Project Based Learning Protocols

Initial Project Design: Overview Document

Integrated Science PBL

Name of Project:			Duration : Semester Long				
Subject/Course: Integrated Science		Teacher(s):		Grade Level: 9			
Other subject area	as to be included, if	any:					
Significant Conter (KY Core and/or of (SWBAT/I Can/Outcome	thers)						
"STEM" Habits (to be taught & Assessed	Engaged Learner	Intentional Collaborator	Active & Responsible Decision-maker	Effective Communicator	Creative & Critical Thinker	Altruistic Leader	Other
	X	X	X	X	X	X	X

Supplemental File	1
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Project Summary (include student rol problem/challenge, purpose/beneficiary	e, issue, action taken,				
Driving Question Develop the seminal question for your students. The question should be open-ended, discipline centered and provocative.					
Entry Event To launch inquiry and engage students.					
Individual Product:			Group Product:		
		Need to	o Knows:		

Supplemental File	e 1						
	Students	will know:					
	Students will understand:						
	Students w	ill be able to:					
Individual Competencies:		Group Competencies:					
(Student work): Anticipate the ideal stude thoughts here.		amarks ledge and skills (both content & 21st Century Skills) you expect at the end of the project. Write down your					
(During Project)	Journal/Learning Logs?	Notes?					
	Preliminary Plans/Outlines/Prototypes?	Checklists?					
	Rough Drafts?	Concept Maps?					
	Online Tests/Exams?	Other:					
Summative Assessments (End of Project)	Written Product(s), with rubric?	Other Product(s) or Performance(s), with rubric?					
(End of Project)	Oral Presentation, with rubric?	Peer Evaluation?					
	Multiple Choice/ Short Answer Test	Self-Evaluation					

Supplemental File 1						
	Essay Test?			Other:		
Reflection Methods:	Journal/ Learning Log	Whole Class Discussion	Survey	Focus Group	Fishbowl	Other
(individual, team, or whole class)	X	X	X	X	X	X
Public Audience (experts, audiences students will engage end of project)	, or product users se with during/at					
Resources Needed:	People	Facilities	Equipment	Materials	Community	Other
Notes:						

"STEM" - Survey 2017-18

Block 3

Q20 To Student: We would like to know about your perceptions of geosciences as a career option. Although you will not get personal benefit from taking part in this research study, your responses may help us understand more about why students choose geosciences as a career. We hope to receive completed questionnaires from about 600 people, so your answers are important to us. Of course, you have a choice about whether or not to complete the survey/questionnaire, but if you do participate, you are free to skip any questions or discontinue at any time. The survey/questionnaire will take about 5 minutes to complete. There are no known risks to participating in this study. Your response to the survey is anonymous which means no names will appear or be used on research documents, or be used in presentations or publications. The research team will not know that any information you provided came from you, nor even whether you participated in the study. questions about the study, please feel free to ask; my contact information is given below. If you have complaints, suggestions, or questions about your rights as a research volunteer, contact the staff in the University of Kentucky Office of Research Integrity at 859-257-9428 or toll-free at Thank you in advance for your assistance with this important project. Rebecca Freeman Earth & Environmental Sciences, College of Arts & Sciences, University of Kentucky PHONE: 859-257-6376 E-MAIL: rebecca.freeman@uky.edu PLEASE CONTINUE TO THE NEXT PAGE

Q1 1. Please enter your survey ID number:	
End of Plack	

Please indicate your level of agreement with the following statements

Q2 2. I would consider being a science m	najor
○ Yes (1)	
O No (2)	
Q3 3. I have decided on a college major	
○ Yes (1)	
O No (2)	
Skip To: Q7 If Q3 = No (2)	
	Page Break

Supplemental File 2

4 4. What will your future major be?	
O Biology (1)	
Chemistry (2)	
O Environmental Sciences (3)	
Geology (4)	
O Physics (5)	
○ STEM field not listed (8)	
Other (9)	

Q5 5. Please indicate your level of agreement with the following statements regarding the effect of required classes on your choice of major:

