (1)
Survey 1	13.2 (3.96)	12.2 (2.28)	11 (2.65)	13
Survey 2	15.8 (2.59)	18.2 (5.98)	12 (6.93)	13
Survey 3	N/A	18.4 (3.72)	N/A	15
Improvement		p = .02 η^2 = 0.667		
Comments	24.83 (20.13) [6,51]	12.86 (11.65) [1,29]		

Q2 - Finding

- Use of micro-scaffolds has positive effect on learning
- R2:
  - Mandatory use of aspects for the Personal phase
  - Intelligent support to encourage use of diverse aspects, and preferably aspects that trigger reflection
- R3: Intelligent support to encourage ratings (esp. those that trigger learning)
- R4: Include use of micro-scaffolds in the Learner profile

Q3: Did learner profiles differ?

	CL Study1 (38)	CL Study2 (13)	P/AL Study2 (8)	IL Study 2 (16)
Training	2.16 (.95)	1.77 (.59)	1.5 (.53)	1.81 (.75)
Experience*	2.87 (.78)	2.77 (.59)	2.25 (.46)	2.44 (.73)
YouTube*	3.5 (1.11)	4.38 (.65)	4.13 (.64)	4.19 (.98)
YouTube4Learning	2.71 (1.01)	2.85 (.89)	2.62 (1.19)	3.25 (1)
Task Value**	4.49 (.38)	3.95 (.4)	3.83 (.53)	4.02 (.45)
Self-Efficacy	3.72 (.56)	3.46 (.72)	3.88 (.56)	3.66 (.4)
Academic Control	3.91 (.46)	4.04 (.49)	4.25 (.68)	4.22 (.58)
Intrinsic Motivation	4.05 (.52)	3.79 (.35)	3.72 (.68)	3.79 (.51)
Extrinsic Motivation	3.37 (.74)	3.62 (.33)	3.97 (.59)	3.41 (.82)
Effort Regulation**	3.81 (.57)	3.92 (2.28)	3.53 (.54)	3.45 (.55)
Rehearsal	3.4 (.8)	2.94 (.85)	2.88 (.88)	2.94 (.92)
Organization**	3.84 (.94)	3.27 (1.25)	2.38 (1.03)	3.02 (1.07)
Elaboration**	4.13 (.54)	3.67 (.49)	3.63 (.74)	3.55 (.75)
Self-Regulation**	3.56 (.49)	2.82 (.51)	3.31 (.54)	3.23 (.46)

Likert scale [1-5], 1 is the lowest

Q3 - Finding

- More experienced students are more likely to exhibit target behaviour
- R5: Include past experience and MSLQ scales in the learner profile
- R6: Different strategies needed for intelligent support
  - CL: Encourage to refer to past experience
  - P/AL: encourage elaboration, SR, organization, the value of commenting/rating
- R7: Further investigate constructive behaviour to identify personalizes strategies

Q4: What was learners' experience?

		CL Study 1	CL Study 2	P/AL Study 2
NASA-TLX Demand	Personal Space	9.89 (4.87)	11.1 (4.95)	10 (7.28)
	Social Space	8.86 (4.84)	9 (4.42)	13.67 (3.21)
NASA-TLX Effort	Personal Space	8.55 (4.21)	8.9 (2.99)	7.4 (5.03)
	Social Space	8.37 (4.89)	7.4 (4.34)	15.67 (.58)
NASA-TLX Frustration	Personal Space	**5.79 (4.49)**	8.5 (5.06)	5.8 (5.45)
	Social Space	**8.63 (6.17)**	8.8 (5.36)	5.67 (6.43)
NASA-TLX Performance	Personal Space	**12.76 (4.48)**	11.5 (5.29)	9.4 (7.7)
	Social Space	**10.4 (6.09)**	7.6 (3.91)	9.67 (8.5)
TAM Usefulness	**Personal Space ****	**3.91 (.38)**	**3 (.89)**	3.68 (1.61)
	Social Space	3.33 (1.77)	4.72 (1.35)	3.87 (6.43)

NASA-TLX Cognitive Load: Likert scale from 1 (*Low*) to 20 (*High*)
TAM: 1 (*High*) to 7(*Low*)

Q4 - Findings

- 45% od Study 1 participants found commenting demanding

"I needed to pay proper attention to understand what was explained, to recall my experience, and perceive the usefulness of the tricks and tactics told by the presenter".

