Location: **Session:** **Date:** **Start time:** **End time:**

APPENDIX A
Timed Interval Observation Sheet

	Time:													
	Minutes ➔	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**Notes**
Class Organization	① Individual students working alone ② Pairs of students ③ Small groups (3+ students) ④ Whole class	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	
Type of Instruction	① Teacher led lecture/presentation ② Teacher led lecture with discussion ③ Demonstration by teacher ④ Student presentations of work ⑤ Student reading ⑥ Cooperative learning ⑦ Teacher interacting with student(s) ⑧ Hands-on activity ⑨ Administrative task ⑩ Interruption or break	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩	
Classroom Interaction	① Teacher-driven ② Student-driven	① ②	① ②	① ②	① ②	① ②	① ②	① ②	① ②	① ②	① ②	① ②	① ②	
Student Role	① Passive/little response ② Active response ③ Co-construct meaning	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	
Student Engagement	① Low engagement (< 20%) ② Moderate engagement (50%) ③ High engagement (> 80%)	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	
Cognitive Activities	① Receipt of knowledge ② Applied procedural knowledge ③ Knowledge representation ④ Knowledge construction ⑤ Other (specify)	① ② ③ ④ ⑤	① ② ③ ④ ⑤	① ② ③ ④ ⑤	① ② ③ ④ ⑤	① ② ③ ④ ⑤	① ② ③ ④ ⑤	① ② ③ ④ ⑤	① ② ③ ④ ⑤	① ② ③ ④ ⑤	① ② ③ ④ ⑤	① ② ③ ④ ⑤	① ② ③ ④ ⑤	
Technology Integration by Teacher	① Not used ② Add-on ③ Partially integrated ④ Fully integrated	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	
Students' Technology Use	① Not used ② Single application used ③ 2 + applications used	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	① ② ③	
Students' Study Guide Use	① Not used ② Readings used or referenced ③ Handouts used or referenced ④ Other (specify)	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	① ② ③ ④	

CLASS ORGANIZATION

① Individual students working alone
② Pairs of students
③ Small groups (3+ students)
④ Whole class

TYPE OF INSTRUCTION

① Teacher-led lecture/presentation: *Distinguished by lack of student-teacher interaction*
② Teacher-led lecture with discussion: *Student-teacher interaction, including teacher or student questioning, providing examples, explanations, discussion of concepts.*
③ Demonstration by teacher: *Teacher provides a visual demonstration of concept, experiment, procedure, etc.*
④ Student presentation of work: *Student presents and explains work done as part of individual or group activity. Typically student stands and addresses the class.*
⑤ Student reading: *Individual or group reading.*
⑥ Cooperative learning: *Students divided into groups, with individual members fulfilling specific roles in the group (e.g., scribe, spokesperson, artist, etc)*
⑦ Teacher interacting with student(s): *May be exhibited in conjunction with a hands-on activity, students presentation, or student reading where teacher provides hints, prompts, feedback to student(s).*
⑧ Hands-on activity: *Individual or group activity work.*
⑨ Administrative task: *Taking role, signing-in, assigning homework, completing surveys, etc.*
⑩ Interruption or break:

CLASSROOM INTERACTION

① Teacher-driven: *The teacher directs or guides the focus of the class. He/she*
② Student-driven: *The students direct or guide the focus of the class. Discussions may be wide ranging but on topic.*

STUDENT ROLE

① Passive/little response: *Students mainly receive knowledge through activities such as lectures, directions, viewing video. Students may answer some questions at prompting of teacher.*
② Active response: *In teacher-led discussions students provide input to open-ended questions and elaborated talk occurs. Can include student presentations and active engagement in solitary activity.*
③ Co-construct meaning: *Students initiate dialogue with fellow students or the teacher and construct their own meaning from the less activity.*

STUDENT ENGAGEMENT

① Low engagement (<20%): *Most of the students are not focused on the learning tasks. They may be doing things unrelated to the learning or confused about what they should do.*

② Moderate engagement (~50%): *At least half of the students are focused on the learning tasks, but some are easily distracted or confused and a minority may not be on task.*
③ High engagement (>80%): *Nearly all of the students are focused on the learning tasks. Most of the activity in the classroom is relevant to the tasks.*

COGNITIVE ACTIVITIES

① Receipt of knowledge: *May include listening, repetition, answering simple / closed-ended questions, or reading. Knowledge gained can be found in external sources; no original or creative thinking involved.*
② Applied procedural knowledge: *Involves following step-by-step procedures for completing a task or activity or arriving at a solution. The procedural steps can be provided by the teacher or found in the Student Guide.*
③ Knowledge representation: *Students may present and explain their original work. May also include students explaining their understanding of concepts in a way that helps others understand.*
④ Knowledge construction: *Students are involved in activities or tasks that call for original or creative thinking to produce a product, arrive at a solution, or develop an understanding that they would not find elsewhere.*
⑤ Other (specify):