	Strongly Disagree (1)	Disagree (2)	Agree (3)	Strongly Agree (4)
Two required semesters of chemistry makes me less likely to choose a STEM major (1)	0	0	0	0
Two required semesters of physics makes me less likely to choose a STEM major (2)	0		0	0
Two required semesters of calculus makes me less likely to choose a STEM major (3)	0		0	0

Q6 6. Please indicate your level of agreement with the following statements regarding who and/or what influenced your choice of major:

	Strongly Disagree (1)	Disagree (2)	Agree (3)	Strongly Agree (13)
My choice of major was influenced by a friend or family member (1)	0	0	0	0
My choice of major was influenced by a teacher in high school or middle school (2)			0	0
My choice of major was influenced by a "STEM" teacher (3)	0	0	0	0
My choice of major was influenced by a "STEM" advisor (4)	0	0	0	0
My choice of major was based on interests developed prior to attending "STEM" (5)	0	0	0	
My choice of major was influenced by a class taken prior to attending "STEM" (6)		0	0	0

Q7 7. Please indicate your level of agreement with the following statements regarding what is important to you about your future major:

important to you a	Strongly Disagree (1)	Disagree (2)	Agree (3)	Strongly Agree (4)
It is important to me that my major be in a prestigious department (4)	0	0	0	0
It is important to me that my major leads to environmentally friendly employment (7)	0		0	0
It is important to me that my major involves working outdoors (8)	0		0	0
My choice of major depends on salaries in the field (1)	0	0	0	0
My choice of major depends on ease of obtaining a job in that field (9)	0	0	0	0
It is important to me that courses in my major use up-to-date technology (10)	0	0	0	0
It is important to me that courses in my major take place in new and modern classrooms (3)	0	0	0	0
		End of Block		

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Q8 8. Please indicate your level of agreement with the following statements regarding activities you enjoy:

	Strongly Disagree (1)	Disagree (2)	Agree (4)	Strongly Agree (5)
I enjoy outdoor activities: camping, hiking, biking, etc. (1)	0	0	0	0
I enjoy traveling to different places (2)	0	\circ	0	0
I enjoy observing nature (3)	\circ	\circ	\circ	\circ

Q9 9. Please indicate you level of agreement with the following statements about becoming a geologist:

	Strongly Disagree (1)	Disagree (2)	Agree (3)	Strongly Agree (4)
My friends would support me becoming a geologist (3)	0	0	0	0
My family would support me becoming a geologist (2)	0	0	0	0
I would feel proud of my career if I became a geologist (1)	\circ	\circ	0	0

Q10 10. Please rate the prestige of each occupation

	Not at all Prestigious (1)	Not Very Prestigious (2)	Somewhat Prestigious (3)	Very Prestigious (4)
Biology occupation (1)	0	0	0	0
Chemistry occupation (2)	0	\circ	0	0
Environmental science occupation (3)	0	\circ	0	\circ
Geology occupation (4)	0	0	0	0
Physics Occupation (5)	0	\circ	\circ	\circ

Q11 11. Select which income range you think represents the average entry level salary for a graduate with a bachelor's degree in each field:

	less than \$30,000 (1)	\$30,000- 39,999 (2)	\$40,000- 49,999 (3)	\$50,000- 59,999 (4)	\$60,000- 69,999 (5)	\$70,000- 79,999 (6)	more than \$80,000 (7)
Biology (1)	0	\circ	\circ	\circ	\circ	\circ	\circ
Chemistry (2)	0	\circ	\circ	\circ	\circ	\circ	\circ
Environmental Science (3)	0	\circ	\circ	\circ	\circ	\circ	\circ
Geology (4)	0	\circ	\circ	\circ	\circ	\circ	\circ
Physics (5)	0	\circ	\circ	\circ	\circ	\circ	\circ

Carry Forward All Choices - Displayed & Hidden from "11. Select which income range you think represents the average entry level salary for a graduate with a bachelor's degree in each field:"



Q12 12. Which one of the following describes the minimum entry-level salary you would be satisfied with upon graduating with a bachelor's degree in...

