

# USING CONCEPT MAPPING TO EXPLORE INTEGRATED LEARNING

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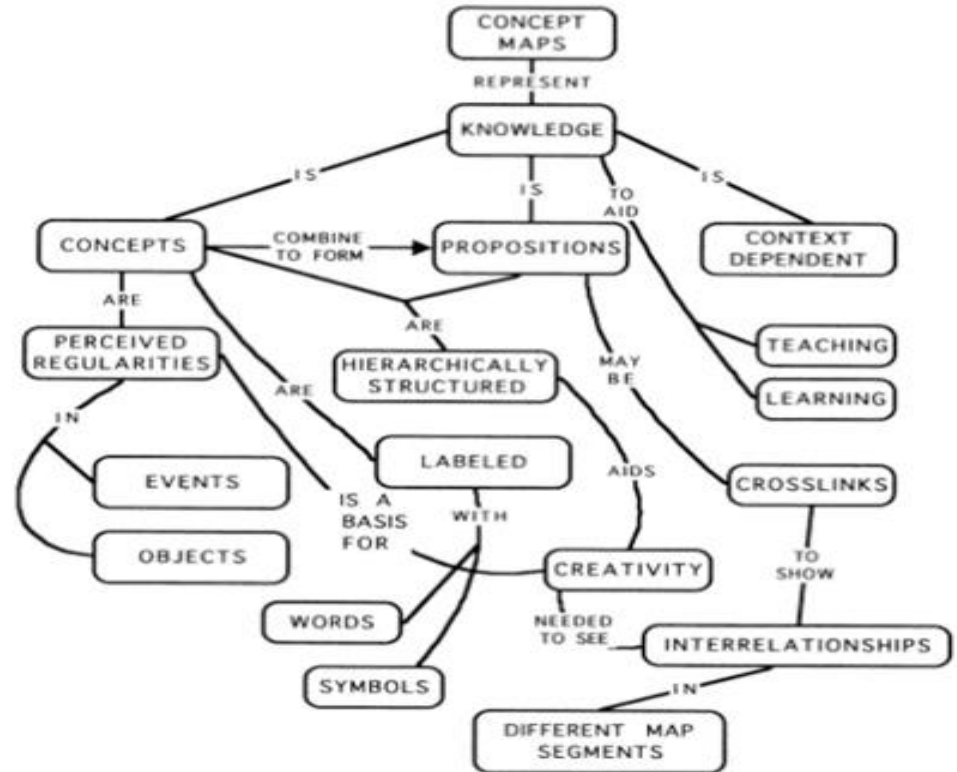
# Concept Maps, In Theory

- Graphical representations of knowledge
- Cognitive tool for structuring and sharing knowledge
- Tool for exploration and understanding inter-relationships between different, sometimes seemingly disparate, ideas
- Reflects a way of thinking that is not ideally captured by linear, procedural, or hierarchical learning approaches



# Concept Maps, In Practice

- Concepts or nodes
- Links
- Linking phrases
- Note, different from mind maps



# How To

## Steps:

1. Identify a question or proposition
2. Identify the key concepts around the question
3. [Rank concepts in order of the most descriptive or broad broadest concept, then narrowing the descriptions until the most specific concept is listed last] - optional
4. Connect the concepts by linking phrases, describing the relationships between each concept
5. Provide examples, including social, personal, and professional examples to clarify the concept or the relationship between concepts



# Importance of Links

- High density of interconnectedness associated with higher levels of learning within a given domain
- No concept is an isolated entity, links represent a process of knowledge integration
- Links may be as simple as linking phrases, or may be associated with any number of data forms, inclusive of assignments or media.
- Previous research shows that CM
  - Facilitates the development and application of critical thinking skills
  - Facilitates the capacity to transition from declarative knowledge to integrated interdisciplinary thinking



# Research Basis

- TDF “**Using Concept Mapping to Explore Integrated Learning and Interdisciplinary Thinking**”
  1. \*\*\*Does CM assist students in transitioning from declarative knowledge, to declarative integration (declarative knowledge of instructor integrations), to integrated interdisciplinary thinking?
  2. Is CM a tool to efficiently stimulate faculty interdisciplinary networking in teaching and research?
  3. Is CM suitably user-friendly, in practice, to encourage adoption?



