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Cognitive Load in Asynchronous Discussions in a Fully Online Course

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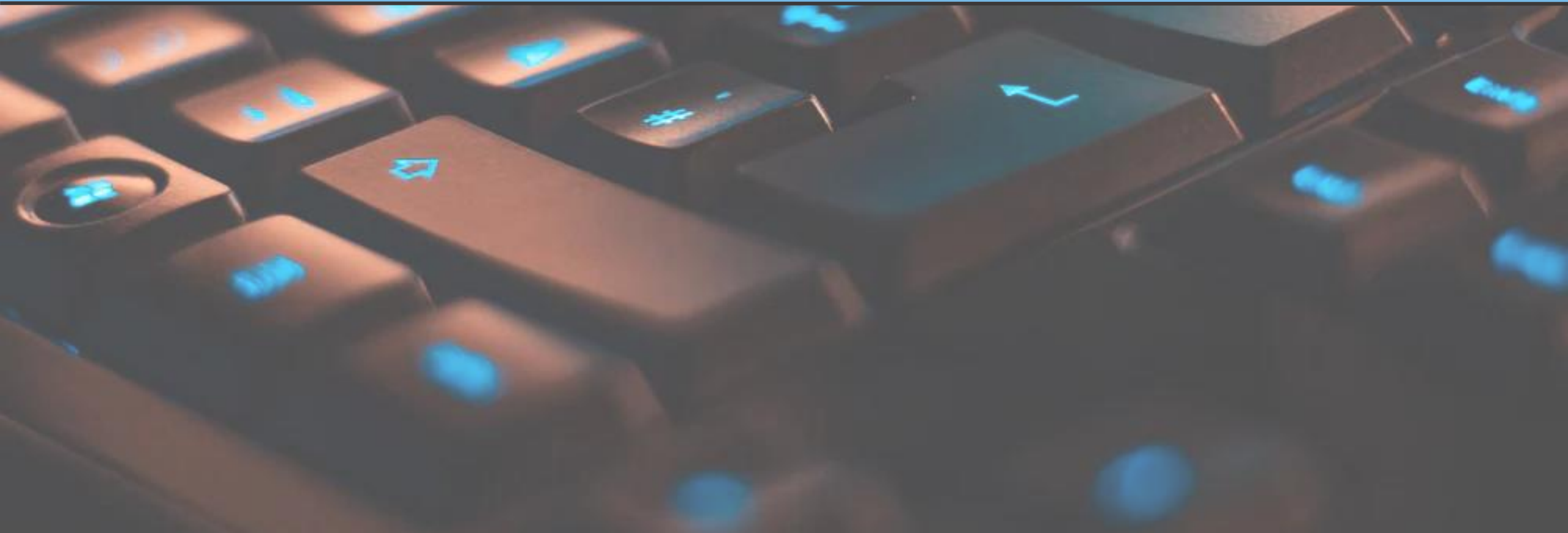
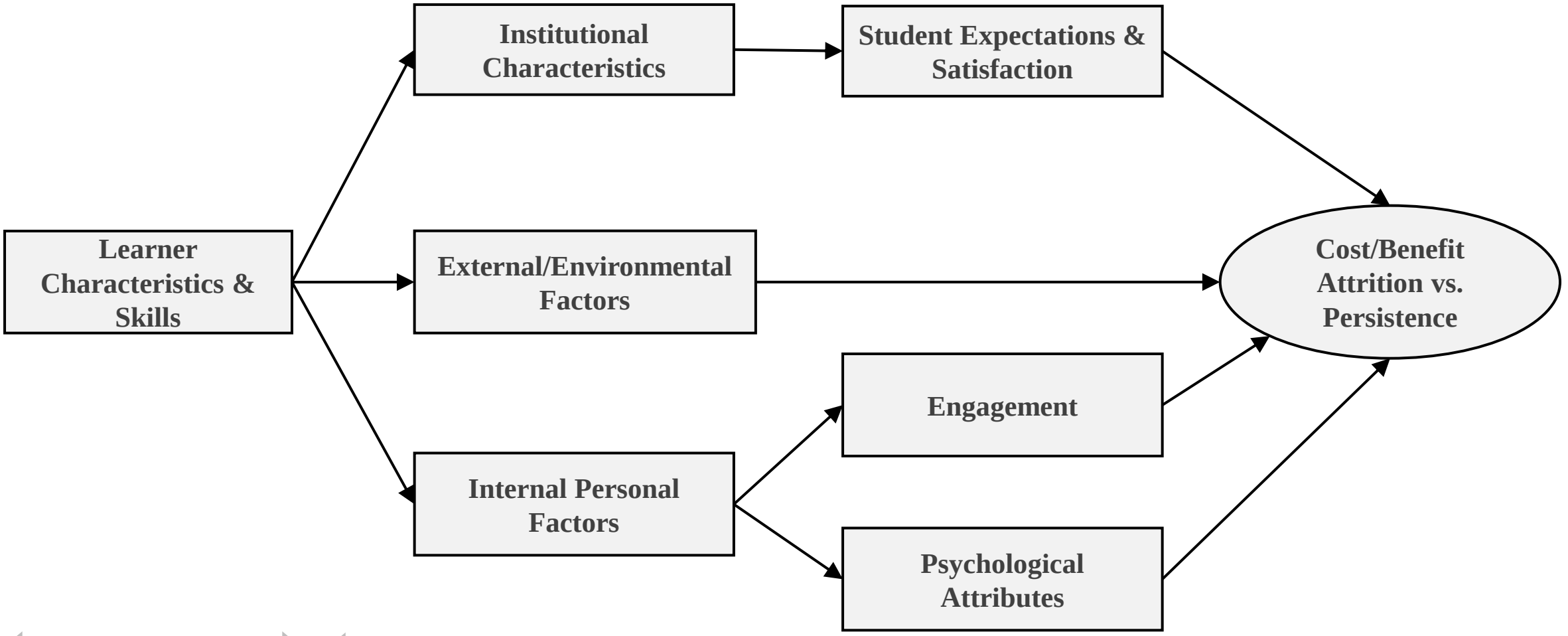