	less than \$30,000 (1)	\$30,000- 39,999 (2)	\$40,000- 49,999 (3)	\$50,000- 59,999 (4)	\$60,000- 69,999 (5)	\$70,000- 79,999 (6)	\$80,000- 89,999 (7)
Biology (x1)	0	\circ	\circ	\circ	\circ	\circ	\circ
Chemistry (x2)	0	\circ	\circ	\circ	\circ	\circ	\circ
Environmental Science (x3)	0	\circ	\circ	\circ	\circ	\circ	\circ
Geology (x4)	0	\circ	\circ	\circ	\circ	\circ	\circ
Physics (x5)	0	\circ	\circ	\circ	\circ	\circ	\bigcirc

Page Break

Q13 13. I think working in a career related to... would be personally fulfilling

	Strongly Disagree (1)	Disagree (2)	Agree (4)	Strongly Agree (5)
Biology (1)	0	0	\circ	\circ
Chemistry (2)	0	0	\circ	\circ
Environmental Science (3)	0	0	\circ	\circ
Geology (4)	0	0	\circ	\circ
Physics (5)	0	0	\circ	\circ

Carry Forward All Choices - Displayed & Hidden from "13. I think working in a career related to... would be personally fulfilling"



Q14 14. It is easy to get a job with a degree in:

·	Strongly Disagree (1)	Disagree (2)	Agree (4)	Strongly Agree (5)
Biology (x1)	\circ	\circ	\circ	\circ
Chemistry (x2)	\circ	\circ	\circ	\circ
Environmental Science (x3)	\circ	\circ	0	\circ
Geology (x4)	\circ	\circ	\circ	\circ
Physics (x5)	\circ	\circ	\circ	\circ

Carry Forward All (Choices - Display	ed & Hidden from	"14. It is easy to	get a	job with a ded	ree in:
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Q15 15. Rate the difficulty of each type of academic major

	Very Difficult (1)	Somewhat Difficult (2)	Somewhat Easy (3)	Very Easy (4)
Biology (xx1)	0	\circ	\circ	\circ
Chemistry (xx2)	0	\circ	\circ	\circ
Environmental Science (xx3)	0	\circ	\circ	0
Geology (xx4)	0	\circ	0	0
Physics (xx5)	0	\circ	0	\circ

Carry Forward All Choices - Displayed & Hidden from "15. Rate the difficulty of each type of academic major"



Q16 16. In middle or high school I took a class in:

	Yes (1)	No (2)
Biology (xxx1)	\circ	
Chemistry (xxx2)	\circ	
Environmental Science (xxx3)	\circ	
Geology (xxx4)	\circ	
Physics (xxx5)	\circ	

End of Block

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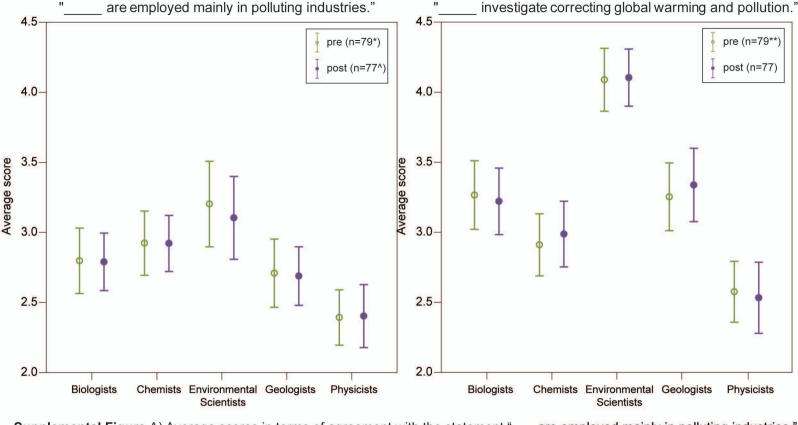
Q17 17. Please indicate your level of agreement with the following statements regarding various science fields and the environment:

