Program Development Grant Final Report Cover Sheet

DR# 115

Project Title: Females Understanding Solar Energy (FUSE) **Date:** November 6, 2001

Project Manager: Michele Mingoia & Betty Preece **Section:** Central Florida (D11)

Email: mmingoia@cfl.rr.com/bp@snez.net **Phone:** (407) 365-2410

Deliverables: Indicate type (i.e. document, web page, brochure, etc.), title, and media (hard copy, email file, disk, etc.)

Forms and working documents: Application, letter of acceptance, letter no accepted, Participant's permission, health & release forms, Acknowledgement of bus transportation and stops by parent, Bus pickup locations and girls, Schedule of events, Evaluation.

Media: Press release (one) not printed; call to TV Channel 13 local news brought cameraman and 3-4 min repeated clip several times on local evening newscasts. **Photos**-- photos available as prints, slides, negatives and on disk

Other: Exhibit board with photos of activities and solar car races prepared and presented to over 100 teachers as part of Florida Science Teachers Association field trip to Florida Solar Energy Center and to nearly 70 engineers and engineering students of ASME, AIAA, IEEE at same location on same day Thursday 18 Oct 2001 (photos taken but not yet developed). Thank you notes from girls (hardcopy).

Select the one primary Strategic Priorty this project addressed:

•• Leadership √Education •• Diversity •• Visibility •• Vitality

SWE Committees to which this report and deliverables would be of interest:

√ Career Guidance •• Public Relations √ Multi Cultural Committee
•• Continuing Devel. •• Publications •• Other: _____
•• Membership

Project Audience (age, sex, diversity) Female: _√_____ Male: _____

Age Group	*No. Actual/Proposed*	*Diversity*	*No. Actual/Proposed*
√ Elementary	48/25	• Caucasian	/
• Middle School	/	• African American	/
• High School	/	• Hispanic	5/
• College	/	• American Indian	/
• Professional	/	• Pacific Islander	3/
• Other _____	/	• Asian	/
		• Other __Multi_____	2/
			1/

Contact Hrs: 35 per attendee

GIRLS WITH DISABILITIES 11

SWE Volunteers (No.) **1 full time 2 part time** **Estimated Total Hours: 42**

Non-SWE Volunteers (No.) 5 **Estimated Total Hours: 4**

Other women participants besides FUSE coordinators--2 women engineers from Florida Solar Energy Center, 1 woman from 45 Civil Engineering Sqdrn, Florida Director of High School/High Tech, and an engineering student from Florida Tech. Some SWE CG materials were provided by the SWE Career Guidance speaker.

Amount of Grant: $9372 Total Final Expenses: $9372 Amount SWE Owes You: $ 937.20

-or-

Amount You Owe SWE: _____

Executive Summary: A short summary of what the Project was and what it accomplished.

Females Understanding Solar Energy (FUSE) was a one-week summer day camp at the Florida Solar Energy Center in June 18-22, 2001 for 49 rising 5th and 6th grade girls. The program was targeted to girls with disabilities, minorities, and disadvantaged. The purpose of FUSE was to expose girls to technical subjects and situations where they would interact with women engineers and scientists.

Field trips were to Education Station at NASA Kennedy Space Center, KSC Visitor Center and 3-D movie, BCC Planetarium, a scavenger hunt on the BCC computers, a trip on the Indian River Lagoon on a solar powered boat to carry out environmental investigations, and the Astronaut Hall of Fame. Teams of 4 girls built each car from the Florida Solar Energy Center kits and then had races to determine the best cars. For all the girls, this was the high point of the week. A photo was taken of each team with its car and a copy of her team and car and sent to each girl.

At the end of the week, the girls will have been exposed to workplace accomplishments of women engineers and scientists, encouraged to consider such careers for themselves, and made aware of the value of science in everyday life. Evaluations were completed by the girls that give highest possible marks to just about everything.

Recognition of SWE and the Donor

Females Understanding Solar Energy (FUSE) was funded primarily by a grant from the Society of Women Engineers and the ExxonMobil Foundation Fund. In addition, the Florida Solar Energy Center provided location, womanpower, expertise, and materials at or below cost.

Narrative Description, including program goals, schedule, program conduct and content.

PROGRAM GOALS

1--Experience using scientific method to solve problems Scientific method was described to girls and they were encouraged to use it in their projects. They used teams to work on most activities such as car building, computer scavenger hunt, using photovoltaic cells, etc.

2--Daily participation in field trips, activities and fun--over the week there were only 2 girls absent, each on one day. There was enthusiastic participation as if they were afraid they might miss something--no one ever "sat out" anything.. We never needed to encourage them to take part in anything.

3--Complete team project to present to group. Every team built a car that ran in the races. They also completed the computer scavenger hunt, cooking food, for examples.

4--Gain basic understanding of solar energy and impact on environment. Testing the PV cells, racing the cars, cooking food, using hot water in the rest room all showed ways that solar energy can be used. they understood that alignment with the sun produced the most energy. Discussions by FSEC staff and engineers helped them know more about solar energy being "friendly" to the environment. Some of these forms were available for inspection.

5--Communication skills, teamwork, computer operation, problem solving. Writing daily in their journals and making verbal reports to the staff were encouraged. All teams completed the computer scavenger hunt, some teams helping others. Much problem solving took place in building and getting cars to run. Explanations to other teams and team members help understanding. Many friendships were formed that continued afterward.

6-- Interaction with women engineers and scientists to gain knowledge about careers. See the Evaluation tabulation for this detail but every girl indicated that she had learned about SMET careers and women and minorities in them. SWE member and women scientists and engineers from FSEC all told about their careers and how they got where they are.

SCHEDULE: See deliverable materials (appendix)
The schedule contains all the activities in detail.

PROGRAM CONTENT SUMMARY:
Journal writing daily and keeping handout information together in journal folder; game to identify careers for women in SMET followed by career information; visit to Kennedy Space Center where we had a special meeting with Astronaut Story Musgrave who signed autographs and had photos with us; visit to the Education Station at KSC for demos on space and hands-on space activities followed by lunch and the IMAX theater on City in Space; solar PV cell experiments; computer scavenger hunt for information on solar energy and solar cars. making UV beads into a bracelet; visit to planetarium hands-on solar activities including charting

movement of sun spots followed by shows on Seasons and Amazing Universe; making sun dial and charting sun motion over a day; cooking lunch over solar cookers; visit to Astronaut Hall of Fame; ride in solar powered boat to do marine biology experiments.; building and racing the Solar Sprint cars.

Measured results (number and mix of attendees, surveys, other measures of impact, etc.) including comparisons to prior data or prior expectations, what constitutes success, use charts where appropriate.