Asynchronous online course offerings are increasing.

+	"No Significant Difference" in student grades
-	Higher withdrawal rate

Understanding student persistence in online learning is complex.



Learning tasks in online courses demand working memory resources – cognitive load.

Cognitive Load		
Intrinsic Load	Extraneous Load	Germane Load

Cognitive load influences persistence and satisfaction in online courses.

Intrinsic load: amount of mental processing required to understand the task

- task complexity
- element interactivity
- task environment

Extraneous load: working memory load experienced as learners interact with learning materials

- Material presentation (split attention, redundancy, etc.)

Germane load: work required to create a new knowledge schema

Asynchronous online classes often use discussions to establish a learning community.

- Idea exchange
- Content focus
- Critical thinking
- Peer feedback
- Problem solving
- Collaboration

Cognitive load of asynchronous online discussions has not previously been reported.

The cognitive load of asynchronous online discussions has not previously been reported.

NASA-TLX Instrument

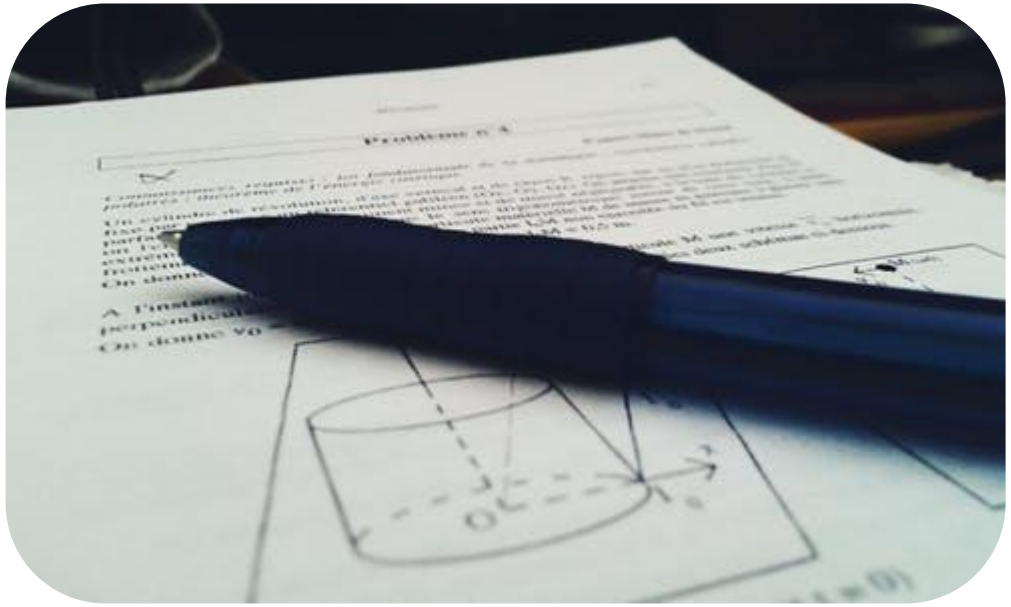
- Mental demand
- Time demand
- Perceived success
- Effort
- Frustration
- ~~Physical activity~~

This study was designed as a quantitative descriptive investigation.

(variables were not manipulated or controlled, only measured)

- Survey data: NASA-TLX
- LMS data: final course grade, discussion scores
- Institutional data: withdrawal rate

Introductory Physics
(population = 578, n = 78)



We identified 5 discrete tasks involved in engaging in asynchronous online discussions.

✓	Understanding expectations
✓	Crafting initial post
✓	Reading posts
✓	Creating reply posts
✓	Integrating instructor feedback

The cognitive load instrument was validated by confirmatory factor analysis.

Perceived success subscale was removed from the model

Factor Model	N	Chi-square test statistic	Df	P-value	CFI	TLI	RMSEA	SRMR	Reliability
Expectations	78	4.807	2	0.090	0.976	0.927	0.134	0.037	0.833
Crafting Post	77	2.762	2	0.251	0.994	0.982	0.070	0.025	0.852
Reading Posts	76	5.156	2	0.076	0.985	0.956	0.144	0.022	0.914
Creating Reply Post	78	6.096	2	0.047	0.973	0.918	0.162	0.036	0.862
Instructor Feedback	78	1.190	2	0.551	1.000	1.012	0.000	0.013	0.908

Two tasks had the highest cognitive load: understanding expectations & crafting initial post.

	Discussion Tasks				
Subscales	**Understanding what is expected**	**Crafting initial post**	**Critically reading posts**	**Creating reply posts**	**Integrating instructor feedback**
Mental Demand	5.49	5.85	4.31	4.59	4.22
Temporal Demand	5.04	5.27	4.19	4.26	3.90
Effort	6.71	6.28	5.22	5.54	5.08
Frustration	4.63	4.66	3.97	4.23	3.78

There were not enough withdrawals during the study time frame for analysis.

As with any study, there are limitations.

- Nonresponse error
- Voluntary, un-incentivized survey
- Low response rate

Once the sources of high cognitive load are identified, they can be investigated.

