

HEA-Heliophysics Educator Ambassador Workshop—Anchorage, AK June 2009
Preliminary Questionnaire Analysis—Quantitative Data

PART 1—TEACHERS' BACKGROUND

This analysis presents preliminary findings from the week-long HEA workshop held at the University of Alaska in Anchorage, Alaska from Sunday, June 21, 2009 through Friday, June 26, 2009. This analysis includes all quantitative data from 1) the daily feedback forms—Monday through Wednesday, 2) the pre- and post-assessments and 3) the end-of workshop questionnaire—Friday. Qualitative analyses from Friday's session are presented in a companion Excel file—HEAPrelimQual0809.xls. The pre-post assessment analysis that is being guided by Laura Peticolas and Lindsey Bartalone will be forthcoming.

In total, there were 30 participants at the workshop. Among the attendees, six identified themselves as non-teachers, i.e. not having responsibilities for teaching in the classroom. They described their professional roles as...

- Curriculum coordinator (2)
- District program director
- Informal science educator
- Program specialist
- Administrator

Four of the teachers said that they had additional responsibilities outside the classroom. In addition to teaching their students, they told us that they fulfill the roles of...

- Teacher trainer
- Principal
- NASA educational consultant
- Public Relations under state grant for the Department of Education

Teacher participants (N=29) are an experienced group averaging 20 years of teaching, ranging from 3 to 30 years. The 24 classroom teachers reported instructing a total of 2,949 students in a typical year. These teachers said they are instructing anywhere from 24 to 350 students or approximately 123, on average.

Details of the grade levels, subject areas, school environments and composition of their classes follows...

TEACHERS' TEACHING EXPERIENCE					
Grade Level	Number of Teachers*	% of Teachers	Subject Areas	# of Teachers**	% of Teachers
	N=24	N=24		N=13	N=13
Elementary	2	8%	General science/elementary	6	46%
Middle School	15	63%	Earth Science	5	39
High School	13	54%	Physical Science/chemistry	4	31
Post High School	1	4%	Weather Climate/environmental science	3	23
			Astronomy/space science	3	23
			Geology	3	23
			Math/engineering	2	15
			Biology	2	15

*The 24 teachers who told us the grade levels they are teaching said that they are...

- Teaching one level=17
- Teaching two levels=7

**The 13 teachers who told us the subjects they teaching said that they are...

- Teaching four subjects=1
- Teaching three subjects=5
- Teaching two subjects=2
- Teaching one subject=5

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TEACHERS' SCHOOL ENVIRONMENT					
Title I	Receiving Free/Reduced Lunches	Setting			
N=22	N=24	N=24			
Title I Schools	Average % Students	Rural	Suburban	Urban	
50%	42%	42%	33%	25%	
	% Range				
	1-100%				

COMPOSITION OF TEACHERS' CLASSES			
	Females	White and Asian Males	Other Males
	N=22	N=22	N=22
Average Percentage of Class	49%	31%	20%
Range of Percentages	22-60%	0-50%	1-45%

Female and other male students are considered minorities with regard to taking science. Thus, we estimate that approximately 69% of the participants' students are minorities.

Twenty-nine of the 30 participants in the workshop indicated that the most influential factors in their decision to participate in the project were personal enthusiasm/passion for astronomy, general love of learning and their desire to use cutting-edge science with students. A complete summary of the factors teachers selected is below. They were asked to identify the two most influential factors in their decision to participate.

FACTORS MOST INFLUENCING DECISION TO PARTICIPATE IN PROJECT	# of Teachers	% of Teachers
	N=29	N=29
Personal enthusiasm/passion for astronomy and space science	12	42%
General love of learning	11	38
Desire to use cutting-edge science with students	9	31
Desire to learn more about astronomy/space science	8	28
Desire to enhance resources/tools for use in the classroom	5	17
Desire to learn more about inquiry-based, 'real' science	3	10
Interest in participating in a NASA project	3	10
Desire to see Alaska	3	10
Desire to share science knowledge with colleagues	2	7
Other—Previous work with Dr. Laura Peticolas, French Space Agency Mission	2	7

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PART 2—WORKSHOP EVALUATION

As part of their evaluation of the workshop experience, teachers were asked to rate the value of three elements of the workshop from their perspective. Using a 5-point scale, all thirty participants indicated ratings of the elements in the range of 'quite a bit of value' to 'enormous value', with the field trip drawing the highest ranking of 4.5.

