This table lists the proportion of instructors teaching each of the 16 course subjects (columns) who claimed that each of the 35 desired skills (rows) was taught. Values are percentage of instructors who said "yes", the SKILL was taught in their COURSE.

Data are from 1037 courses offered as part of 67 geoscience prms. Only courses "required" by geoscience prgrms were included.

Adapted from Viskupic et al. 2021 Figure 1

Greens are > 50% Reds are < 50%

Skill	skill type **	COURSE TOPICS (ordered L-R from most 'data-centric' to least) Hydrology	Geophysics	Field	Structure	Sed/Strat	Geochemistry	Geomorphology	Climate	Paleontology	Environment	Petrology	Historical	Mineralogy	Earth Materials	Geology	Row Avg. Purple=top 1/3	top 10
Use algebraic equations (quantitative skills)	1	100	100	83	98	84	96	88	84	68	68	90	76	86	94	87	***87***	**3**
Address uncertainty in data interpretation (manage uncertainty)	1	89	95	84	87	75	82	71	73	78	65	71	60	53	50	68	***73***	**9**
Collect & analyze data (data collection & interpretation)	1	71	65	95	85	79	48	67	27	73	38	69	50	63	50	47	***62***	
Evaluate assumptions in data analysis (evaluation of data quality)	1	82	88	70	58	56	66	71	70	57	59	69	53	35	44	47	***62***	
Conduct statistical analyses (quantitative skills)	1	75	57	61	57	70	73	56	63	70	59	46	48	26	18	39	***54***	
Use calculus skills (quantitative skills)	1	75	85	34	47	37	61	47	41	5	26	46	14	28	29	13	***39***	
Distinguish observations/interpretations (reasoning & synthesis)	2	94	95	100	98	100	84	90	84	92	88	90	97	84	91	85	***91***	**1**
Use prior knowledge/skills (apply skills in new scenarios)	2	84	82	92	90	83	80	88	64	84	74	92	77	90	88	53	***81***	**6**
Describe evidence to support argument (reasoning & synthesis)	2	87	82	70	93	76	84	78	94	60	77	82	63	59	68	62	***76***	**8**
Access & integrate information (apply skills in new scenarios)	2	75	68	78	63	79	70	78	73	70	85	67	83	69	68	62	***73***	**9**
Use geoscience & other knowledge (apply skills in new scenarios)	2	80	60	65	62	73	76	65	76	81	88	33	67	59	44	55	***66***	
Recognize data sources (evaluation of data quality)	2	46	48	60	33	52	42	41	70	51	56	27	53	33	24	47	***45***	
Work as part of a team (work as part of a team)	3	96	85	100	100	94	86	80	81	89	85	90	90	94	97	85	***90***	**2**
Read the primary literature (evaluation of literature)	3	87	87	80	71	87	92	88	84	95	88	81	83	71	74	50	***81***	**5**
Complete writing assignments (written communication)	3	93	68	91	66	87	72	82	78	84	88	82	72	60	62	60	***76***	**8**
Present a talk or poster (oral communication)	3	53	49	50	40	51	68	56	53	60	74	45	54	34	29	31	***50***	
Practice temporal reasoning (temporal thinking)	4	91	85	92	93	88	76	83	84	92	79	79	83	57	68	88	***83***	**4**
Practice 3D spatial thinking (spatial thinking)	4	91	93	95	100	89	48	88	65	68	44	83	72	88	74	89	***79***	**7**
Make field observations (field skills)	4	83	72	100	93	94	39	84	38	65	55	72	83	53	74	74	***72***	**10**
Work with geospatial data (spatial thinking)	4	89	72	95	90	66	43	85	78	39	71	43	52	18	33	82	***64***	
Make a geologic map (field skills)	4	44	31	92	87	41	15	58	7	8	29	31	59	6	15	57	***39***	
Describe system parts & relationships (systems thinking)	5	80	53	57	55	64	70	63	82	68	71	65	80	67	59	62	***66***	
Discuss complexity of scale and interactions (systems thinking)	5	82	63	62	72	68	62	71	79	65	71	57	63	47	35	45	***63***	
Discuss change that has multiple effects (systems thinking)	5	66	23	38	33	54	72	74	91	49	79	45	73	22	29	49	***53***	
Discuss implications vs. predictions (systems thinking)	5	46	52	51	32	40	34	43	58	49	56	41	47	29	29	36	***43***	
Distinguish current processes vs. prior history (systems thinking)	5	49	22	54	33	49	36	45	61	38	53	18	57	14	21	34	***39***	
Analyze feedback loops (systems thinking)	5	33	12	16	18	27	38	45	82	24	56	18	53	6	3	26	***30***	
Build predictive models (systems thinking)	5	49	50	24	35	40	30	22	24	11	27	20	13	18	12	15	***26***	
Make causal maps of systems (systems thinking)	5	36	15	30	17	27	24	37	27	8	35	18	30	2	3	34	***23***	
Explore systems with computer models (systems thinking)	5	55	47	5	18	11	36	31	49	5	18	22	20	8	3	13	***23***	
Connect course content to life (understand societal relevance)	6	67	50	41	43	76	66	57	61	41	94	20	43	55	50	68	***55***	
Address national or global problem (understand societal relevance)	6	60	42	24	47	46	58	49	88	35	82	18	47	26	35	72	***49***	
Work on local problem (understand societal relevance)	6	71	23	30	18	19	46	41	30	5	38	0	17	8	34	23	***26***	
Address environmental justice (understand societal relevance)	6	24	8	14	5	6	14	8	30	5	56	0	13	14	9	32	***16***	
Work on community-inspired project (understand societal relevance)	6	11	12	14	2	5	16	10	0	3	18	0	7	6	3	2	***7***	
Avg		69	58.3	61.3	58.3	59.8	57.2	61.1	61.4	51.3	61.4	49.4	55.8	42.5	43.4	51.2		

**** skill types from Figure 1's caption. ("data skills" was split here for convenience.)**

1	data skills; quantitative
2	data skills; "reasoning"
3	team & communication skills
4	geoscience skills
5	systems thinking
6	societal relevance

OBSERVATIONS

Hydrology seems to be the most "quantitative" of fields.

Note that "data centric" does not equate to skilled with mathematics

Only for hydrology, geophysics and geochemistry do more than 50% of instructors claim to **use** calculus skills

There will always be some uncertainty about exactly how instructors interpret the skills defined.