	Strongly Disagree (1)	Disagree (2)	I Don't Know (4)	Agree (5)	Strongly Agree (6)
Physicists investigate correcting global warming and pollution (1)	0	0	0	0	0
Physicists are employed mainly in polluting industries (2)	0	0	0	\circ	0
Geologists investigate correcting global warming and pollution (3)	0	0	0		0
Geologists are employed mainly in polluting industries (4)	0	0			
Environmental scientists investigate correcting global warming and pollution (5)	0	0			
Environmental Scientists are employed mainly in polluting industries (6)	0	0	0		
Chemists investigate correcting global warming and pollution (7)	0	0	0	0	0

Supplemental File 2

Chemists are employed mainly in polluting industries (8)		0	\circ	0	0
Biologists investigate correcting global warming and pollution (9)	0	0	0	0	0
Biologists are employed mainly in polluting industries (10)		0	0	0	0
Q18 18. Please ind geoscience:					
	icate your level of Strongly Disagree (1)	agreement with th Disagree (2)		statements	regarding Strongly Agree (4)
geoscience: I have a great	Strongly				Strongly Agree
I have a great deal of knowledge about	Strongly				Strongly Agree
I have a great deal of knowledge about geoscience (1) I believe geoscience is	Strongly				Strongly Agre

emental File 2	



Supplemental Figure A) Average scores in terms of agreement with the statement "___ are employed mainly in polluting industries."

B) Average scores in terms of agreement with the statement "___ investigate correcting global warming and pollution." 1 = Strongly disagree, 3 = Don't know, 5 = Strongly agree.

Supplemental Table 1A. Correlations among all pre-survey questions, excepting those among prestige, difficulty of major, and average entry salary. Values highlighted in green are significant (p<0.05).