- 1=No value at all
 2=A slight bit of value
 3=Moderate amount of value
 4=Quite a bit of value
 5=Enormous value

VALUE OF ELEMENTS				
Elements of Workshop Experience	Mean Rating	Rating	Freq. #	Freq. %
Being in Alaska	4.4			N=30
		1	0	—
		2	1	3%
		3	4	13
		4	6	20
		5	19	63
			100%	
The Field Trip	4.5			N=30
		1	0	—
		2	1	3%
		3	3	10
		4	7	24
		5	19	63
		100%		
The Planetarium Show	4.2			N=30
		1	0	—
		2	0	—
		3	6	20%
		4	11	37
		5	13	43
		100%		

Workshop presentations offered Monday through Wednesday were rated by the participants on a 4-point scale for their understanding of the presentation and a 5-point scale for their anticipated use in their own workshops of the topics presented. (See rating scale details below.) For Monday's session, a LANL (Los Alamos National Laboratory) Observer was in attendance and completed the questionnaire along with the 30 participants resulting in 31 questionnaires being completed. A total of 29 questionnaires each was completed on Tuesday and Wednesday—one teacher left early each day.

Three types of presentations were made—activities, presentations of content and discussions focusing on administrative issues related to the 'big picture' for the program. The mean ratings for teachers' understanding and anticipated use for each type of presentation (cluster means) along with the presentations comprising each type are summarized in the following table 'Workshop Presentations Clustered by Type.' Presentation titles are color coded (blocks to left) to identify the day of the week of the presentation—Monday=blue, Tuesday=pink and Wednesday=tan. Details for frequency of responses and accompanying percentages follow in summaries by day—pages 6-12—with table titles highlighted in matching colors for each day's session.

Rating Scale for Understanding of Presentations

- 1=Not clear at all
 2=Not clear enough
 3=Clear enough
 4=Very Clear

Rating Scale for Anticipated Use of Topics in Workshops

- 1= Will not present
 2=Unlikely to present
 3=Somewhere likely to present
 4=Very likely to present
 5= Certain to present

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PRESENTATIONS CLUSTERED BY TYPE			
	PRESENTATIONS	UNDERSTANDING MEANS	ANTICIPATED USE MEANS
	ACTIVITIES	3.48	3.72
	Ice Core analogy	3.8	3.9
	Demo-activity: A cloud by any other name	3.7	4.1
	Mapping magnetic fields	3.7	3.9
	SSS-UV bead experiment	3.6	4.0
	Demonstration: A water analogy	3.6	3.8
	Four states of matter	3.6	3.7
	Experiment: The Greenhouse effect	3.5	4.1
	SSS-Solar output (electromagnetic spectrum & particles	3.4	3.6
	SSS-Stormy sun	3.4	3.5
	Particle Detection	3.4	3.3
	Computer interactive: Plasma pinball	3.4	3.4
	Space Science Sequence (SSS) Unit 1-Mystery & Research	3.3	3.5
	SSS-Balloon-rocket mission and layers of the atmosphere	2.9	3.6
	CONTENT PRESENTATIONS	3.47	3.69
	Video: AIM mission and noctilucent clouds	3.7	4.2
	Presentation-demo: Light interactions with matter	3.6	4.1
	Sun-Earth Connection	3.6	4.1
	Pre-assessment & KWL chart: Climate vs. weather	3.6	4.0
	Magnetosphere protecting atmospheres	3.6	3.9
	Skype: AIM science	3.6	
	Contribution to climate change from solar variation vs. human activity	3.5	4.1
	IBEX mission	3.4	3.6
	Skype: NASA Heliophysics elementary grade focus	3.4	3.0
	Panel: THEMIS magnetometers in the classroom	3.3	3.3
	The upper atmosphere and TIMED mission	3.2	3.3
	Video & Skype: What can we learn from SSS?	3.2	3.0
	DISCUSSIONS/Administrative Issues	3.21	3.01
	HEA role and responsibilities (Wednesday)	3.6	
	HEA role and responsibilities (Tuesday)	3.4	
	SSS Unit 1 NASA Support Resources	3.2	3.4
	Power of the NASA Meatball	2.7	2.6

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Teachers were asked to rate their prior knowledge of the ideas presented at Monday’s sessions on a 5-point scale ranging from ‘1=no knowledge at all’ to ‘5=expert knowledge.’ Of 31 teachers completing questionnaires, 29 offered a rating resulting in a mean rating of 2.59, which is solidly in the range of ‘2=a little knowledge’ and ‘3=a moderate amount of knowledge.’