SURVEY

A survey was taken of participants to determine their opinion of the experience. Results follow:

Grade when school starts in fall 5th = 25, 6th = 23

51 girls accepted into camp, 48 participated

Ethnic--see above

Parent occupation (not all students answered these questions)

FATHER

computer/graphics =3, construction = 5, firefighter/police = sales=3, electronics technician = 2, auto/transportation mechanic = 44 , skilled construction trades = 3, designer/engineer = 5, remainder 1 each: self, with animals, military, student at 2 yr college, department chair, photographer, "shief" [?:chef.]

MOTHER

homemaker = 8. sales = 3. seamstress = 2. babusotter = 2. nurse = 3, teacher (including aide and substitute) = 4, computer = 2, services = 2 , remainder 1 each: sales, secretary, police, bus driver, bartender, animals, makes windows

Relative/friend is engineer or scientist: father = 6, mother = 2, uncle = 6, aunt = 1, grandparent = 4, friend = 5 (note that this does not agree too well with above parent occupations)

QUESTIONS 1 = low, 4 = high

Q#1--The presentations helped me learn about careers in science, engineering

1=2, 2=1, 3 = 22, 4 = 23

Q#2--Presentations helped me learn about preparing for a career in science and engineering

1 = 0, 2= 5, 3= 21, 4 = 22

Q#3--I learned about opportunities for women and minorities in science and engineering

1= 0, 2 = 4, 3 = 17, 4 = 24

Q#4--I learned about how science and engineering are used in everyday life

1 = 0, 2 = 6, 3 = 6, 4 = 34

Q#5--I met an engineer, scientist or engineering student

Yes = 45 no = 2

Q#6--I learned some new things about solar energy

Yes =46 No = 2

Q#7--What was the most valuable thing you learned?

how to build (and race) solar car = 19, how Photovoltaic cell works = 7, science to use in school = 4, other solar uses(heating, cars, cooking) = 4, work as team = 2, everything = 2, remainder 1 each: things to remember, H makes good fuel, solar energy saves money, stars are born and die

Q#8--How will you use this in your life or class?

My favorite of them all__When I came I did not know what I wanted to be but now I know millions of things!

Remember/use in future when I grow up, many ways = 5, science fair project = 3, want to be scientist/engineer/astronaut = 4, become marine "byruoegoust", in classroom = 6, how to build (other) solar things = 6, do team projects = 2, learn more about solar energy = 3, help make cleaner air, save money, no "glue" (clue?)

Publicity or other public attention. (Attach copies of press clippings, list of dates and stations of TV radio publicity with short description.)

See appendix

Description of deliverables. If not included in this file, describe format, title, etc. (i.e. a video titled "xyz" or a series of web pages at http://www….)

See page 1.

Lessons learned, problems encountered and future plans (what you would do differently if you did this again.) If the project design you followed differed significantly from the original plan describe the nature of and the reasons for the changes.

SUCCESSES

The most common question from the girls was: Can we come back next week or Can we come back next year? The fact that every car ran and every project whether team or individual was completed indicates the girls did learn the basic goals of this program. They were able to talk to staff and ask good questions indicated they had acquired at least a basic understanding of solar energy and SMET careers.

Be flexible was the most important action all weeks--Shuttle launch schedule, weather, inability by some field trip sites to have us on the previously agreed day or time all happened. We had planned ahead for some such changes and that was useful.

The most critical items for success of this project were:

- The Florida Solar Energy Center facility and the two project coordinators Susan Schleith and Penny Hill. We were welcomed into the FSEC and Susan and Penny were obviously well qualified to carry out such a project. To be successful in a similar project, you must have the cooperation and participation of such a facility and talented staff.
- Providing bus transportation made it possible for 35 of the 48 girls to take part. We had a bus from the north end and another from the south end plus van pickup in the central county. Brevard County is 70 miles long. Some girls traveled 40 miles each way each day on the bus just to come--with joy and no complaints--and a few were brought by a parent another 5 miles each way just so they could come from a migrant worker community.
- Providing arrival, midmorning and mid-afternoon snacks helped us make sure that all girls were getting nutrition while with us. Providing lunch made sure everyone ate the same. Some of our girls may not have had breakfast before coming because of family circumstances

This was one of the most rewarding activities in which I have ever participated--I felt it really DID make a difference in these girls. At the end of the week, you will be exhausted but exhilarated and the girls will be begging for more! [Betty Preece]

LESSONS LEARNED

Announcement of grant was received from SWE on March 12, 2001, however, the check was not received until well into June. This delayed the start of materials acquisition and put the last part of the planning process into a crunch. It was also not clear where the check would be sent (grant program manager, section treasurer, section president, etc.). The expectations on timing for the receipts of the funds should be clearer in the SWE grant application materials.

Labor effort provided by FSEC staff exceeded budget by a considerable amount, however, the staff donated their time over that budgeted. Overhead charges by FSEC were not discussed in early arrangements and were not accounted for in the original budget, however, FSEC donation of project materials offset this charge allowing us to stay within budget.

We would have liked to have had more time to advertise it in advance of registration but maybe the short lead time was good as we got 125 applications for 25 spots in barely a week.

More participation by SWE members and other women engineers and scientists would have given the girls more exposure. Several SWE volunteers who said they would come did not show up.

Teaching girls correct way to use all tools and supervision would have improved more skills with tools. More time would be needed for this activity.

The scientific method could have been made more prominent but the girls were eager to get started.

Final bills came in slowly after the event. It would have been advantageous to have assigned a treasurer for the activity.

BE VERY FLEXIBLE AND MAKE PLANS FOR ANY FORSEEN HITCHES AND MAYBE SOME YOU CAN'T FORESEE.

Finances, include all funding sources for income and expenses and show amount paid by the Grant and the balance due.