Q4 – Findings (cont.)

- Significant difference on Usefulness of commenting for CL from two studies

- Study 1: Rating more useful than commenting

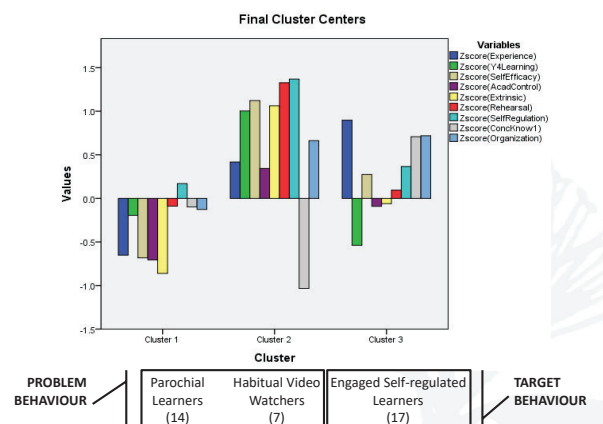- Study 2: Rating less useful than commenting

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Q4 – Findings (cont.)

- Study 1: Rating more frustrating than commenting (and lower performance)
- Rating supports learning by sharing understanding and seeing other perspectives
- 20% did not find rating useful
  - Lots of comments to rate
  - Not all comments of good quality
  - Many similar comments
  - No structure

Q4 – Recommendations

- R8: add means to the Personal space to aid reflection, and to write high-quality comments

- R9: In Social space, direction learners' attention to high quality comments; provide a structure to browse

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Are all CLs same?

	C1 (14)	C2 (7)	C3 (17)	Diff
Experience**	2.21 (.58)	3 (.58)	3.35 (.61)	C1-C2 *, C1-C3 **
Y4L**	2.64 (1.01)	3.86 (.9)	2.29 (.69)	C1-C2 *, C2-C3 **
Self Efficacy**	3.29 (.45)	4.31 (.4)	3.83 (.41)	C1-C2 **, C1-C3 *
Extrinsic Motivation**	2.84 (.59)	4.29 (.34)	3.44 (.81)	C1-C2 **, C2-C3 *
Rehearsal**	3.11 (.49)	4.32 (.49)	3.27 (.85)	C1-C2 **, C2-C3 *
SR**	3.45 (.31)	4.08 (.32)	3.55 (.33)	C1-C2 **, C2-C3 *
Organization*	3.25 (.99)	4.14 (.75)	4.21 (.73)	C1-C3 *
CK1**	11.86 (5.16)	6.71 (5.22)	16.29 (5.83)	C2-C3 **
CK2*	12.71 (6.37)	9.14 (3.93)	16.47 (6.31)	C2-C3 *
CK3*	14.46 (6.36)	12 (5.89)	18.87 (4.93)	C2-C3 *
Comments*	18.71 (14.38)	10 (7.26)	24.24 (12.27)	C2-C3 *
Ratings*	63.79 (45.64)	32.29 (19.31)	86.35 (53.59)	C2-C3 *
Usefulness**	3.65 (.34)	4.24 (.37)	3.99 (.27)	C1-C2 **, C1-C3 *
VTA*	2.21 (1.05)	1.29 (1.25)	3 (1.17)	C2-C3 *
VEA*	3.07 (1.39)	1 (1.73)	2.94 (1.64)	C1-C2 *, C2-C3 *
Reflect. Comm.**	2.29 (2.7)	.71 (1.25)	5.65 (4.99)	C2-C3 **
PropR**	.21 (.17)	.1 (.19)	.41 (.21)	C1-C3 *, C2-C3 **