# A Tale of Two Modules

- ENV 108 – Dynamic Landscapes
  - Terminology intense geography module, ENV students
- LAN 104 – Business, Communication and the Environment
  - Terminology intense JD (LC) module, interdisciplinary



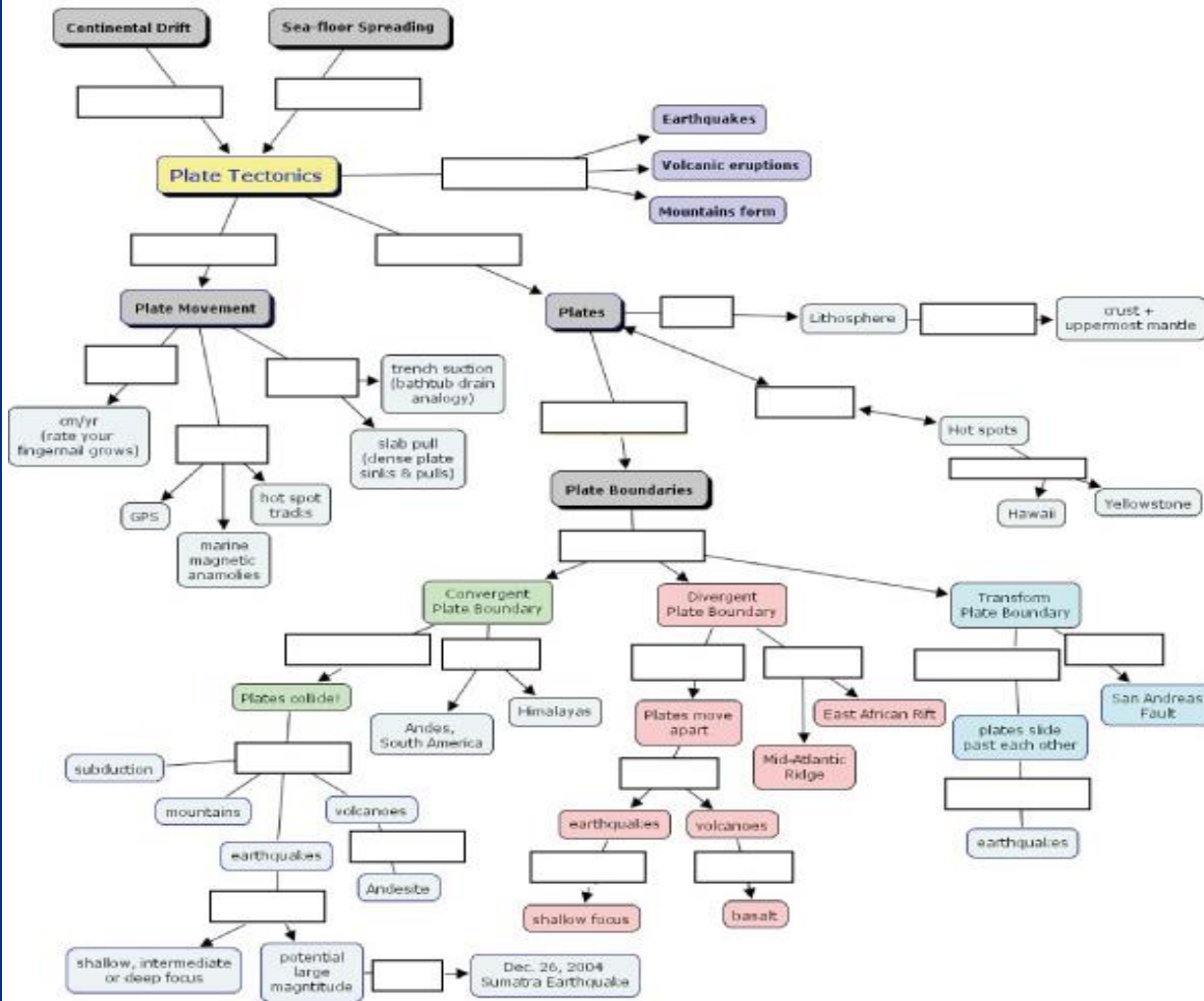
# ENV 108 Study Design

- Pre and post exercises
- Three intervening exercises with staggered format and increasing difficulty
- Ex 1, early semester
  - Part 1, fill-in-the blank, matching (declarative)
  - Part 2, fill-in-the-blank, student integration
- Ex 2, mid-semester
  - Part 1, fill-in-the-blank, student integration
  - Part 2, parking lot, increasing difficulty
- Ex 3, latter part of semester
  - Part 1, parking lot, repeat
  - Part 2, full CM