See attached spreadsheet

Appendices:

Deliverable items listed above will follow in hardcopy

Budget Category	Budget Sub Category	Proposal Category Subtotal	Proposal Amount	Budget Replan #2 (6/18/2001)	Actual	Budget variance	Hours reported
Personnel Costs		**$2,072**					
	FSEC Coordinator		$1,400	$1,062	$1,061.50	$0.00	50
	FSEC Asst. Coord		$672	$2,176	$2,175.60	$0.00	168
	SWE Project Co-Managers		$0	$0	$0.00	$0.00	
	Camp counselors		$0	$0	$0.00	$0.00	
Facilities usage/overhead from FSEC		**$0**	$0	$479.21	$479.21	$0.00	
Materials		**$850**					
	Journals, portfolios, pens, etc		$250	$510		$476.38	
	Office Supplies from FSEC stock				$11.56		
	Wal Mart (journals)				$22.06		
	Jr Solar Sprint car kits		$100	$0	$0.00	$0.00	
	Other project materials		$250	$510		$475.98	
	Wal Mart (paper products & brushes)				$6.80		
	Home Depot				$7.81		
	Crafts & Stuff (extension cord)				$3.70		
	Home Depot (6/18) (drill bits)				$4.56		
	Home Depot (6/18)				$11.15		
Office supplies	Copies - registration materials			$250	$250.00	$0.00	
	Postage - registration materials			$50	$50.00	$0.00	
	Mailers - registration materials			$180	$180.00	$0.00	
	Books & printed materials		$250	$0	$0.00	$0.00	
Admission fees	Solar boat trip includes AHFame			$882	$882.00	$0.00	
	Planetarium			$162	$153.00	$9.00	
Follow up activities	Photo processing, mailing, follow up activities with students				**$717.29**	($717.29)	
Food		**$1,375**					
	Snacks & drinks		$625	$0	$0.00	$0.00	
	Lunches		$750	$0	$0.00	$0.00	

Budget Category	Budget Sub Category	Proposal Category Subtotal	Proposal Amount	Budget Replan #2 (6/18/2001)	Actual	Budget variance	Hours reported
	Lunches, snacks & drinks via FSEC			$1,075	$1,075.00	$0.00	
	Cash expense for lunches (M&F)			$300		$37.49	
	KFC (Monday lunch) 6/18				$111.04		
	Bagel World 6/17				$24.50		
	Papa John Pizza 6/21				$84.20		
	Publix Grocery 6/19				$5.98		
	Bread Store 6/21				$11.16		
	Publix Grocery 6/20				$3.99		
	Publix Grocery 6/22				$21.64		
Transportation		**$1,875**					
	Accessible bus/vans for pick up/return FSEC-home & daily field trips		$1,500	$0	$0.00	$0.00	
	Accessible bus/vans for pick up/return FSEC-home		$375	$0	$0.00	$0.00	
	Bus transportation (non accessible)			$1,491	$1,645.75	($154.75)	
	Bus transportation bill #2				$122.50	($122.50)	
	Parent to bring students to/from bus				$50.00	($50.00)	
SWE Section Administrative Costs		**$200**	$200	$200	$200.00	$0.00	
Subtotal		**$6,372**					
Accommodations for students with disabilities	(variable depending on needs of participants)	**$3,000**	$3,000	$0	$0.00	$0.00	
	Sign language interpreter			0	$0.00	$0.00	
	Personal assistant (may be counselor)			0	$0.00	$0.00	
	Materials in alternative forms			0	$0.00	$0.00	
Subtotal		**$3,000**					
Total		**$9,372**		**$9,326**	**$9,372.00**	($45.69)	

Initial check (90%)	**$8,434.80**	**$9,372**	**$9,372.00**	<<<<<<<<	**INCOME**
When final report is submitted	**$937.20**	**$46**	**$0.00**	<<<<<<<<	**BAL TO SPEND**

# girls planned	**25**
# girls invited	**51**

Budget Category	Budget Sub Category	Proposal Category Subtotal	Proposal Amount	Budget Replan #2 (6/18/2001)	Actual	Budget variance	Hours reported
# girls actually attending	**48**						

Cash expenses		changes	Receipts verified
from $300	$330.15		Detail level

Budget Category	Budget Sub Category	Fixed costs	Variable per girl	$ going to FSEC	Paid	Check amount	Proposal Basis
Personnel Costs							
	FSEC Coordinator	$1,400		$1,400	CK 181	$5,272	$25/hr/8hrsx7 days
	FSEC Asst. Coord	$672		$672	CK 181		$12/hr/8hrsx7 days
	SWE Project Co-Managers	$0					volunteers
	Camp counselors	$0					volunteers
Facilities usage/overhead from FSEC		$337.20		$337.20	CK 181		**donated**
Materials							
	Journals, portfolios, pens, etc		$10				$10ea x 25girls
	Office Supplies from FSEC stock						
	Wal Mart (journals)						
	Jr Solar Sprint car kits		$0				5 kits x $20
	Other project materials		$10				$10ea x 25 girls
	Wal Mart (paper products & brushes)						
	Home Depot						
	Crafts & Stuff (extension cord)						
	Home Depot (6/18) (drill bits)						
	Home Depot (6/18)						
Office supplies	Copies - registration materials				CK 181		
	Postage - registration materials				CK 181		
	Mailers - registration materials				CK 181		
	Books & printed materials		$10				for girls & staff
Admission fees	Solar boat trip includes AHFame		$18		CK 178	$882	
	Planetarium		$3		CK 179	$153	
Follow up activities	Photo processing, mailing, follow up activities with students						
Food							
	Snacks & drinks		$25	$600			$5/girl/day x 25 girls x 5 days
	Lunches	$125	$25	$700			$5ea/day x (30girls + staff) x 5 days

Budget Category	Budget Sub Category	Fixed costs	Variable per girl	$ going to FSEC	Paid	Check amount	Proposal Basis
	Lunches, snacks & drinks via FSEC	$22	$23.00		CK 181		
	Cash expense for lunches (M&F)				CK 180/cash	$300	
	KFC (Monday lunch) 6/18						
	Bagel World 6/17						
	Papa John Pizza 6/21						
	Publix Grocery 6/19						
	Bread Store 6/21						
	Publix Grocery 6/20						
	Publix Grocery 6/22						
Transportation			101				
	Accessible bus/vans for pick up/return FSEC-home & daily field trips	$1,500					$300/day x 5 days
	Accessible bus/vans for pick up/return FSEC-home	$375					$75/day x 5 days
	Bus transportation (non accessible)				CK 182	$1,645.75	
	Bus transportation bill #2						
	Parent to bring students to/from bus						
SWE Section Administrative Costs		$200				$200	
Subtotal		**$4,632**	**$2,525**	**$3,709**			
Accommodations for students with disabilities	(variable depending on needs of participants)	$2,763					
	Sign language interpreter						$25/hr/8hrsx5 days = $1000 per student
	Personal assistant (may be counselor)						$10/hrx10hrs/day x 5 days = $500 per student
	Materials in alternative forms						$100
Subtotal							
Total			**$9,919**	**$3,709**		**$8,453**	

Initial check (90%)	
When final report is submitted	

BAL to DISBURSE	$919	FSEC %age is on>>>

# girls planned	**25**
# girls invited	**51**

Budget Category	Budget Sub Category	Fixed costs	Variable per girl	$ going to FSEC	Paid	Check amount	Proposal Basis
# girls actually attending	**48**						