<u> </u>	Geology is a Geology i prestigious difficult	e s	starting salary for a graduate with a bachelor's c degree in b	I would feel hy proud of my v career if I s became a b	My family would support me s becoming a k	My friends would support me I becoming a	l enjoy c. c. observing h	l enjoy outdoor activities: l camping, tr hiking, d biking, etc.	Ge lenjoy ar traveling to ma different po	Geologists investigate are employed correcting mainly in global polluting warming an industries pollution	_ 60 4 0	pı	rtant my r us es nt ology	t my jor leads ironment / friendl y			It is important in that my important in major be in a dipprestigious is department it it		satisfactory entry-level salary for a graduate with a 1 b bachelor's ge degree in im	I ha ve a deal of l believe knowle geoscience is about geoscience	l great dge	d like n more	It is easy to get a job with a degree in Geology
It is important that my major involves working outdoors	0.174	0928	0499	6	0.0922	0.106	0.389	0.548	0.128	0.226	0.0026	0.378		0.191	0.025	-0.0131	-0.175	0.143	0.0842	0.000981	0.038	8660.0	0.206
Geology is a prestigious occupation		0.12	0.148	0.295		0.153	0.127	0.00305	0.0601	-0.071	0.137	0.381	0.205	0.0359	-0.0034	0.0171	-0.0673	-0.0227	0.0211	0.348	0.222	0.432	0.133
Geology is a difficult major			0.217	0.0346	-0.0342	-0.222	0.088	0.0582	-0.00192	0.0829	0.138	0.0321	-0.101	-0.0337	0.00917	-0.188	-0.208	-0.0317	0.0631	0.0203	-0.331	-0.0477	-0.345
The average starting salary for a graduate with a bachelor's degree in geology				-0.00294	0.0517	-0.00118	-0.0352	0.107	-0.0251	0.0814	0.226	0.218	0.128	-0.0064	0.0447	0.0733	-0.0564	0.173	0.594	0.118	0.206	0.0721	-0.116
I would feel proud of my career if I became a geologist					0.392	0.346	0.174	0.352	0.0602	0.335	0.361	0.459	-0.0519	0.113	0.226	0.000211	-0.0485	0.0579	-0.0261	0.156	0.0574		0.289
My family would support me becoming a geologist						0.726	0.231	0.185	0.0951	0.134	0.0457	-0.00768	0.0349	0.164	7660.0	0.155	-0.00345	-0.189	0.0751	9660000-	-0.0126		0.00111
My friends would support me becoming a geologist							0.136	0.226	0.0837	0.0664	0.127	0.0164	0.0919	0.0554	0.0563	0.169	0.0365	-0.155	-0.0217	0.102	0.0693	0.0832	0.0495
I enjoy observing na ture								0.352	0.259	0.118	-0.0402	0.267	-0.124	0.206	0.092	0.00818	0.0148	-0.177	0.109	0.0257	-0.0391		0.0109
I enjoy outdoor a ctivities : camping, hiking, biking, etc.									0.0828	0.182	-0.0319	0.386	-0.138	0.0352	0.19	-0.0756	0.104	0.201	0.196	-0.0687	0.113	0.0137	0.0357
I enjoy traveling to different places										0.0888	68900'0	0.0855	0.0778	0.0681	0.116	0.124	0.0498	-0.101	-0.0247	0.0852	0.104	0.126	0.0237
Geologists are employed mainly in polluting industries											0.541	0.102	-0.0106	-0.0553	0.107	-0.0367	-0.11	0.155	-0.0872	-0.0121	-0.0713	-0.00706	0.039
Geologists investigate correcting global warming and pollution												0.0517	-0.0144	0.0143	0.0739	-0.0689	0.000876	0.235	0.027	0.179	-0.0389	0.142	-0.0332
I would find geology a fulfilling career													-0.0356	0.0261	-0.0332	-0.0121	-0.0202	-0.0607	-0.00778	0.292	0.283	0.363	0.297
It is important that my major uses current technology														0.0337	0.051	0.604	0.158	0.0146	-0.0238	0.137	0.239	0.00341	0.157
It is important that my major leads to environmentally friendly employment															7670.0-	-0.0346	0.107	-0.264	0.0876	-0.0604	-0.0659	0.118	-0.0514
My choice of major depends on ease of obtaining a job in that field																0.2	0.28	0.357	-0.0207	0.17	0.143	-0.0275	0.225
It is important to me that courses in my major take place in new and modern classrooms																	0.183	-0.0238	0.0887	0.054	0.221	-0.154	0.35
It is important that my major be in a prestigious department																		0.116	-0.0801	0.0104	0.155	0.0485	0.011
My choice of major depends on salaries in the field																			0.185	0.00565	0.218	0.0326	0.0707
Minimum satisfactory entry-level salary for a graduate with a bachelor's degree in geology																				-0.0512	0.0455	0.0814	-0.138
I believe geoscience is important																					0.168	0.271	0.244
I have a great dea I of knowledge about geoscience																						0.265	0.257
I would like to learn more a bout geoscience										-	-	_	\dashv							_			0.031

Supplemental Table 1B. Correlations among all post-survey questions, excepting those among prestige, difficulty of major, and average entry salary. Values highlighted in green are significant (p<0.05).