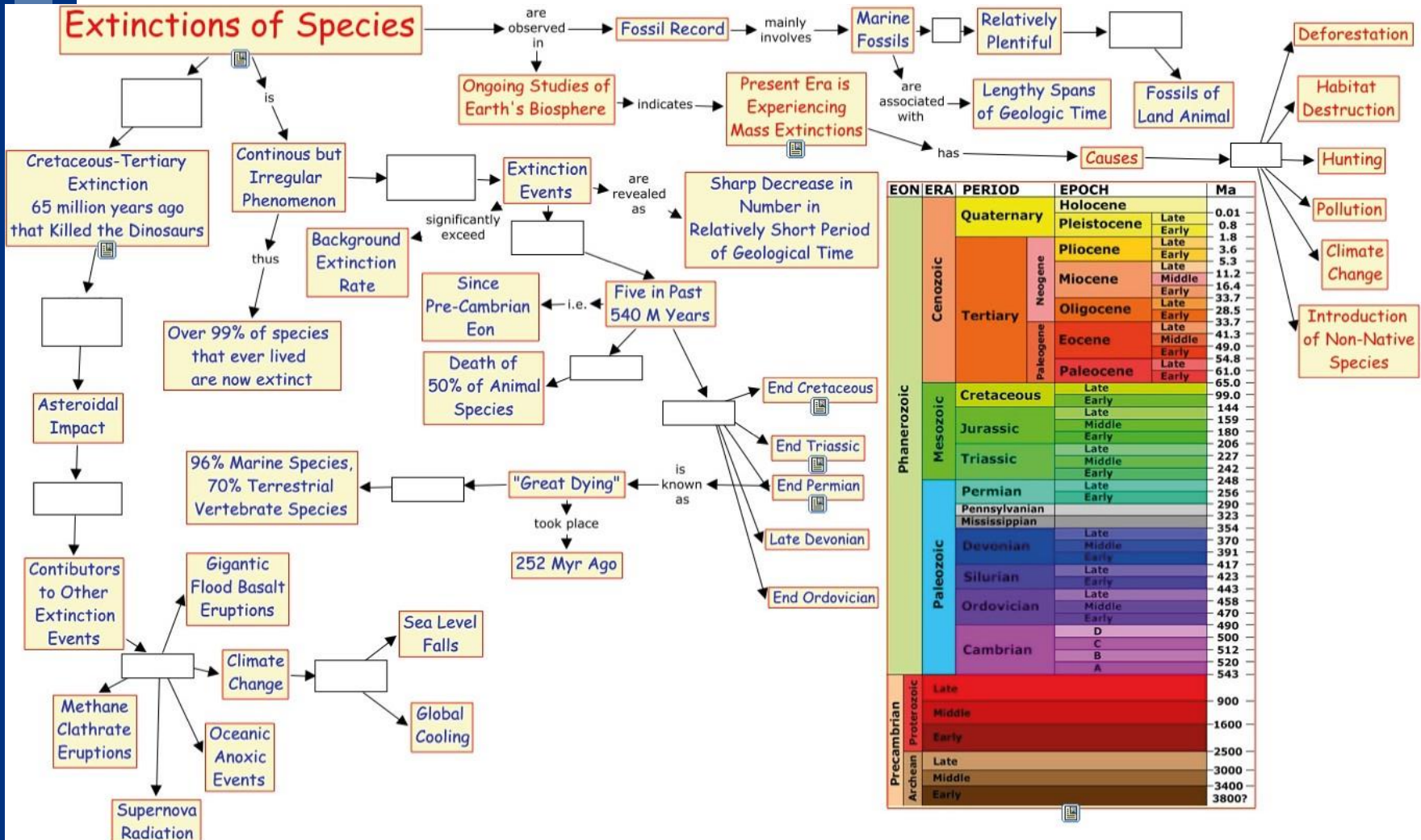


# Exercise 1, Part 1 – Fill in the Blank, Matching

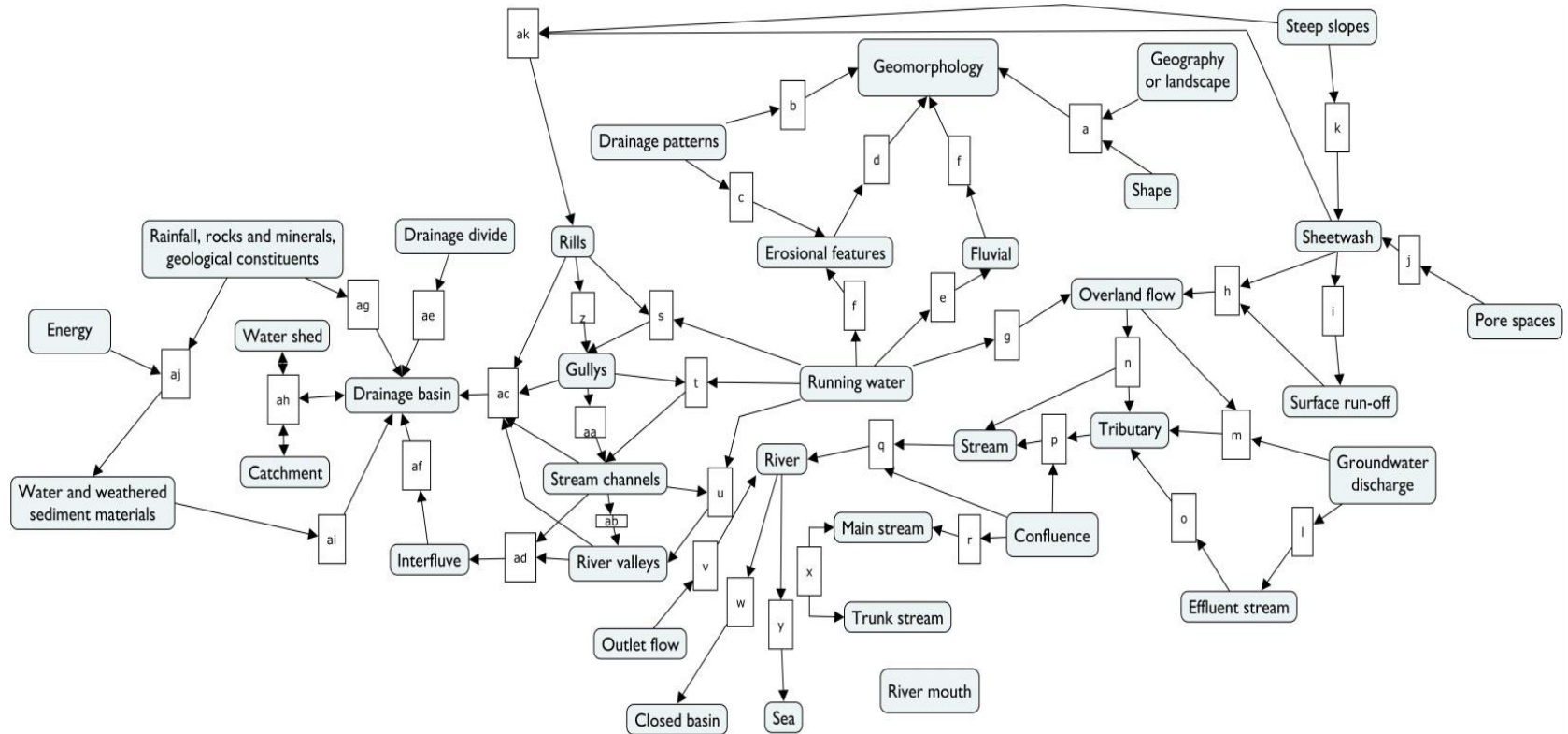


Involves  
 Involves  
 Ideas lead to  
 Ideas lead to  
 Explains why and where  
 Characterized by  
 Characterized by  
 Classified into  
 =  
 Rate  
 Made up of  
 Independent of  
 Results in  
 Results in  
 Results in  
 Is measured by  
 Most geological activity occurs at  
 Examples  
 Examples  
 Examples  
 Example  
 Example  
 Caused by  
 Plate interaction  
 Plate interaction  
 Plate interaction  
 Erupts  
 Erupts