Cash expenses	
from $300	$330.15

Budget Category	Budget Sub Category	Notes
Personnel Costs		
	FSEC Coordinator	actual $21.23/hour
	FSEC Asst. Coord	actual $12.95/hour
	SWE Project Co-Managers	
	Camp counselors	
Facilities usage/overhead from FSEC		10% of $ going to FSEC
Materials		
	Journals, portfolios, pens, etc	Accopress folders and notebook paper
	Office Supplies from FSEC stock	
	Wal Mart (journals)	
	Jr Solar Sprint car kits	Will be donated bu FSEC. Actual cost would be $50 ea
	Other project materials	
	Wal Mart (paper products & brushes)	
	Home Depot	
	Crafts & Stuff (extension cord)	
	Home Depot (6/18) (drill bits)	
	Home Depot (6/18)	
Office supplies	Copies - registration materials	Check 1 to FSEC
	Postage - registration materials	Check 1 to FSEC
	Mailers - registration materials	Check 1 to FSEC
	Books & printed materials	
Admission fees	Solar boat trip includes AHFame	Make check to Nature Tours
	Planetarium	Make check to Brevard Community College
Follow up activities	Photo processing, mailing, follow up activities with students	
Food		
	Snacks & drinks	Adjusted to match FSEC form.
	Lunches	Adjusted to match FSEC form.

Budget Category	Budget Sub Category	Notes
	Lunches, snacks & drinks via FSEC	Check 1 to FSEC
	Cash expense for lunches (M&F)	Cash
	KFC (Monday lunch) 6/18	
	Bagel World 6/17	
	Papa John Pizza 6/21	
	Publix Grocery 6/19	
	Bread Store 6/21	
	Publix Grocery 6/20	
	Publix Grocery 6/22	
Transportation		
	Accessible bus/vans for pick up/return FSEC-home & daily field trips	
	Accessible bus/vans for pick up/return FSEC-home	
	Bus transportation (non accessible)	
	Bus transportation bill #2	
	Parent to bring students to/from bus	
SWE Section Administrative Costs		
Subtotal		
Accommodations for students with disabilities	(variable depending on needs of participants)	Adjusted to cover FSEC ohead.
	Sign language interpreter	
	Personal assistant (may be counselor)	
	Materials in alternative forms	
Subtotal		
Total		

Initial check (90%)		
When final report is submitted		$1,712.70

# girls planned	**25**
# girls invited	**51**

Budget Category	Budget Sub Category	Notes
# girls actually attending	**48**	

Cash expenses	
from $300	$330.15

FORMS

Sign In Sheet

Name	Monday	Tuesday	Wednesday	Thursday	Friday
Adams, Lindsay					
Allen, Elaina					
Argo, Shaara					
Back, Emily					
Bentley, Melanie					
Brown, Tiffany					
Brown-Wiggin, Alexandra					
Burns, Ashley					
Burns, Kelsey					
Busacca, Taylor					
Calderon, Gabriela					

Name	Monday	Tuesday	Wednesday	Thursday	Friday
Comer, Emily					
Cox, Carly					
Cruce, Meagan					
Denton, Lindsey					
Duvall, Christina					
Engle, Jessica					
Fox, Ruth					
Frantzen, Tia					
Garcia, Jessica					
Garcia, Rosa					
Grenier, Kayla					
Juduh, Kristina					

Name	Monday	Tuesday	Wednesday	Thursday	Friday
Keener, Beth					
Key, Monica					
Lester, Kaley					
Letts, Ariel					
Martin, Ashley					
Miller, Jessica					
Miller, Stephanie					
Minthorn, Lindsay					
Nelson, Taneisha					
O’Connor, Kristina					
Ottaviani, Kyrie					
Patel, Nikita					

Name	Monday	Tuesday	Wednesday	Thursday	Friday
Prasse, Stephanie					
Rymer, Ginger					
Samash, Kathryn Anne					
Scates, Christy					
Sharlock, Nora					
Stevens, Ashley					
Sullivan, Melissa					
Sweet, Montana					
Thomas, Charlene					
Tucker, Brittany					
Turner, Torrie					
Winkler, Ursula					
Wood, Ginnie					

Name	Monday	Tuesday	Wednesday	Thursday	Friday
Znoj, Allyce					
Znoj, Elizabeth					

Submarine Sandwich Order Form
for Friday's lunch

Name: _____

I would like: _____ white sub roll
_____ wheat sub roll

The type of sandwich I would like:

_____ Roast Beef, Ham, Bologna, American Cheese

_____ Bologna, Salami, Ham, Swiss Cheese

_____ Ham, Capacola, Salami, Provolone Cheese

_____ Roast Beef, Ham, Turkey, Swiss Cheese

Submarine Sandwich Order Form
for Friday's lunch

Name: _____

I would like: _____ white sub roll
_____ wheat sub roll

The type of sandwich I would like:

_____ Roast Beef, Ham, Bologna, American Cheese

_____ Bologna, Salami, Ham, Swiss Cheese

_____ Ham, Capacola, Salami, Provolone Cheese

_____ Roast Beef, Ham, Turkey, Swiss Cheese

Submarine Sandwich Order Form
for Friday's lunch

Name: _____

I would like: _____ white sub roll
_____ wheat sub roll

The type of sandwich I would like:

_____ Roast Beef, Ham, Bologna, American Cheese

_____ Bologna, Salami, Ham, Swiss Cheese

_____ Ham, Capacola, Salami, Provolone Cheese

_____ Roast Beef, Ham, Turkey, Swiss Cheese

Submarine Sandwich Order Form
for Friday's lunch

Name: _____

I would like: _____ white sub roll
_____ wheat sub roll

The type of sandwich I would like:

_____ Roast Beef, Ham, Bologna, American Cheese

_____ Bologna, Salami, Ham, Swiss Cheese

_____ Ham, Capacola, Salami, Provolone Cheese

_____ Roast Beef, Ham, Turkey, Swiss Cheese

Bring this (signed) form with you on the bus to FUSE camp on Monday

Acknowledgment of Bus Transportation

I acknowledge that my daughter, _____ will be riding a privately chartered bus from her bus 'stop' at _____ . I realize that the bus is unable to wait for her to arrive in the morning, and that the bus will drop her off at this stop regardless of whether I am present or not.

_____
Parent signature

Bring this (signed) form with you on the bus to FUSE camp on Monday

Acknowledgment of Bus Transportation

I acknowledge that my daughter, _____ will be riding a privately chartered bus from her bus 'stop' at _____ . I realize that the bus is unable to wait for her to arrive in the morning, and that the bus will drop her off at this stop regardless of whether I am present or not.

_____
Parent signature

May 1, 2001

Dear Principal

The Central Florida Chapter of the Society of Women Engineers in cooperation with the Florida Solar Energy Center has received funding from the ExxonMobil Corporation to do a science and mathematics summer camp for girls who completed the fourth or fifth grade in May 2001.