Rating Scale for Understanding of Presentations

- 1=Not clear at all
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Rating Scale for Anticipated Use of Topics in Workshops

- 1= Will not present
- 2=Unlikely to present
- 3=Somewhere likely to present
- 4=Very likely to present
- 5= Certain to present

UNDERSTANDING AND ANTICIPATED USE OF TOPICS IN WORKSHOPS								
Understanding of Presentation					Anticipated Use of Topics			
Presentation—Monday	Mean Rating	Rating	Freq. #	Freq. %	Mean Rating	Rating	Freq. #	Freq. %
Discussion: Power of the NASA meatball	2.7			N=31	2.6			N=27
		1	5	16%		1	5	19%
		2	5	16		2	9	33
		3	14	45		3	6	22
		4	7	23		4	7	26
				100%		5	—	—
Activity: Mapping magnetic fields	3.7			N=31	3.9			N=29
		1	0	—		1	1	3%
		2	0	—		2	—	—
		3	8	26%		3	6	21
		4	23	74		4	17	59
				100%		5	5	17
Activity: Space Science Sequence (SSS) Unit 1—Mystery & Research	3.3			N=31	3.5			N=29
		1	0	—		1	0	—
		2	0	—		2	3	10%
		3	21	68%		3	12	41
		4	10	32		4	10	35
				100%		5	4	14
Activity: SSS-Solar output (electromagnetic spectrum & particles)	3.4			N=31	3.6			N=29
		1	0	—		1	0	—
		2	3	10%		2	15	17
		3	12	39		3	6	21
		4	16	51		4	14	48
				100%		5	4	14
Activity: SSS—Stormy sun	3.4			N=31	3.5			N=29
		1	0	—		1	1	3%
		2	0	—		2	4	14
		3	18	58%		3	7	24
		4	13	42		4	13	45
				100%		5	4	14
							100%	

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UNDERSTANDING AND ANTICIPATED USE OF TOPICS IN WORKSHOPS								
Understanding of Presentation				Anticipated Use of Topics				
Presentation—Monday	Mean Rating	Rating	Freq. #	Freq. %	Mean Rating	Rating	Freq. #	Freq. %
				N=31				N=29
Discussion: SSS Unit 1 NASA Support resources	3.2	1	1	3%	3.4	1	1	3%
		2	3	10		2	5	17
		3	17	55		3	9	31
		4	10	32		4	9	31
				100%		5	5	17
				100%*				
				N=31				N=29
Video & Skype presentation: What can we learn from SSS?	3.2	1	0	—	3.0	1	1	3
		2	2	6		2	7	24
		3	20	65		3	13	45
		4	9	29		4	6	21
				100%		5	2	7
				100%				
				N=29				N=26
Skype presentation: NASA Heliophysics elementary grade focus	3.4	1	0	—	3.0	1	2	8%
		2	3	11%		2	7	27
		3	12	41		3	8	31
		4	14	48		4	6	23
				100%		5	3	11
				100%				
				N=30				N=25
Presentation: IBEX mission	3.4	1	0	—	3.6	1	0	—
		2	1	3		2	2	8%
		3	15	50		3	10	40
		4	14	47		4	9	36
				100%		5	4	16
				100%				
				N=30				N=27
Activity: Four states of matter	3.6	1	0	—	3.7	1	0	—
		2	1	3%		2	5	19
		3	9	30		3	6	22
		4	20	67		4	7	26
				100%		5	9	33
				100%				

*Total is less than 100% due to rounding.