# Exercise 1, Part 2 – Fill in the Blank



# Exercise 2, Part 1 – Fill in the Blank



# Exercise 2, Part 2 – Parking Lot (and Exercise 3, Part 1)

**Q:** How would you characterise the contributions of drainage patterns (and factors affecting drainage patterns), channel flow, and sediment transport in determining geomorphology?

<p>drainage density total length of streams in a basin total area of basin impermeable surface permeable surface stream order stream system complexity Strahler system link-order system first-order stream second-order stream third-order stream 6—12<sup>th</sup> order streams 80% of world's water ways distinctive morphology drainage pattern regional steepness variable rock resistance variable climate hydrology / rainfall structural controls (geology) vegetation</p>	<p>dendritic parallel rectangular trellis radial centripetal deranged uniform rock resistance tree-like joints and faults at right angles weakened bedrock variable rock resistance areas where rocks are folded major streams parallel to mountains; minor streams flow in at right angles flow outward in spoke-like pattern central high point, e.g. volcano steep slope resistant rock parallel flow central low point, e.g. caldera base level</p>	<p>volcano sinkholes karst limestone perennial flow intermittent flow channel area flow velocity discharge sediment load bed load suspended load dissolved load rocks clays molecules stream capacity competence aggradation degradation longitudinal profile graded stream</p>
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# Exercise 3, Part 2 – Full Concept Map

**Question:** What are some processes that are important to coastal geomorphology, and how can these processes be characterised (e.g. quantitatively, qualitatively, in terms of effects, the interactions of different processes, or any other relevant point or relationship you wish to include)?

Try to see if you can make a map with at least 20 concepts.



# Extinctions of Species

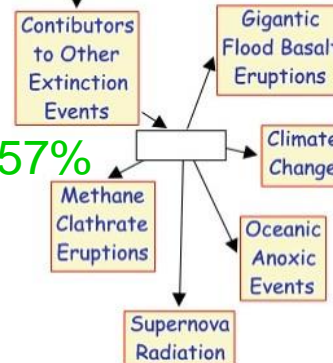
most notable is; example, includes – 57% caused by

Cretaceous-Tertiary Extinction  
65 million years ago  
that Killed the Dinosaurs

thought to be caused by; caused by – 71% example

Asteroidal Impact

grouped with; classified, other effects – 14% caused by

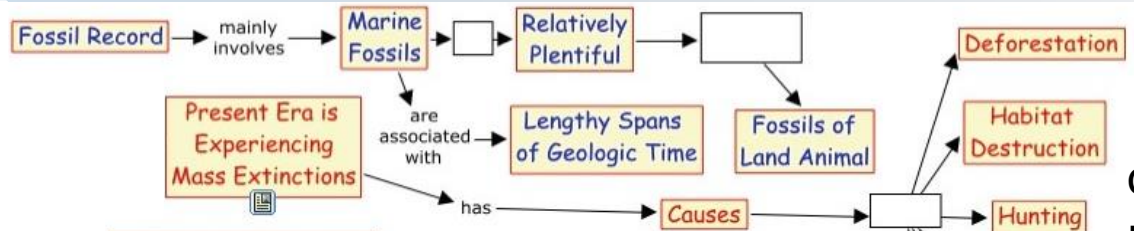


including; such as – 57% leads to





are; compared to;  
 are – 64% unlike – 29% (majority is, include)