Usage of domain vocabulary

Parochial learners (14)		Habitual video watchers (7)		Engaged SR learners (17)	
Keyword	U	Keyword	Usage	Keyword	Usage
presentation	0.71	presentation	0.86	presentation	0.94
story	0.71	pen	0.57	slide	0.76
end	0.64			story	0.76
clear	0.64			line	0.65
beginning	0.57			pen	0.65
talk	0.57			art	0.65
speech	0.5			beginning	0.59
pen	0.5			end	0.59
art	0.5			interest	0.59
slide	0.5			interesting	0.53
				text	0.53
				eye contact	0.53

Habitual Video Watchers

Hecking, T., Dimitrova, V., Mitrovic, A., Hoppe, U. Using Network-Text analysis to characterise learner engagement in active video watching. ICCE 2017

Self-regulated learners

HOW to help users engage more effectively

NUDGES

Choice Architecture

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

Choice Architecture: Principles

- Maximize *capability* to regulate own behavior
- Increase/reduce *motivation* to engage /discontinue in the desired/undesired behavior
- Maximise *opportunity* to support self-regulation

R. Münscher, M. Vetter, and T. Scheuerle. 2015. A review and taxonomy of choice architecture techniques. *Journal of Behavioral Decision Making,* 29, 511-524.

In AVW-Space

- *Capability:* take into account both the learner's self-regulation capabilities and their knowledge /experience of the soft skill
- *Motivation*: aim to increase the learner's motivation to engage in constructive behavior and to improve their knowledge
- *Opportunity*: automatically identify opportunities to support engagement in active video watching to improve learning

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Towards Intelligent Nudging

- Learner model
- Interactive visualizations
- Personalized nudges:
  - Decision information nudges (*before* interaction)
  - Decision structure (within an interval)
  - Decision assistance (*afterwards*)
    Feedback (positive/negative)

Enhancing AVW-Space

Identify comments with high social value

Find high attention intervals

Cluster users

(1) Characterise behaviour   (2) Identify opportunities for intervention

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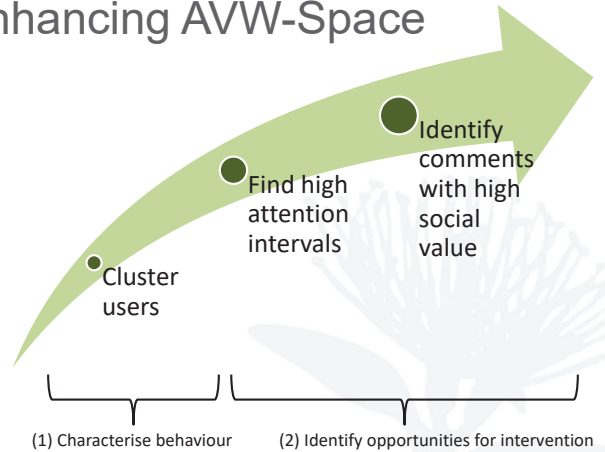
Attention Intervals (Region Aggregation)

Example of identified pattern (P2)
Behaviour: one cluster disengaged, other engaged
Intervention: show existing comments to users approaching interval

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Interactive visualizations

- Comment timeline
- Comment histogram

Nudges

- Before interaction
- Four types
  - No comment reminder
  - No comment reference point
  - Aspect under-utilized
  - Diverse aspects

AVW-Space Logged in as: tan

Student actions | Teacher actions | Admin actions

Student Actions » Space: PresentationSkills-December2017 » 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.

Your previous comments

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.

The bars below the dots show how many comments have been made at that part of the video.

- 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

Add comment

Watch video: TUTORIAL 3: Make a presentation like Steve Jobs

Key techniques that Steve Jobs used in presentations - headlines, passion, make numbers meaningful, visual and more. 7 min.