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Understanding of Presentation				Anticipated Use of Topics				
Presentation—Monday	Mean Rating	Rating	Freq. #	Freq. %	Mean Rating	Rating	Freq. #	Freq. %
Activity: Particle Detection	3.4			N=31	3.3			N=28
		1	0	--		1	1	4%
		2	4	13%		2	6	21
		3	12	39		3	8	29
		4	15	48		4	11	39
				100%		5	2	7
Computer interactive: Plasma pinball	3.4			N=31	3.4			N=28
		1	0	--		1	0	--
		2	4	13%		2	5	18%
		3	12	39		3	10	36
		4	15	48		4	10	36
				100%		5	3	10
Demonstration: A water analogy	3.6			N=30	3.8			N=28
		1	0	--		1	0	--
		2	2	7%		2	2	7
		3	9	30		3	7	26
		4	19	63		4	13	48
				100%		5	5	19
				100%				
AVERAGE MEAN RATING FOR THE DAY	3.4				3.4			

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Teachers were asked to rate their prior knowledge of the ideas presented at Tuesday’s sessions on a 5-point scale ranging from ‘1=no knowledge at all’ to ‘5=expert knowledge.’ Of 29 teachers completing questionnaires, 28 offered a rating resulting in a mean rating of 2.82, which is solidly in the range of ‘2=a little knowledge’ and ‘3=a moderate amount of knowledge’—well beyond the midpoint for the range.

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UNDERSTANDING AND ANTICIPATED USE OF TOPICS IN WORKSHOPS									
Understanding of Presentation					Anticipated Use of Topics				
Presentation—Tuesday	Mean Rating	Rating	Freq. #	Freq. %	Mean Rating	Rating	Freq. #	Freq. %	
Discussion: HEA role and responsibilities	3.4			N=28					
		1	0	—					
		2	2	7%					
		3	12	43					
		4	14	50					
				100%					
Presentation: Magnetospheres protecting atmospheres	3.6			N=29				N=28	
		1	0	—					
		2	0	—					
		3	11	38		3.9	1	0	—
		4	18	62		2	2	7%	
				100%		3	7	25	
Panel: THEMIS magnetometers in the classroom	3.3			N=27				N=29	
		1	0	—					
		2	1	4%		1	0	—	
		3	17	63		2	11	38%	
		4	9	33		3	6	21	
				100%		4	5	17	
Activity: SSS—UV bead experiment	3.6			N=29				N=28	
		1	0	—					
		2	0	—		1	0	—	
		3	11	38		2	1	3%	
		4	18	62		3	5	18	
				100%		4	14	50	
				5	8	29			
						100%			

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Understanding of Presentation					Anticipated Use of Topics			
Presentation—Tuesday	Mean Rating	Rating	Freq. #	Freq. %	Mean Rating	Rating	Freq. #	Freq. %
Presentation: Sun-earth connection	3.6			N=28	4.1			N=28
		1	0	—		1	0	—
		2	0	—		2	1	3%
		3	12	43%		3	3	11
		4	16	57		4	15	54
				100%		5	9	32
Activity: SSS—Balloon-rocket mission and layers of the atmosphere	2.9			N=29	3.6			N=29
		1	1	4%		1	1	4%
		2	5	17		2	4	14
		3	18	62		3	7	24
		4	5	17		4	12	41
				100%		5	5	17
Presentation: The upper atmosphere and TIMED mission	3.2			N=29	3.3			N=28
		1	0	—		1	0	—
		2	3	10%		2	6	21
		3	17	59		3	12	41
		4	9	31		4	8	28
				100%		5	3	10
AVERAGE MEAN RATING FOR THE DAY	3.4				3.7			