The camp will run from June 18 to June 22, from 9:00 a.m. to 3:30 p.m. and will be housed at the Florida Solar Energy Center in Cocoa. The purpose of the camp is to provide girls with a safe and nurturing environment in which to explore science and mathematics concepts through hands-on experiences, field trips and interactions with women scientists and engineers.

There is no charge for the camp and lunch will be provided each day. We ask that you distribute these flyers to fourth and fifth grade girls at your school. Space is limited to 25 students. If you have any questions, please call Susan Schleith at 638-1017 or Penny Hall at 638-1018.

Sincerely,

Susan T. Schleith
Florida Solar Energy Center

Cc Ed Short, Elementary Science Specialist
Brevard County Public Schools
Ginger Davis, Secondary Science Specialist
Brevard County Public Schools

SCHEDULES

Planned Schedule for FUSE Camp

Day:	Monday	Tuesday	Wednesday	Thursday	Friday
Destination:	FSEC	NASA	Planetarium	FSEC	Lagoon Boat ride & AHF
Our Objective(s):	Establish teams, procedures, goals for the week	Exposure to various careers in Space Industry	Background on Sun		
Student Objectives:	Demonstrate process and procedure for solar thermal and solar electric experiment	Identify careers held by women in Space Program		Complete & race vehicles	
Activities:	Perform solar experiments Draw initial design for solar vehicle High School/High Tech (1:00) Visit Library	Select a career and chart education course to achieve it.	Movie at Planetarium & show	JSS Race	
Materials:	Solar Thermal trays, thermometers, PV cells, motors, propellers,	Journals		JSS Track	
Lunch:	Hot dogs in cookers Rice Mix Potato Chips	Box Lunches or Kentucky Fried Chicken	Kay's Barbeque or Burger King	Submarine sandwiches Potato chips	Pizza Drinks

ACTUAL Schedule for FUSE Camp

Day:	Monday	Tuesday	Wednesday	Thursday	Friday
Destination:	NASA	FSEC & Library	Planetarium & FSEC	FSEC	Lagoon Boat ride & AHF
Our Objective(s):	Exposure to various careers in Space Industry	Establish teams, procedures, goals for the week, PV basic information	Background on Sun, physics and physical properties, solar thermal basic information	PV in motion!!	Exposure to various PV applications in space and on land
Student Objectives:	Identify careers held by women in Space Program, learn about the different technologies	Conduct solar electric experiments, research basic car dynamics/physics . Begin vehicle design process	Learn about the physics and dynamics of our sun; sun tracking, conduct solar thermal experiments	Complete & race vehicles; See their designs perform	Learn about various PV applications on land and space; learn about astronauts and conditions in space
Student Challenge Activity:	Career Investigation - Select a career and chart education course to achieve it.	Internet scavenger hunt leading to designing the car; visioning	How do we really know the earth rotates?	Build a car that will complete the track	Brainstorm and list PV Applications in space and on land

Activities:	**9:00-9:30** Intro activity (name bingo)	**9:00-9:30** Intro activity (Way Cool Fuels video)	**9:00** Sundial model **9:30-12:00**	**9:00-9:30** Intro activity (Race the Sun video)	**9:00-9:30** Intro activity (evaluations)

	9:30 SWE presentation **10:30-3:00** NASA Talk with various female engineers and scientists IMAX "L5, City in Space" Meet an Astronaut Visit Memorial Mirror and mock Shuttle**Lunch** - Journaling	**9:30-10:00** JSS video & explanation **10:15-11:15** & **11:15-12:15** Hands-on PV activities, UV beads, Tour of FSEC (flip/flop w/) Library research **12:15** Lunch **1:00-1:30** HighSchool/High Tech presentation **1:30-3:15** Car design **3:15-3:30** Journals	Planetarium "Seasons" movie "Amazing Universe" planetarium show Heliostat; sketching sunspots Sundial **12:15-1:00** Cooking & solar thermal experiments **1:00-3:00** Car building	**9:30-12:00** Finish car, test and revamp **12:00** Pizza party **1:00-2:30** JSS Race **2:30-3:30** Race discussion, FSEC Engineers, Thank you cards, PV Power Point	**10:30-12:00** Solar boat trip - water testing, wildlife, view launch sites (optional: spider island) **1:00-2:45** AHF: Space exhibits, interactive simulation equipment
Materials:	Journals	PV cells, motors, propellers, Journals, UV Beads, Car building materials	Journals Car building materials, Solar Thermal trays, thermometers,	Car building materials JSS Track, Journals	Journals
Snacks:	**Morning:** Bagels, Juice Water as needed	**Morning:** Bag mini donuts, Juice **Afternoon:** Fruit,	**Morning:** Bagels, Juice **Afternoon:** Cookies,	**Morning:** Bag mini donuts, Juice **Afternoon:** Fruit,	**Morning:** Bagels, Juice Water as needed

		Soda, Pretzels Water as needed	Soda, Chips Water as needed	Soda, Pretzels Water as needed	
Lunch:	**Pick Up 11:15** **PSJ** Kentucky Fried Chicken, Chips, Watermelon Drinks (cans) Cookies	**Pick Up 12:05** Kay's Barbeque Drinks	Hot dogs in cookers Rice Mix Potato Chips Drinks	Pizza Drinks S'mores	Sub sandwiches Potato chips Cookies Drinks (cans)
Take Homes:	Dr. Art's book	UV Beads	Sundial	Participant Ribbon	Panel, Motors & Propellers

EVALUATION OF FUSE
JUNE 22, 2001, FLORIDA SOLAR ENERGY CENTER

Please help us evaluate how this FUSE program met your expectations.

I am a _____Student Grade_____ when school starts in fall

My ethnic background is ____African American _____Asian American
_____ Native American _____Pacific Islander
_____White/Caucasian_____Mixed_____

My father's occupation_____
My mother's occupation_____

This relative of mine is an engineer or scientist (circle all that apply) mother, father, sister, brother, aunt, uncle, grandparent, cousin or friend

PLEASE CIRCLE THE NUMBER THAN CORRESPONDS WITH YOUR RESPONSE TO THE FOLLOWING. (1 is low and 4 is high)

1. SESSIONS-- The presentations helped me learn about careers in science, engineering
1 2 3 4

2. SESSIONS-- Presentations helped me learn about preparing for
a career in science/math/ engineering 1 2 3 4

3. I learned about opportunities for women and minorities in science and engineering
1 2 3 4

4. I learned about how science, math and engineering are used in everyday life. 1 2 3 4

5. I met an engineer, scientist or engineering student. yes___ no___
6. I learned some new things about solar energy. yes___no___
7.What was the most valuable thing you learned?

8.How will you use this in your life or in your class/lab?