It is easy to get a job with a degree in geoscienc e	0.0502	0.0706	-0.322	0.201	0.298	0.247	0.335	0.134	0.134	0.109	-0.129	-0.0408	0.135	0.13	-0.0837	0.286	0.126	0.175	0.074	0.0304	0.306	0.265	0.126
	0.00317	0.413	-0.0979	0.239	0.379	0.259	67600	0.265	0.275	0.0964	0.00926	0.00703	0.582	-0.133	0.0238	-0.03	-0.296	-0.0203	-0.0174	0.092	0.291	0.443	
I have a great deal of I would like knowledge to learn abbout geoscience geoscience	-0.0386	0.131	-0.249	0.247	0.162	0.19	0.137	0.235	0.182	0.189	0.00348	0.117	0.306	-0.0108	0.00226	0.237	980.0-	0.341	0.236	0.0804	0.0899		
11 graphs 11 graphs 12 gra	9650.0	0.204	0.101	0.108	0.403	0.459	0.329	0.183	0.173	0.087	-0.132	0.153	0.235	-0.0156	-0.0403	0.126	-0.0591	0.0359	0.148	-0.034			
≥ = e s	-0.0744	0.245	0.167	0.626	0.145	0.243	0.12	-0.0168	-0.047	0.000158	0.00697	0.0675	0.014	790.0	0.0399	0.103	0.131	0.0354	0.112				
n e of	0.213	0.0776	-0.043	0.107	0.0842	0.0493	-0.0211	0.101	0.168	-0.152	-0.0491	0.0874	0.239	-0.0524	0.131	0.532	-0.128	0.385					
	-0.019	-0.117	-0.257	0.182	-0.134	0.0492	-0.029	0.118	0.0419	-0.0924	0.00903	9960'0	0.181	-0.0158	0.2	0.345	0.0106						
3 c i a se	-0.16	-0.0411	0.107	0.0794	-0.27	-0.158	-0.163	-0.302	-0.25	0.149	-0.0453	0.0161	-0.264	0.549	۲	0.0807							
	0.131	-0.0541	-0.108	0.182	0.128	-0.0228	-0.0134	ľ	0.0582	0.0099	-0.0418	0.14	0.149	0.0271									
Intist my major major major letter my major letter my major letter my to ease of ervicoment obtaining a ally friendly job in that employment field	151'0	-0.0557	-0.039	0.0639	-0.203	-0.225			0.0213	0.00453	-0.0034	0.0445		0.00522									
It is important that my major uses current technology	121'0-	0.0395	0.0116	0.18	-0.131	0	-0.134		-0.143	0.141	-0.113	0.0621	-0.104										
I would find geology a fulfilling career	0.116	0.386	-0.224	0.157	0.297	0.114	0.128		0.156	0.0789	0.108	0.0438											
Geologists investigate correcting global warming and pollution	0.00432	0.00218	-0.0799	-0.0554	0.0579	7060.0	20502		0.0522	-0.0144	0.422												
Geologists are employed mainly in polluting industries	0.00895	0.0298	-0.0165	-0.0362	-0.0054	-0.211	-0.0969		-0.0327	-0.173													
l enjoy travel ing to different places	0.276	0.125	-0.0617	0.0813	0.134	0.252			0.354														
l enjoy outdoor activi ties: camping, hiking,	0.421	0	-0.0756	0.127	0.118	0.223	0.153																
l enj oy observi ng na ture	0.283	0.0638	-0.277	0.0571	0.137	0.194	0.168																
My friends would support me becoming a geologist	0.062	0.16	-0.184	2680'0	0.621	0.642																	
My famil y would support me becoming a geologist	-0.0225	0.241	9990'0-	0.214	0.496																		
I would feel My fam proud of my would career if I support became a becoming	3 0.127	3 0.296	1 -0.0435	0.119																			
The average starting salary for a graduate with a backelor's degree in geology	4 0.0208	7 0.23	0.0321																				
The average starting salary for a graduate graduate graduate with a prestigious difficult degree in a graduate major in a graduate graduat	9 0.104	-0.0117																					
Geology is a prestigious occupation	-0.0179						DD.					-					_		ss	۲.			
	It is important that my major involves working outdoors	Geology is a prestigious occupation	Geology is a difficul t major	The average starting salary for a graduate with a bachelor's degree in geology	I would feel proud of my career if I became a geologist	My family would support me becoming a geologist	My friends would support me becoming a geologist	l enjoy observing nature	I enjoy outdoor activities:camping, hiking, biking, etc.	I enjoy traveling to different places	Geologists are employed mainly in polluting industries	Geologists investigate correcting global warming and pollution	I would find geology a fulfilling career	It is important that my major uses current technology	It is important that my major leads to environmentally friendly employment	My choice of major depends on ease of obtaining a job in that field	It is important to me that courses in my major take place in new and modern classrooms	It is important that my major be in a prestigious department	My choice of major depends on salaries in the field	Minimum satisfactory entry-level salary for a graduate with a bachelor's degree in geology	I believe geoscience is important	I have a great deal of knowledge about geoscience	I would like to learn more about geoscience