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UNDERSTANDING AND ANTICIPATED USE OF TOPICS IN WORKSHOPS														
Understanding of Presentation								Anticipated Use of Topics						
Presentation— Wednesday	Mean Rating	Rating	Freq. #	Freq. %				Mean Rating	Rating	Freq. #	Freq. %			
Discussion: HEA role and responsibilities	3.6				N=28									
		1	0	—										
		2	0	—										
		3	12	43%										
		4	16	57%										
				100%										
Presentation-demo: Light interactions with matter, absorption, emission, scattering, reflection	3.6				N=29									
		1	0	—										
		2	0	—										
		3	11	38%										
		4	18	62%										
				100%										
Experiment: The greenhouse effect	3.5				N=29									
		1	0	—										
		2	0	—										
		3	13	46%										
		4	15	53%										
				100%										
Demo-activity: A cloud by any other name	3.7				N=28									
		1	0	—										
		2	0	—										
		3	9	32%										
		4	19	68%										
				100%										
Video: AIM mission and noctilucent clouds	3.7				N=28									
		1	0	—										
		2	0	—										
		3	9	29%										
		4	20	71%										
				100%										
					N=27									
		1	0	—										
		2	0	—										
		3	6	22%										
4	12	45%												
5	9	33%												
				100%										
					N=27									
		1	0	—										
		2	0	—										
		3	8	30%										
4	8	30%												
5	11	40%												
				100%										
					N=28									
		1	0	—										
		2	1	4%										
		3	4	14%										
4	13	46%												
5	10	36%												
				100%										
					N=27									
		1	0	—										
		2	1	3%										
		3	4	15%										
4	11	41%												
5	11	41%												
				100%										

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PART 3—PLANNED USE OF MATERIALS

Students

All 24 of the classroom teachers said that they planned to use the materials/ideas from the workshop in their classrooms. Additionally, two of the participants who identified themselves as non-teachers offered information about how they would implement the materials. The district program director plans to train other teachers “through my NASA program and professional development to teachers” who reach 1,000 students per year in grades 6 through 12. The informal science educator plans to use the materials as a “resource directly related to NASA education.” A summary of how the 24 classroom teachers plan to use the materials in their classrooms follows. . .

Of the 24 teachers, 23 listed the specific topics/activities they planned to use, with as many as five and six topics mentioned by several teachers. Multiple responses result in percentages exceeding 100%.

PLAN TO IMPLEMENT		
TOPICS/ACTIVITIES	# Teachers (N=22)	% Teachers
Magnetism/EMR/magnetic fields/magnetic field mapping/magnetosphere	14	63.6%
SSS/1.1/1.6/1.3	8	36.4%
AIM	7	31.8%
Earth-Sun Connection/sun cycles/solar flares/CME	6	27.3%
IBEX	5	22.7%
UV/UV Beads/filters	4	18.2%
TIMED	3	13.6%
THEMIS	2	9.1%
Space weather	2	9.1%
Energy transfer(convection tubes)/conduction	2	9.1%
GEMS	2	9.1%
Rockets	2	9.1%
Hands-on activities	1	4.6%
Heliosphere	1	4.6%
NASA Missions	1	4.6%
NLC	1	4.6%
Mystery activity	1	4.6%
7 aspects	1	4.6%
Visible Light spectrum	1	4.6%
Global warming	1	4.6%
IBIS	1	4.6%
Boulleor (sic)	1	4.6%

The 24 teachers said that on average they plan to implement the materials with 2,462 students, ranging from 30 to 200. On average, this is 103 students per teacher per year. They will be reaching them in . . .

STUDENTS' GRADE LEVELS, ABILITY LEVELS AND SUBJECT AREAS FOR PLANNED IMPLEMENTATION								
Grade Level	# of Teachers*	% of Teachers	Student Ability Levels	# of Teachers	% of Teachers	Subject Areas	# of Teachers	% of Teachers
	N=24	N=24		N=23	N=23		N=24	N=24
Elementary	3	13%	All/inclusive	20	87%	General science/elementary	10	42%
Middle School	14	58%	Gifted/honors	7	30	Physics	6	25
High School	13	54%	Special Ed.	2	9	Earth science	6	25
			Bi-lingual	2	9	Astronomy/space science/EM radiation	4	17
			Elementary	1	4	Physical science	4	17
						Geology	2	8
						Life science	1	4
						Integrated science	1	4
						Chemistry	1	4

*Of the 24 teachers 6 plan to implement at multiple levels in . . .

- Elementary and middle school N=2
- Middle school and high school N=4

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Preliminary Questionnaire Analysis—Quantitative Data

ANTICIPATED USE OF TOPICS PRESENTED							
	Freq. %	Integral Part of Basic Science Curriculum*	Resource/ Supplement*	Non-Science Curriculum*	To Train Teachers	To Use Another Way	Specific Other Ways Mentioned
Anticipated Use	N=21						
	Freq.	16	4	0	2	0	
	% of Teachers	76%	19%	—	10%	—	

* One teacher plans to use the materials as a resource in addition to integrating into the basis curriculum.