Your previous comments
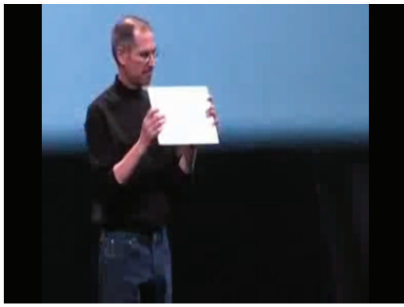
Make a comment

Don't forget to make a comment on the presentation techniques in the video.
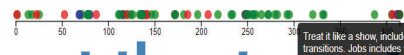
Treat it like a show, include ads, flows, themes, transitions. Jobs includes video clips, demo, guests. Gives dramatic flair.

- I am rather good at this

Add comment

Student Actions » Space: PresentationSkills-December2017 » Watch Video: TUTORIAL 4: The five secrets of speaking w

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

by Christine Clapp, Spoken with Authority, 6 min.

By Christine Clapp, Spoken with Authority
www.spokenwithauthority.com

Your previous

How about a comment?

Another person in your class said:

Fill the room. Lower your shoulders - it helps the voice. speak at a slow, understandable pace. Add interest/variation to your voice - sounds good and makes you look confident.
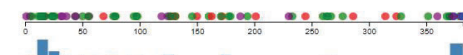
What do you think about this?

- 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

Add comment

Experiment Design

- Survey 1 (May 3)
- Phase 1: watch & comment on videos
- Phase 2: examine and rate comments
- Survey 2 (May 24)
- End (June 11)

Participants

- Volunteers recruited from ENGR101 (1,039 students)
- Two groups:
  - Control: original version of AVW-Space
  - Experimental: Nudges
- 449 students completed Survey 1
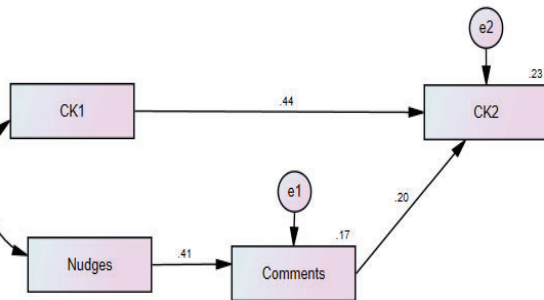- 237 students completed Survey 2

Research Questions

1. Does engagement with AVW-Space improve students' knowledge?
2. Does the inclusion of interactive visualizations and nudges have an impact on the number of students who engage with the platform in the constructive way?
3. What is the effect of interactive visualizations and nudges on student engagement?
4. Do students in control/experimental group have different opinions about the usefulness of AVW-Space and cognitive load?

RQ1: Conceptual Knowledge

	Inactive (16)	Passive (75)	Constructive (146)	
CK1	10.94 (3.96)	12.59 (4.31)	13.66 (5.64)	
CK2	12.25 (5.32)	13.16 (5.93)	15.10 (6.06)	H = 7.04 p = .03
Significant			t = 3.18 p = .002	
Correlation CK1-CK2		.42 (p = 0)	.57 (p = 0)	

Path Analysis

Experimental group: 102 participants (passive + constructive

Chi-square = 2.551
Degrees of freedom = 2
Probability level = .279
Model fit: CFI = .988, RMSEA = .052

RQ2: Effect on Behaviours

- All students who completed Survey 1
- Chi-square = 9.972, p = .007

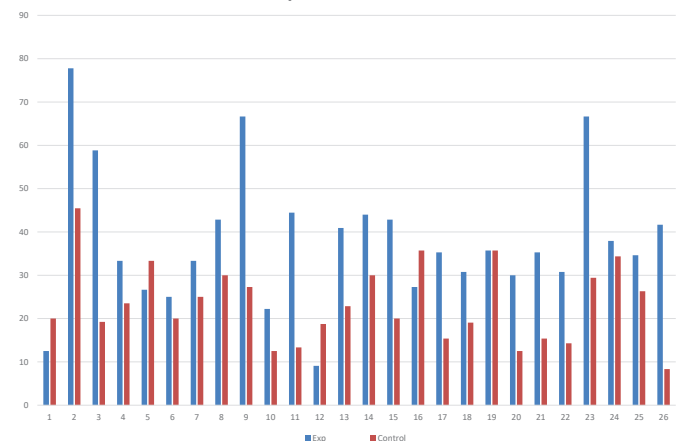|	Inactive (100)	Passive (155)	Constructive (194)
Control	53	95	86
Experimental	47	60	108