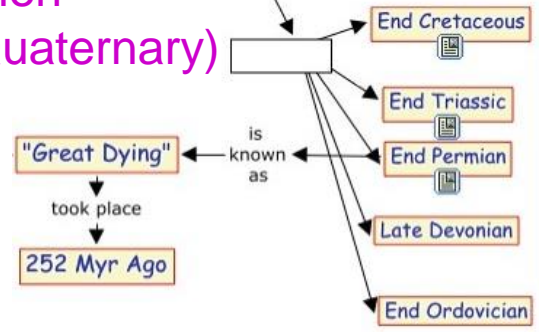


only one response recognises human influence

Sharp Decrease in Number in Relatively Short Period of Geological Time

Five in Past 540 M Years

when (Quaternary)

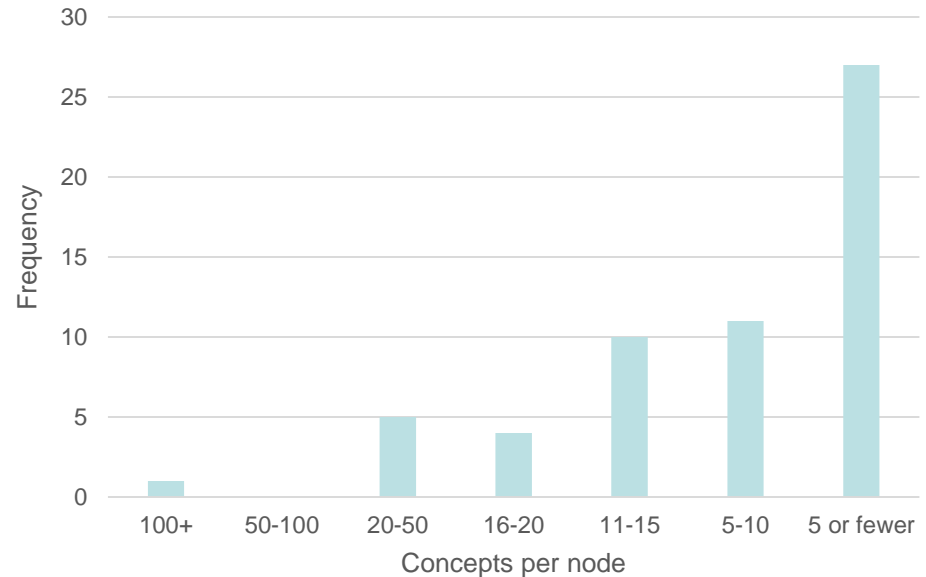


EON	ERA	PERIOD	EPOCH	Ma	
Phanerozoic	Cenozoic	Quaternary	Holocene	0.01	
			Pleistocene	Late 0.8 Early 1.8	
		Tertiary	Neogene	Pliocene	Late 3.6 Early 5.3
				Miocene	Middle 11.2 Late 16.4
					Oligocene
			Paleogene	Eocene	Late 41.3 Middle 49.0
					Paleocene
				Mesozoic	Cretaceous
		Jurassic	Late 159 Middle 180		
			Triassic		Late 206 Middle 227
	Permian	Early 242 Late 248			
		Paleozoic	Pennsylvanian		Early 256 Late 290
	Mississippian				Early 323 Late 354
			Devonian		Late 370 Middle 391
	Silurian				Early 417 Late 423
			Ordovician		Early 443 Late 458
	Cambrian				Middle 470 Early 490
		Precambrian	Proterozoic	D 500	
	C 512				
	B 520				
	A 543				
Late 900					
Archean	Proterozoic	Middle 1600			
		Early 2500			
		Late 3000			
Archean	Proterozoic	Middle 3400			
		Early 3800?			