PART 4—PERCEPTIONS OF BEING PREPARED TO TEACH HELIOPHYSICS

Prior to the workshop, participants completed an assessment designed to gauge their level of knowledge prior to workshop—a pre-assessment. Included were a series of questions asking teachers to rate how prepared they felt to teach their students in various topic areas. A post-assessment was completed by the teachers on Thursday, following three days of workshop participation. The average mean ratings and change from pre- (T1) to post-assessment (T2) are summarized below.

Rating Scale for Preparation to Teach Students

- 1=Not prepared at all
- 2=Minimally prepared
- 3=Moderately prepared
- 4=Well prepared
- 5=Exceptionally well prepared

PREPARED TO TEACH STUDENTS			
AREAS TO TEACH	T1 (N=28)	T2 (N=28)	Change
Different boundaries in the Solar System	1.89	3.74	1.85
The Sun's Output	2.36	4.14	1.78
Changing forms of energy in the heliosphere or solar system	2.19	3.74	1.55
Space-based tools to study the Sun and its effects	2.11	3.93	1.82
Importance of Earth's magnetic field to sustain life	2.75	4.11	1.36
Relationships between solar radiation, atmosphere and climate	2.79	4.04	1.25
Total Average Mean Ratings	2.35	3.95	1.60

In addition to presenting workshop topics to their students, the attendees also looked forward to sharing what they learned with fellow teachers. All of the participants were asked to estimate the number of fellow teachers with whom they anticipated sharing the materials and ideas learned at the workshop. In total 28 of the participants shared their estimates...

SHARING WITH COLLEAGUES				
Participants	# of respondents	Average number fellow teachers will share with	Range of fellow teachers to share with	Total fellow teachers estimated to reach
Classroom Teachers	22	35	10-100	776
Non-Teachers	6	148	50-500	890
Total	28	60	—	1,666

Workshops participants not only completed pre- and post-assessment questions related to how prepared they felt to teach the materials/ideas from the workshop to their students, but also how they felt about teaching what they were learning with their fellow teachers. As they embarked on 'spreading the word' to the nearly 1,700 teachers they anticipated reaching, they offered ratings of their level of preparedness not only on the pre-and post-assessments—pre- completed prior to the workshop and post- completed on Thursday of the week-long workshop—but also on the final questionnaire completed on Friday.

CORNERSTONE EVALUATION ASSOCIATES LLC

HEA-Heliophysics Educator Ambassador Workshop—Anchorage, AK June 2009
Preliminary Questionnaire Analysis—Quantitative Data

A summary of the mean ratings for each day as well as changes from pre- to post (T2-T1), post to final (T3-T2) and pre- to final (T3-T1) is presented in the final table below. It is noteworthy that not only did the mean ratings increase 1.94 points from the pre- to the post- assessment, but also with an additional day of planning their own workshops and interacting with one another, the teachers gained even more confidence in their abilities to present the materials to fellow teachers as evidenced by a 2.16 increase from pre-assessment to the end of the workshop.

Rating Scale for Preparation to Teach Other Teachers

- 1=Not prepared at all
- 2=Minimally prepared
- 3=Moderately prepared
- 4=Well prepared
- 5=Exceptionally well prepared

PREPARED TO TEACH OTHER TEACHERS						
AREAS TO TEACH	ASSESSMENTS			CHANGE		
	T1 (N=28)	T2 (N=28)	T3 (N=30)	T2-T1	T3-T2	T3-T1
Different boundaries in the Solar System	1.64	3.61	4.00	1.96	0.39	2.36
The Sun's Output	1.96	4.04	4.17	2.08	0.13	2.21
Changing forms of energy in the heliosphere or solar system	1.96	3.71	3.83	1.75	0.12	1.87
Space-based tools to study the Sun and its effects	1.79	3.82	4.03	2.03	0.21	2.24
Importance of Earth's magnetic field to sustain life	2.21	4.18	4.47	1.97	0.29	2.24
Relationships between solar radiation, atmosphere and climate	2.18	4.07	4.23	1.89	0.16	2.05
Total Average Means	1.96	3.90	4.12	1.94	0.22	2.16

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