THANK YOU FOR RESPONDING TO THIS EVALUATION!
THANK YOU FOR COMING TO HAVE FUN WITH SCIENTISTS AND ENGINEERS!
THANK YOU FOR COMING TO LEARN ABOUT SOLAR ENERGY!

ACTIVITIES
AND
WORKSHOPS

Find someone who 'fits' in the boxes below. Write their name in the box. Try and get 'bingo' with 5 across, down or diagonal.

Someone with a solar pool heater Name:	Someone who knows what car pooling is Name:	Someone who can name one female astronaut Name:	Someone who rides their bike to school Name:	Someone who knows what solar thermal means Name:
Someone whose parents car pool to work Name	Someone who knows which day of the week has a 'solar' name Name:	Someone who's mother works at the Space Center Name:	Someone who knows what a sundial is Name:	Someone who knows what a renewable resource is Name:
Someone who has cooked in a solar oven before Name:	Someone who knows what F.U.S.E. stands for Name:	**FREE SPACE**	Someone who knows what ultra violet radiation is Name:	Someone who knows what a planetarium is Name:
Someone who knows what ozone depletion is Name	Someone who has been to the Florida Solar Energy Center before Name:	Someone who walks to school Name:	Someone who loves science class Name:	Someone who has done a project in a team before Name:
Someone who is excited to be here Name:	Someone who has done an experiment for science fair Name:	Someone who has something solar powered at home (like a calculator) Name:	Someone who knows what global warming is Name:	Someone who knows what Photovoltaic means Name:

Internet Scavenger Hunt

See how many of these websites you can locate.

Where would you find information on when next year's Junior Solar Sprint race in Florida is?

_____

At which website can you find the Junior Solar Sprint rules that are used in the Florida races?

_____

Which website will give you help on figuring out how friction and aerodynamics affect your car?

_____

Which website will give you help if you are having trouble with the steering of your car (it's not going forward in a straight line)?

_____

Which website will help you understand how a PV panel works?

_____

Which website has information that will help you maximize the output of your panel (so your car will go faster)?

_____

Angles and Meters Teacher Information

Curriculum Integration:
- Math

Objective: Students will:
- measure the energy output of their photovoltaic cell under varying conditions.

Vocabulary:
- multitester or DC meter: an instrument used to measure energy output
- photovoltaic (PV): the effect of producing electric current using light
  photo: light
  voltaic: producing direct electric current by chemical action

Background Information:
- Photovoltaic cells generate clean direct current electricity.

Materials:
- photovoltaic (PV) cell
- DC meter
- protractor
- *Angles and Meters* worksheet or graph paper
- reflectors (aluminum foil or mirrors)

Procedure:
1. Divide into teams of two to three students.
2. Provide each student with a copy of *Angles and Meters* worksheet or graph paper, 1 photovoltaic cell, 1 DC meter, protractor and reflectors.
3. Attach alligator clamps on the panel to the wires on the DC meter.
4. Connect the red clamp on the PV cell to the red clamp on the meter. Connect the black clamp on the PV cell to the black clamp on the meter.
5. Place PV cell in sunlight, read meter, and record reading.
6. Move PV cell to various angles, read meter, record.
7. Test cell at 0 degrees, 45 degrees 90 degrees and so on.
8. Place foil around cell and repeat tests.

Extension: Repeat test at different times of the day and the year.

Variables:
- angle of cell
- time of day/year
- use of reflectors
- use of filters

Assessment:

- Students read and record energy output.
- Students analyze and discuss findings.

Teacher Analysis:
In order to promote further student analyzing, questioning, and investigating, the following teacher questions and comments may be useful at the conclusion of any activities/investigations. These questions can be used for small/large group discussions, science log/journal entries, or as writing prompts.

- How do you feel about your results? Are they valid?
- Did you conduct a "Fair Test"?
- What, if anything, would you change to make your results more valid?
- Did you control you variables?
- Did your results cause you to think of more questions to explore?

Internet Links:
Electronics: An Online Guide for Beginners
http://hyperion.advanced.org/16497/home/index.html

Electrical Formulas
http://www.misslink.net/sfi/formulas.htm

Jr. Solar Sprint Web Page
http://www.nrel.gov/education/natjss.html

Name(s)_____
Date_____

Angles and Meters

Problem: Does the angle of the sun affect solar electricity produced?

Hypothesis: I think _____
(will happen)
because _____
_____
_____

Materials:
- PV (photovoltaic) cell
- DC (multitester) meter
- protractor

Procedure:
1. Attach the meter to the PV cell
2. Using the ground as a baseline, tilt the PV cell toward the sun.
3. Observe the needle on the meter.
4. Measure at least 5 different angles using the protractor.
5. Record your results.

Data/Results:

Beginning Time:_____ **Ending Time:**_____

angle_____	**meter**_____
angle_____	**meter**_____
angle_____	**meter**_____
angle_____	**meter**_____
angle_____	**meter**_____
angle_____	**meter**_____
angle_____	**meter**_____

1. What angle produced the highest reading? _____
2. Would the time of day affect the output of the PV cell? _____
3. Why or why not? _____

_____

4. What would happen if you connected more than one PV cell to one meter? (Test your hypothesis.)_____
_____
_____

Conclusion: My hypothesis was correct ( ) or incorrect ( ) because_____
_____
_____
_____
_____

Was this a **FAIR TEST**? _____ Why or why not?
_____
_____

Bead Magic Teacher Information

Curriculum Integration:
- Art
- Math
- Health

Objectives: Students will:
- observe beads.
- track the pattern of color change during *Solar Matters*.
- communicate process of UV rays causing beads to change color.

Vocabulary:
- ultraviolet light: invisible radiation or light just beyond violet in the visible spectrum

Background Information:
- Beads contain a pigment which will change color when they receive ultraviolet (UV) rays from the sun.
- Beads are not affected by visible light and will remain white while they are indoors or shielded from UV light.
- Beads will cycle back and forth (white to colors to white) over 50,000 times!
- Students should wear bracelets or have them available throughout the entire unit.

Materials:
- 5 beads, one of each color
- elastic cord or string
- data sheet, teacher's choice of format

Procedure:
1. String beads on elastic cord or string.
2. Wear bracelet in sunshine.
3. Record color change on data sheet.
4. Discuss results.
5. Collect data sheets and bracelets, or put aside to be used during remaining unit activities (optional).
6. Repeat steps 2,3, and 4 during other activities in *Solar Matters* (optional).
7. Observe beads in shade, artificial light (indoors).
8. Extension: test sunglasses and sunscreen for UV protection.

Assessments:
- Students follow directions.
- Students observe and record color change.

- Students communicate reasons for color change.
- Students compare and contrast reuslts.
- Students analyze effect of UV rays.