# Parking Lot Results

- Concepts
  - 67 total
  - 58 used
- Links
  - About 12 per concept

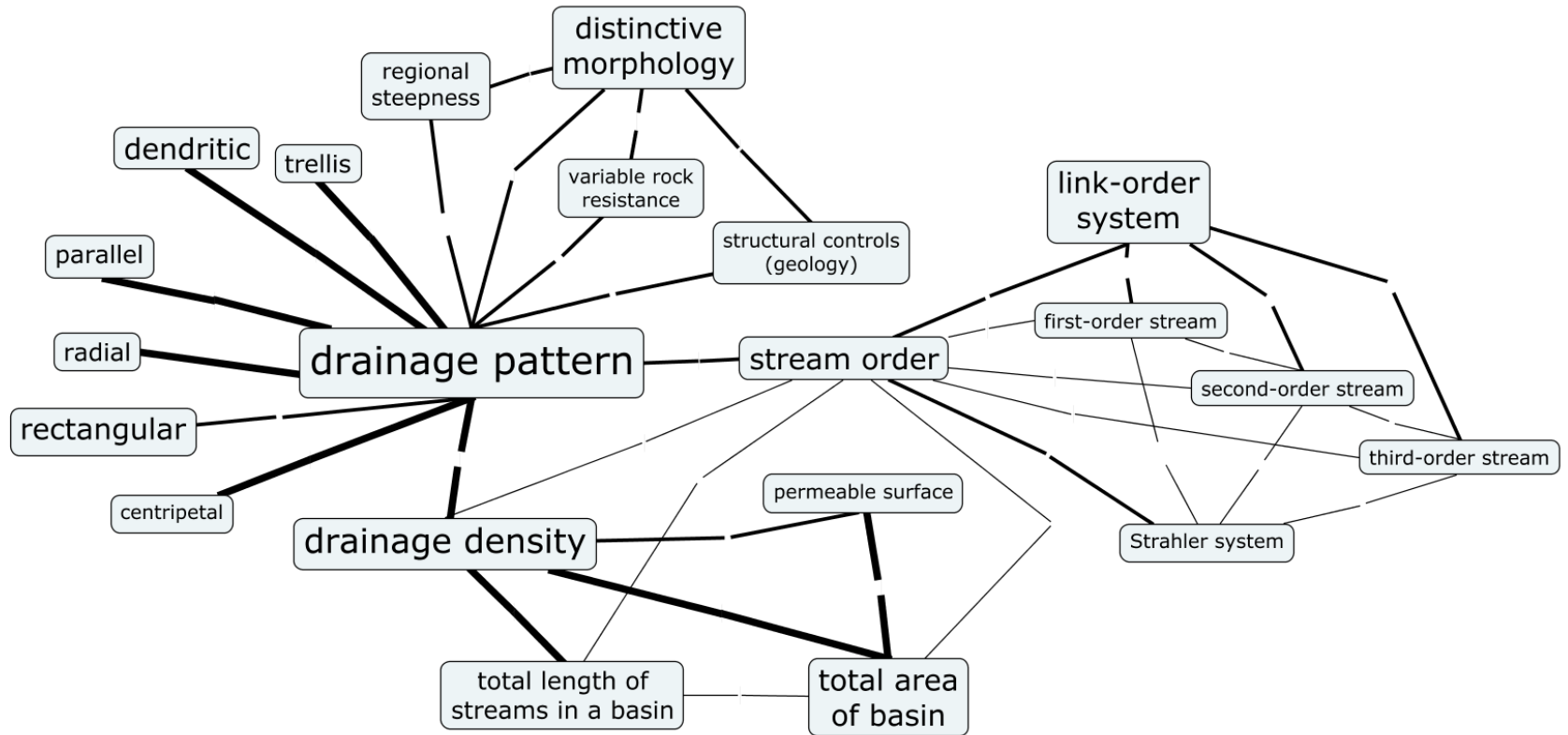


- Link quality
  - examples consists of contain have including classify into involve, is, are