TECHNOLOGY INTEGRATION BY TEACHER

① Not used
② Add-on: *Limited use of computer or related technology by teacher. The use of the technology is simplistic, not well integrated into the lesson, and does not support learning in a meaningful way.*
③ Partially integrated: *Moderate use of computer or related technology by teacher. Technology is used in a single way for productivity, communications, research, or problem-solving/decision making to support learning.*
④ Fully integrated: *Extensive use of computer or related technology by teacher. Technology is used in multiple, complex ways that promote learning through productivity, communications, research, or problem-solving/decision making.*

STUDENTS' TECHNOLOGY USE

① Not used
② Single application used
③ 2+ applications used

STUDENTS' STUDY GUIDE USE

① Not used:
② Readings used or referenced: *The readings in the Student Guide are used or referred to in the classroom.*
③ Handouts used or referenced: *The handout activities in the Student Guide are used or referred to in the classroom.*
④ Other (specify):

APPENDIX B

Affective Survey

Intel ***Design & Discovery*** Attitude Survey for Students

Directions: For questions 1 – 25, please circle the number that best reflects your agreement with each statement about engineering.

		I don't know	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
1.	I think that engineering could be an interesting career.	0	1	2	3	4	5
2.	Engineers have little need to know about environmental issues.	0	1	2	3	4	5
3.	I would like to study engineering because I could make more money than with most jobs.	0	1	2	3	4	5
4.	Engineers are creative.	0	1	2	3	4	5
5.	Engineers spend little time dealing with other people.	0	1	2	3	4	5
6.	Engineers have enough time for family and leisure activities.	0	1	2	3	4	5
7.	Engineers are highly respected by others.	0	1	2	3	4	5
8.	Engineering often requires flexibility in one's thinking.	0	1	2	3	4	5
9.	Engineering requires good problem solving skills.	0	1	2	3	4	5
10.	If I became an engineer, I would be given the same opportunities, pay raises, and promotions as my fellow workers.	0	1	2	3	4	5
11.	Engineers spend most of their time working with computers.	0	1	2	3	4	5
12.	The rewards of becoming an engineer are not worth the effort.	0	1	2	3	4	5
13.	You have to be as smart as a genius to be an engineer.	0	1	2	3	4	5

		I don't know	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
14.	I am considering studying engineering in college.	0	1	2	3	4	5
15.	Most of the skills learned in engineering would be useful in everyday life.	0	1	2	3	4	5
16.	Engineering plays an important role in solving society's problems.	0	1	2	3	4	5
17.	Engineers spend most of their time doing difficult mathematical calculations.	0	1	2	3	4	5
18.	From what I know, engineering is boring.	0	1	2	3	4	5
19.	Engineers are naturally good at science and math.	0	1	2	3	4	5
20.	I would have no problem finding a job if I were an engineer.	0	1	2	3	4	5
21.	Engineers seldom get involved in business decisions.	0	1	2	3	4	5
22.	A woman can succeed in engineering as easily as a man of similar ability.	0	1	2	3	4	5
23.	Engineers spend most of their time working in laboratories.	0	1	2	3	4	5
24.	The advantages of studying engineering in college outweigh the disadvantages.	0	1	2	3	4	5
25.	Engineers are usually people who are called "nerds."	0	1	2	3	4	5

26. There are many different types of engineers. Name as many as you can. Give an example of the work that each type of engineer does.

	Type of engineer	Example of work they do
a.		
b.		
c.		
d.		
e.		

		I don't know	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
27.	I enjoy problems that can be solved in many different ways.	0	1	2	3	4	5
28.	If I studied engineering in college I would do well.	0	1	2	3	4	5
29.	Some of my friends are considering studying engineering in college.	0	1	2	3	4	5
30.	I am good at designing things.	0	1	2	3	4	5
31.	Creative thinking is one of my strengths.	0	1	2	3	4	5
32.	I would rather study alone than study in groups.	0	1	2	3	4	5
33.	I enjoy the subjects of math and science the most.	0	1	2	3	4	5
34.	I have good problem solving skills.	0	1	2	3	4	5

35. Which, if any, of the following have talked to you about engineering as a possible career? Circle all that apply.

Teachers **Parents/Guardians** **School Counselors** **Friends**

36. What is your gender? (Please circle the correct response)

Male Female

37. What is your ethnicity? (Please circle the correct response. Response is optional)

African American	**Asian Pacific**	**Hispanic/Latino**
Native American	**South Asian**	**White**
Biracial	**Other _____**	

38. What grade are you in? _____

39. How old are you? _____

Attitude to Engineering Subscales

Positive: 7 items

- Engineers are creative.
- Most of the skills learned in engineering would be useful in everyday life.
- Engineers are highly respected by others.
- Engineering often requires flexibility in one's thinking.
- Engineering requires good problem solving skills.
- Engineering plays an important role in solving society's problems.
- Engineers have a great deal of natural ability for science & math.