Teacher Analysis:
In order to promote further student analyzing, questioning, and investigating, the following teacher questions and comments may be useful at the conclusion of any activities/investigations. These questions can be used for small/large group discussions, science log/journal entries, or as writing prompts.

- How do you feel about your results? Are they valid?
- Did you conduct a "FAIR TEST"?
  - What, if anything, would you change to make your results more valid?
- Did you control your variables?
  - Did your results cause you to think of more questions to explore?

Internet Links:
Today's Space Weather
http://www.noaa.gov/wx.html
- Today's weather with satellite, radar and 3-D images, as well as solar images and space weather forecast.

What is Ultraviolet Light?
http://katipo.niwa.cri.nz/lauder/uvinfo.htm
- Explains what ultraviolet light is and how it is related to ozone depletion and human health.

What is the Electromagnetic Spectrum?
http://observe.ivv.nasa.gov/nasa/education/reference/emspec/emspectrum.html

World Ozone and Ultraviolet Radiation Data Centre (WOUDC)
http://www.msc-smc.ec.gc.ca/woudc/
- Ozone and UV Radiation data from 300 stations worldwide and an archive of data from 35 years.

“Solar System” Teacher Information

Curriculum Integration:
- Math

Objectives: Students will:
- attach solar cells to motors and activate the “solar system” using sunlight.
- simulate solar energy using “solar systems”

Vocabulary:
- load: a device to which power is delivered
- orientation: set in any definite position with reference to the points of the compass
- photovoltaic (PV): the effect of producing electric current using light
  photo: light
  voltaic: producing direct electric current by chemical action
- system: a group or combination of things or parts forming a complex or unified whole

Background Information:
- Photovoltaic cells (called PV or solar cells) are made of silicon (sand). The silicon is heated to extreme temperatures. It is doped with chemicals, usually boron and phosphorous. This sets up an unstable environment within the solar cell. When light strikes the cell, electrons are dislodged and travel along wires placed within the cell. The electrons follow the wire and power whatever load is attached, in this case a motor. This flow of electrons is called electricity.
- PV cells use light to produce electricity. Solar electricity is quiet, clean, and non-polluting.

Materials:
- PV cells
- Wire
- motors
- propellers

Variables:
- time of day
- outside conditions
- type of light

Procedure:
1. Discuss what a PV (solar) cell is made of and how it works.
2. Give each team of students a solar cell, motor and propeller.

3. Attach the propellers to the motors.
4. Attach the solar cell wires to the motor wires, red to red, black to black.
5. Take the “solar systems” outside and activate them in the sunlight.
6. Discuss results
    - What happens when the panel is turned over away from the light?
    - Observe the rotation of the propeller blades, which way are they turning?
    - What happens when the wires are attached red to black?
    - Does the angle of the cell in relation to the sun make a difference in how fast the propeller turns?
    - What would happen if several cells were hooked together?

Assessments:
- Students cooperatively follow directions.
- Students simulate solar energy by activating their “solar systems”

Teacher Analysis:
In order to promote further student analyzing, questioning, and investigating, the following teacher questions and comments may be useful at the conclusion of any activities/investigations. These questions can be used for small/large group discussions, science log/journal entries, or as writing prompts.
- How do you feel about your results? Are they valid?
- Did you conduct a “FAIR TEST”?
- What, if anything, would you change to make your results more valid?
- Did you control your variables?
- Did your results cause you to think of more questions to explore?

Internet Links:
About Photovoltaics
http://www.eren.doe.gov/pv/howworks.html
- Photovoltaics page explains how it works and includes a brief animation.

Online Renewable Energy Module
http://solstice.crest.org/renewables/re-kiosk/index.html
- Solar Energy page includes solar thermal, solar physics and photovoltaics.

Photoelectric Effect Simulator
http://webphysics.ph.msstate.edu/ccp/27-5
- Animation shows the photoelectric effect while manipulating several parameters.

The Sun’s Joules
http://solstice.crest.org/renewables/sj/index.html

Solar Dome
http://www.solardome.com
- Energy education resources including solar, alternative fuel vehicles, wind energy and environmental education.

US Department of Energy Photovoltaics Program
http://www.eren.doe.gov/pv/howworks.html

- Includes animations, video, and online quiz.

Florida Solar Energy Center (FSEC)
http://fsec.ucf.edu

Name(s)_____
Date_____

“Solar System”

Problem: Can sunlight turn a propeller?

Hypothesis: I think _____
(will happen)
because _____
_____
_____

Materials:
- photovoltaic cell (PV cell)
- propeller
- motor

Procedure:
1. Attach propeller to motor.
2. Attach red wire from motor to red wire on PV cell.
3. Attach black wire from motor to black wire on PV cell.
4. Place solar system in sunlight.

Data/Results:
1. What happens when the panel is turned over away from the light?
2. Observe the rotation of the propeller blades. Which way are they turning?
3. What happens to the propeller when the wires are attached red to black?
4. Does the angle of the cell in relation to the sun make a difference in how fast the propeller turns?
5. What would happen if several cells were hooked together?

Conclusion: My hypothesis was correct ( ) or incorrect ( )
because _____
_____

Was this a FAIR TEST? _____Why or why not?

_____

_____

What's Cooking Teacher Information

Curriculum Integration:

- Math
- Art
- Social Studies
- Geography

Objectives: Students will:

- construct solar cookers.
- heat food using solar cookers.

Vocabulary:

- absorption: the process of light energy changing into heat energy occurring when light falls on an object and is taken into it
- conduction: movement of heat or cold through materials that are solid
- convection: movement of heat through air or in liquids
- radiation: the process of emitting energy in the form of waves or particles (sunlight is solar radiation)
- glazing: the clear material (usually glass or clear plastic wrap) that lets in light and traps heat
- greenhouse effect: trapping of heat resulting in higher ambient temperatures
- reflector: shiny device used to alter the path of light in different
- transmission: movement of particles through something
- insulation: material used to reduce heat loss or gain

Background Information:

- A solar cooker is a solar collector. It "collects" and traps the sun's energy, creating heat. For example, imagine it is a sunny day and you have parked your car, rolled the windows up and left it for several hours. The car becomes a collector; letting in the sun's energy. This heat energy becomes trapped. As more light enters the car, the hotter it gets.
- Solar ovens are improving the quality of life for many people around the world. Solar ovens have been introduced in South America, Africa and India. In Africa, it is typical for a woman to spend nearly half her workday looking for and collecting firewood. Respiratory problems in children have been linked to fumes created by the burning of this poor quality wood. Solar ovens have reduced the need for firewood. Some women have turned their talents for building cookers into businesses, building and selling cookers for added income.
- There are many types of and ways to build solar cookers. Each cooker must have 3 elements or components:
    - Glazing to allow heat to enter (glass, clear plastic wrap, etc.)
    - Insulation to retain heat and maintain temperature (feathers, styrofoam, cardboard, paper, etc.)