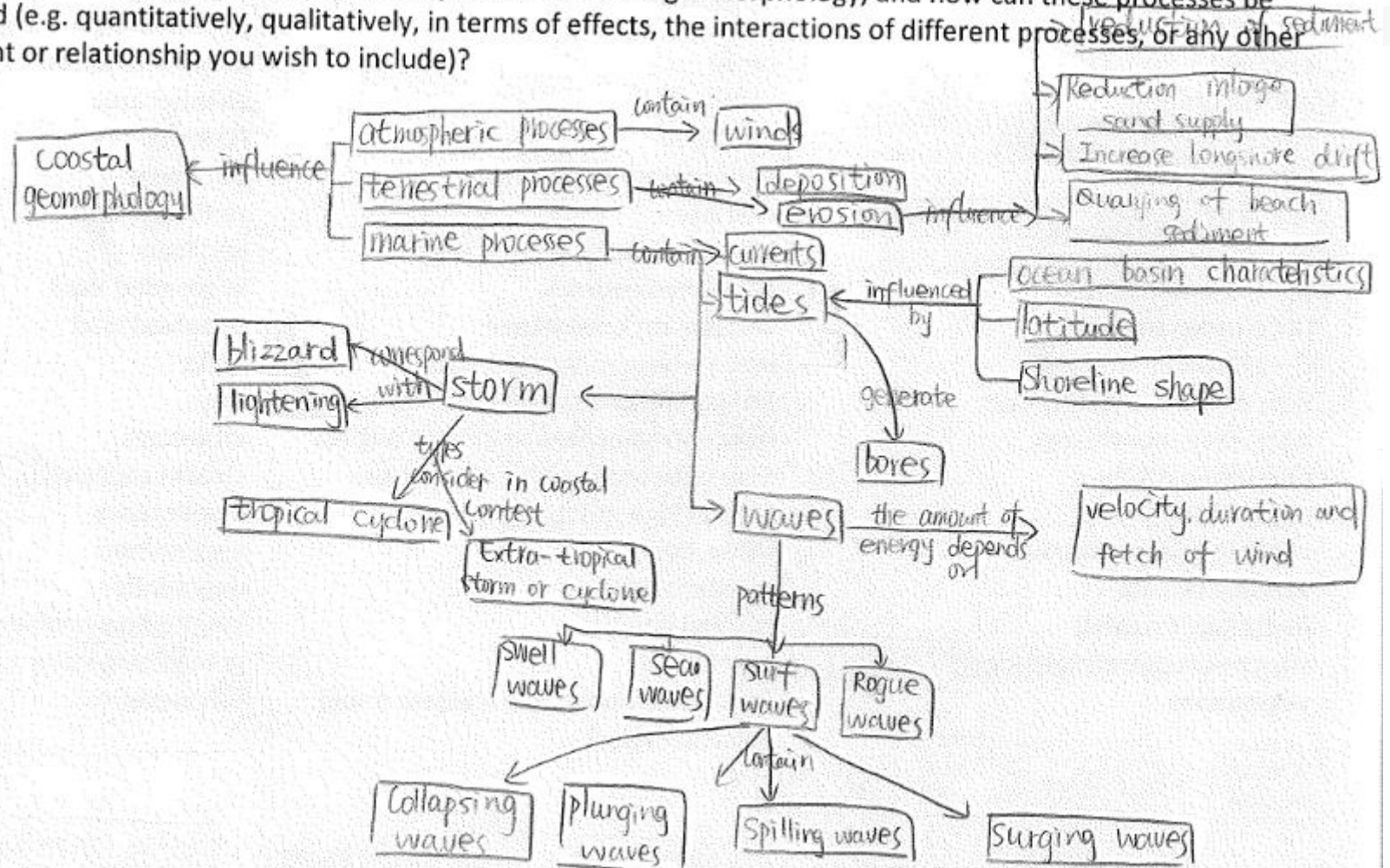


# Parking Lot Results - Aggregated



# Final Map, Example

... processes that are important to coastal geomorphology, and how can these processes be mapped (e.g. quantitatively, qualitatively, in terms of effects, the interactions of different processes, or any other relationship or relationship you wish to include)?



# LAN 104

- Evolving concept maps over duration of semester
- Primary proposition involving interrelation of disparate topics, all relating to sustainability
- Resulted in highly complex and interlinked maps



# Preliminary Conclusions

- Concept maps force focus on integration
- Use (purpose) and outcomes variable, situation dependent
- Preliminary results:
  - LAN 104 exemplifies integrative theme
  - ENV 104, not
    - Language barriers
    - Diagnostic tool



# Shout Outs

- Collaborators
  - XJTLU/former XJTLU
    - Ann Brantingham, Debra Ann Jones, Donald Meyer, Graham Mathews, Lynda Petherick, Penelope Scott, Rebecca Kiddle, Sophie Sturup
  - International
    - Robert Clougherty, Glasgow Caledonian University
    - Viktoria Popova, Cinteg Knowledge Integration
- Champions
  - AEC
  - Roland Sherwood