RQ3: Effect on Engagement

Significantly more comments (U = 17,796, p = .004)
- experimental 6.32 (9.59)
- control group 4.30 (7.77)
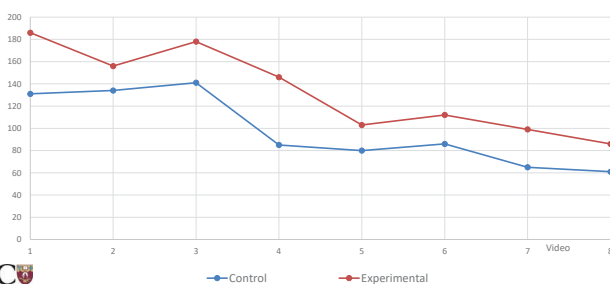
% Participants who commented

R4: Subjective feedback

- Significant interaction effect group * category
  - TAM1: *I think I would like to use AVW-Space frequently*
  - TAM2: *I would recommend AVW-Space to my friends*

Group		TAM1	TAM2
Control	Passive (47)	4.38 (1.93)	4.23 (1.96)
	Constructive (68)	4.26 (1.57)	4.03 (1.55)
	Total (115)	4.31 (1.72)	4.11 (1.72)
Experimental	Passive (23)	4.91 (1.34)	5.22 (1.57)
	Constructive (77)	3.69 (1.47)	3.84 (1.55)
	Total (100)	3.97 (1.53)	4.16 (1.65)
Total	Passive	4.56 (1.77)	4.56 (1.89)
	Constructive	3.96 (1.54)	3.93 (1.54)
	Total	4.15 (1.64)	4.13 (1.68)
Interaction effect group * category		F = 5.17, p = .024 Partial η^2= .024	F = 5.45, p = .021 Partial η^2= .025

TAM: 1 (*High*) to 7(*Low*)

RQ4: TAM

- Significant effect of Behaviour
  - TAM3: *Using AVW-Space would enable me to improve my soft skills quickly*
  - TAM4: *Using AVW-Space would improve my performance considering the development of soft skills*
  - TAM7: *I would find AVW-Space easy to do what I want it to do*
  - TAM8: *My interaction with AVW-Space would be clear and understandable*
  - TAM9: *I would find AVW-Space easy to use*

RQ4: Demand

- **MENTAL DEMAND - Writing comments**
- How **mentally demanding** was to **write comments on videos** in AVW-Space? For example, how much mental and perceptual activity was required - thinking, deciding, remembering, looking, searching?
- Significant interaction effect group * category

RQ4: NASA-TLX

- Passive students reported
  - Higher Demand and Frustration while commenting
  - Lower Performance on commenting and on rating

Usefulness of Interactive Visualizations

100 responses – 85 positive

- *See which parts of the video other people find useful*
- *Can see what other people are doing as inspiration*
- *To compare yourself with the rest of the class.*
- *Difficult to interpret but useful concept*
- *Extremely useful. Clear aid on what others thought about a specific point*
- *It isn't very helpful in the tutorials (I don't care what other people did / didn't know), but for the presentations it was useful because i could know what to look out for in certain parts of the video*
- *I didnt understand them till id finished most of the videos*

Usefulness of Nudges

- 91 responses
  - 8 participants did not notice nudges
  - 62 positive, 21 negative

- *Help me to be engaged*
- *To give me a little push in the right direction of what to comment on*
- *Help you along without giving the answer*
- *I found that helpful and it made the videos less overwhelming to watch*
- *It created subtle pressure to make comments which wasn't really useful at all*
- *They were always the same so not hugely useful*

Future work

- Improved set of nudges
  - More intelligent
  - Supporting social learning
- Other transferrable skills
- Email me if you would like to collaborate with us!

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