    - Reflectors to concentrate more sunlight into the cooker (foil, mirrors)
- **Contents of solar ovens can get extremely hot! Use oven mitts or potholders.**

Materials:
- students select materials for their cookers

Procedure:
1. Organize students into working groups of three to five students.
2. Review safety procedures.
3. Students research cooker designs, gather materials, and build cookers incorporating individual designs and the basic concepts of solar cookers.
4. You may choose to have groups build cookers with one of the three components missing (glazing, insulation, reflectors) to understand the importance of each.

COOKING BASICS
Put food in covered dish. Lift glazing. Set dish in bottom of oven. Set oven facing sun and adjust reflector to reflect the most sunlight. Placing an oven thermometer in the cooker is a good idea and helps students see how hot the air temperature is in the cooker**. Use an oven mitt to remove food from cooker. It gets very hot!**

Assessments:
- Students cooperatively select and construct a solar cooker.
- Students demonstrate proper use of cooker.

Teacher Analysis:
In order to promote further student analyzing, questioning, and investigating, the following teacher questions and comments may be useful at the conclusion of any activities/investigations. These questions can be used for small/large group discussions, science log/journal entries, or as writing prompts.
- How do you feel about your results? Are they valid?
- Did you conduct a "Fair Test"?
- What, if anything, would you change to make your results more valid?
- Did you control your variables?
- Did your results cause you to think of more questions to explore?

More fun with your oven:
- Students research various types of cookers (parabolic, box, angled, basket, cone, etc.) and design one of their own. Ask students to develop a hypothesis predicting which cooker will cook the fastest, get the hottest, or is easiest to use and explain their choice. If time permits students can build the various types and test them.
- Organize a "fun in the sun" cooking festival.

Internet Links:
Global Sun Oven
http://www.sunoven.com

Solar Cooks
http://www.solarcook.com

Solar Cooking Archive
http://solarcooking.org/

Louisiana Energy and Environmental Resource and Information Center (LEERIC) Louisiana State University
http://www.leeric.lsu.edu/educat/lesson3.htm

Additional Resources:
Solar Cookers International
1919 21st Street suite 101
Sacramento, CA 95814
(916) 455-4499
http://solarcooking.org/

Box cookers can be purchased from:
Real Goods
555 Leslie Street
Ukiah, CA 95482
(800) 994-4243
www.realgoods.com

Sun Ovens International
39W835 Midan Drive
Elburn, IL 60119
(800) 408-7919
www.sunoven.com

Science Kit and Boreal Laboratories
777 East Park Drive
Tonawanda, NY 14150-6784
(800) 828-7777
http://sciencekit.com

What's Cooking Recipes

Solar S'Mores 1
24 squares from chocolate bars
12 graham crackers, halved
6 large marshmallows

Place 4 squares of chocolate on each of 6 graham crackers, top with marshmallows. Cover with remaining graham cracker squares to form sandwiches. Press to seal. Wrap with foil. Place in oven. Bake until heated and chocolate begins to melt. Serve immediately. Makes six servings.

Solar S'Mores 2
½ cup crunchy peanut butter
12 graham crackers, halved
6 large marshmallows

Spread peanut butter on 6 graham crackers, top with marshmallows and place in oven. Cover with remaining graham cracker squares to form sandwiches. Press to seal. Bake until heated. Serve immediately. Makes six servings.

Banana Boats
6 bananas
chocolate bar squares, kisses, or chocolate chips
marshmallows, large or miniatures

Peel one strip of skin from banana. Remove small amount of banana or cut slit into banana. Place chocolate and marshmallows inside banana. Wrap in foil. Heat until chocolate begins to melt. Serve immediately. Makes six servings.

Backyard Baked Beans
2 slices bacon (optional)
16 oz. can (1¾ cups) baked beans
¼ cup firmly packed brown sugar
1 small chopped onion
1 tsp. prepared mustard
¼ cup catsup
2 Tbsp. Worcestershire sauce

Cut bacon into small pieces. Combine chopped onion and bacon in container with lid. Cook covered until bacon is brown and onion is tender. Add remaining ingredients. Bake covered for one hour or until beans are thickened and heated through. Leave corner of lid cracked so steam can escape. Lid prevents splatters. Makes four servings.

RESOURCES

Junior Solar Sprint Links

http://www.fsec.ucf.edu/Ed/ACTIVIT/JSS.htm
Florida Solar Energy Center (www.fsec.ucf.edu). Junior Solar Sprint page.

http://tcfreenet.org/org/mres/carmanual/top.html
Minnesota Renewable Energy Society. An Introduction to Building a Model Solar Car: A Student Guide For the Junior Solar Sprint Competition

http://www.nrel.gov/education/pdfs/classin.pdf
National Renewable Energy Lab web site (www.nrel.gov). Junior Solar Sprint classroom investigations page. Teachers, mentors, and their students can use this publication to explore the components of model solar cars. It includes investigations and experiments to improve car performance.

http://www.nrel.gov/education/pdfs/soyou.pdf
National Renewable Energy Lab web site (www.nrel.gov). ASo... You Want to Build a Model Solar Car@ Written for teachers and students who want to participate in JSS, this document contains teacher background on photovoltaics, classroom activities for measuring solar cell output and understanding transmission components, tips on the vehicle construction process, hints for transmission design, formulas for calculating vehicle performance, and design considerations.

http://www.nrel.gov/education/pdfs/tips.pdf
National Renewable Energy Lab web site (www.nrel.gov). Junior Solar Sprint AInside Tips on Parts and Construction. This booklet helps students identify possible options for obtaining parts to build the vehicle's drive train and chassis and provides formulas for determining appropriate gear ratios and wheel sizes.

Photovoltaics Links

http://www.solarex.com/
Solarex. Informative web page that explains in detail how photovoltaics (PV) work, some history of PV use and more.

http://solstice.crest.org//renewables/SJ/index.html
Center for Renewable Energy and Sustainable Technology (CREST)web site (www.crest.org) Web page, The Sun's Joules, includes information on Photovoltaics, solar thermal and passive solar technology

http://www.eren.doe.gov/pv/
U.S. Department of Energy Photovoltaics Program - Includes information about photovoltaics and an animation of how a PV cell is made.

http://www.seds.org/nineplanets/nineplanets/sol.html
Students for the Exploration and Development of Space (www.seds.org)website. This page has a multitude of facts about our sun and some stunning photos.

http://www.astro.uva.nl/demo/sun/kaft.htm
Virtual tour of our sun with many photos. Written and compiled by a graduate student at the University of Amsterdam.