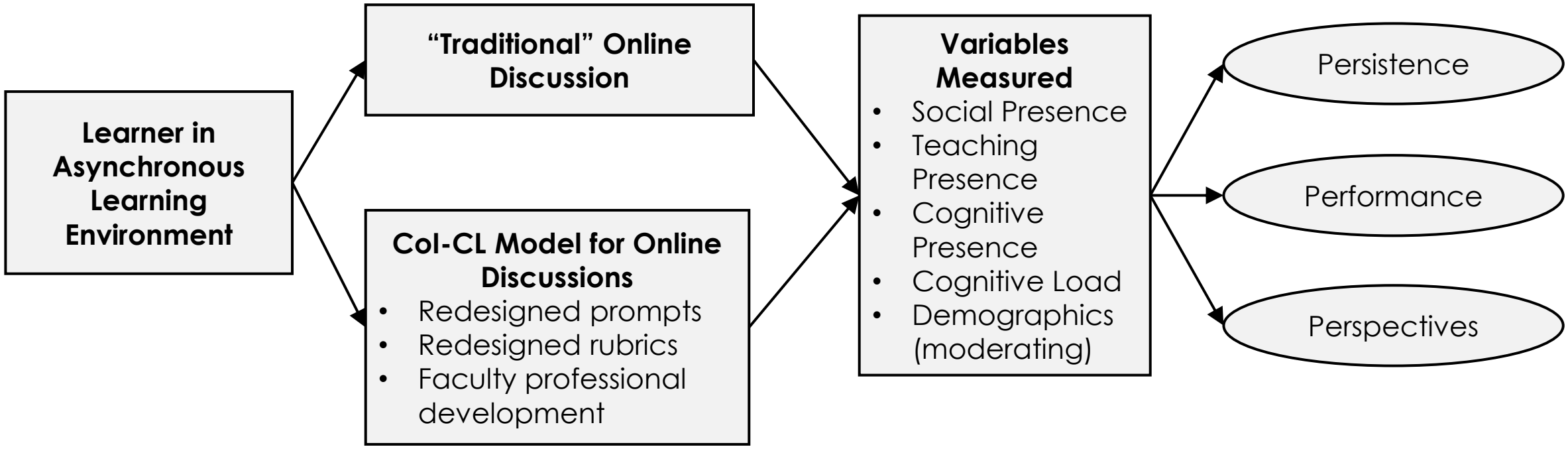
Students reported high cognitive load for understanding what was expected of them.

Possible sources of overload to visual/auditory channels:

- ***Too much text in instructions***
  too much content to process
- ***Extraneous information in instructions***
  non-essential info present
- ***Instructions are poorly organized***
  confusing presentation
- ***Instructions are complex***
  too much information to hold in memory while integrating new material (insufficient cognitive capacity)

When sources of high cognitive load are known, instructional designers can target redesign efforts.

This research will be continued by supporting Community of Inquiry in asynchronous discussions while mitigating impacts to cognitive load.



In Review …

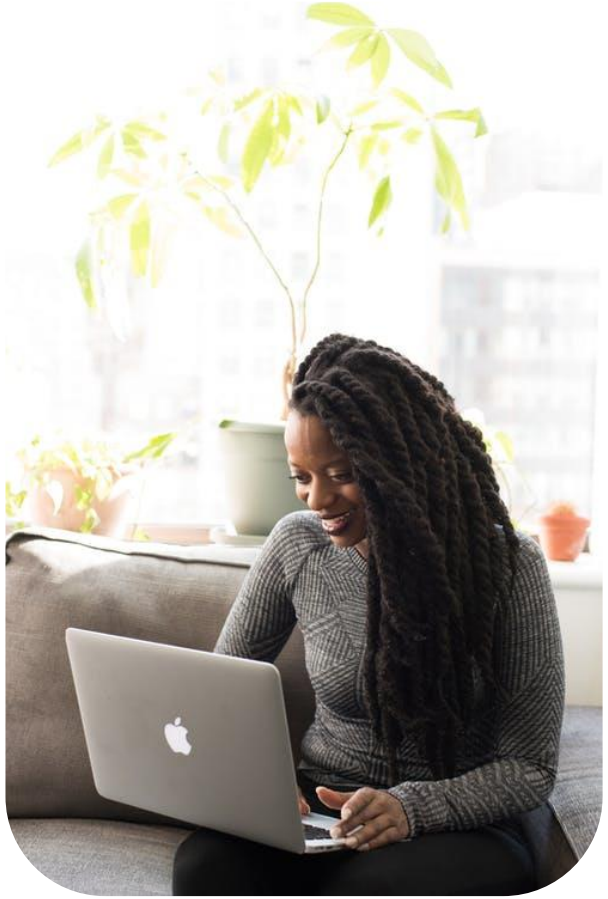
Asynchronous online discussions have discrete tasks that each contribute to cognitive load.

Cognitive overload can negatively impact persistence, performance, and satisfaction.

In this study, students reported highest load for:

- Understanding what is expected
- Crafting the initial post

The effort subscale had highest load for all tasks.



Questions?

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