Negative: 8 items

- Engineers have little need to know about environmental issues.
- Engineers spend little time dealing with other people.
- The rewards of becoming an engineer are not worth the effort.
- To be an engineer requires an IQ in the genius range.
- Engineers spend most of their time doing difficult mathematical calculations.
- From what I know engineering is boring.
- Engineers seldom get involved in business decisions.
- Engineers are usually those people who were called “nerds" in high school.

Interest: 4 items

- I think that engineering could be an interesting career.
- I am considering studying engineering in college.
- I would like to study engineering because it could provide me with more money than most careers.
- The advantages of studying engineering in college outweigh the disadvantages.

Job Issues: 3 items

- A career in engineering would leave me enough time to have family and leisure activities.
- If I became an engineer, I expect that I would be given the same opportunities, pay raises and promotions as my fellow workers.
- I would have no problem finding a job if I had an engineering degree.

Time: 2 items

- Engineers spend most of their time working in laboratories
- Engineers spend most of their time working with computers

Gender Equity: 1 item

- A woman can succeed in engineering as easily as a man of similar ability

APPENDIX C

Cognitive Instrument (Example survey below administered at the Guadalupe site)

Circle the letter of the correct answer.

1. What is the first step in The Design Process?

a. Define the Problem
b. Research Your Solution
c. Identify a Design Opportunity
d. Improve Your Solution. Test, Evaluate & Revise

2. What does SCAMPER stand for?

a. **S**ubstitute—**C**ombine—**A**dapt—**M**agnify/Minimize—**P**ut to Other Uses—**E**liminate/Elaborate—**R**everse/Rearrange
b. **S**ubstitute—**C**ombine—**A**dapt—**M**odify—**P**ut to Other Uses—**E**nlarge—**R**everse/Rearrange
c. **S**ubstitute—**C**orrect—**A**mplify—**M**agnify/Minimize—**P**ut to Other Uses—**E**liminate/Elaborate—**R**euse

3. Which of the following is **NOT** a step in The Design Process?

a. Research the Design Opportunity
b. Brainstorm Possible Solution to the Problem
c. Build Models and Component Parts
d. Decide How to Sell the Product

4. Which of the following is **NOT** a step in The Design Process?

a. Obtain Approval of the Design
b. Prepare Design Requirement and Conceptual Drawings
c. Build a Solution Prototype
d. Refine Your Solution

5. Which of the following is an example of Substitute?

a. Scented Markers
b. Meatless Burgers
c. Big Screen Televisions
d. Running Shoes

6. How many steps are there in The Design Process?

a. 5
b. 10
c. 12
d. 15

7. Potential Energy is energy being stored before being released in a machine.

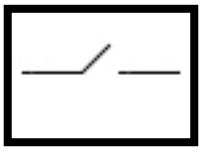
a. True
b. False

8. Which of the following is an example of Put to Other Uses?

a. Cordless Telephones
b. Ergonomic Keyboards
c. Clock Radios
d. Tire Swings

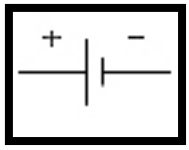
9. This electrical symbol represents what?

a. Lamp
b. Battery
c. Wire
d. Switch



10. This electrical symbol represents what?

a. Lamp
b. Battery
c. Wire
d. Switch



11. This electrical symbol represents what?

a. Outlet
b. Speaker
c. Battery
d. Wire

APPENDIX D

Facilitator Implementation Survey

Intel ***Design & Discovery*** Implementation Survey
for Program Facilitators

Directions: Please place an X in the box which most closely reflects your agreement or disagreement with each statements below.

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't Know
1.	The amount of time I have in order to complete the *Design & Discovery* curriculum is sufficient.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
2.	The *Design & Discovery* curriculum is written at the level of a typical 5th grader.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
3.	A typical 5th grader possesses the knowledge that the *Design & Discovery* curriculum assumes students have.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
4.	A typical 5th grader possesses knowledge well beyond what the *Design & Discovery* curriculum assumes.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
5.	I feel comfortable teaching / facilitating each one of the sessions.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
6.	I plan on seeking additional support for teaching / facilitating one or more sessions (from Intel, school, colleagues, etc).	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't Know
7.	One or more sources of teaching support have been made available to me should I need them.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
8.	I know where I can find teaching support or resources should I need them.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
9.	The *Design & Discovery* curriculum aligns well with Arizona state standards.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
10.	The Facilitator Guide is written in such a way that I can understand and use it easily.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
11.	I have extensive past experience working with students of this age group.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
12.	My past experience includes engineering/science teaching.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]