Creation of a New Advising Metric to Develop Viable Individual Senior Projects

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Abstract:

Determining whether an individual senior project is a ‘good’ project can be a difficult task. To aid the professor in associated advising, but more importantly, the student, a rubric was developed that helps indicate whether a student is proposing an acceptable senior project.

The scope of this effort includes the creation of an assessment tool that measures critical aspects of a good senior project. This includes quantifying the following ‘engineering merit’ aspects: problem statement, function statement, requirements, analyses, performance predictions, and evaluation. These ‘aspects’ exist in all of the capstone projects, regardless of the subject matter or discipline.

Students refer to their proposals when using the metric. Professors review and advise in a timely manner. Students can better determine if they have proposed an ‘acceptable’ senior project before the professor agrees to final acceptance.

The students and professors have applied the rubric to projects in a Mechanical Engineering Technology (MET) senior capstone course. The results showed deficiencies in some projects. This forced changes in the parameters of the project to make it an acceptable project. Assessment of the pedagogical impact of this metric was determined via surveys and comparisons of relevant course data over a number of years.

Introduction:

Senior Project is a process that every engineering student must negotiate. For universities that do not have an active research program for seniors to participate in, defining an individual senior project that will succeed can be difficult. The purpose of this paper is to present an assessment tool that will aid the student, as well as the professor, in proposing a good senior project.

Senior Project for the MET Program at Central Washington University starts in the fall and progresses through all three quarters of the academic year. Fall quarter is devoted to developing the student’s engineering proposal. Their proposal includes an introduction to the engineering problem, design and analysis, methods and construction, testing method, budget/schedule/project management, discussion, and conclusion. The aim of the proposal is to convince ‘management’ that this is a viable engineering project. This is a lot of information for a student to develop in a 10 week period. Therefore, it is imperative that they determine their engineering problem as soon as possible.

Students tend towards projects that are too large, too complicated, and very time consuming. Two of the outcomes for this course directly conflict with the student’s sense of an engineering problem: ABET 3i[1] (respect for diversity, diverse input, societal and global issues) and ABET 3k (commitment to quality, timeliness, and continuous improvement). It is always a challenge attempting to guide the students towards a realistic project. Many students want to design a system. Systems are ‘Death Stars’ to the student’s success. They are too large, too time consuming, and often require resources that are not readily available. So how to get them to scale back?

In the past a Requirements, Analysis, Design, Drawings (RADD)[2] approach was used (ABET 3k). Assessment by RADD was used to improve the performance of the student. This assessment

worked well, but it did not aid the student, or professor, in addressing the engineering problem and getting to a complete solution. Something was needed to address the beginning of the process (ABET 3i). We chose to focus on the engineering problem, function statement, and augmenting RADD with evaluation methods.

The attempt of the proposed rubric is to have the students spend some time at the beginning of the process assessing what they are doing. This should hopefully "open" their eyes to the real scope of their 'Death Star' project and convince them to scale back. If the student understood the scope of work need to complete their 'Death Star' project, maybe they would recognize the desirability of scaling back to something that was attainable.

Method:

The purpose of the assessment tool is to provide feedback to the students by having them rate their project proposal. Do they have a proper function statement? Do their requirements have quantitative values in them? A survey was developed that attempted to provide the students with some of these answers.

The development of the survey centered on helping the students identify the crucial elements of their paper (Problem, Function, Requirements, and Evaluation). First and foremost is having a proper engineering problem. If the students do not develop a proper problem, all other aspects of the proposal become much more difficult. Much like a Free Body Diagram (FBD), if the FBD is incorrect, a correct solution will never be attained. If the students can develop a correct function statement and have requirements that have quantitative values, the rest of their proposal can plausibly be developed from this base.

Many students approach Senior Project as 'a technical endeavor,' instead of what it really is – solving an engineering problem. An engineering project starts with a problem that can be addressed using engineering. Our capstone courses document and evaluate this engineering design process. A technical endeavor or device excludes those attributes and is inappropriate for our needs. Often, just having students think in those terms immediately eliminates a lot of their ideas or suggestions. The survey attempts to have them think in this manner. The survey asks the students what is their engineering problem? What are you trying to solve? The students then rate how they think they are doing in each category (see Appendix A). The next couple of questions deal with function statements and requirements. This is used primarily by the faculty member to aid the student in properly defining the problem the student is attempting to solve. In addition to poor problem definitions, many students litter their function statements with specifications/requirements.

A student provided the following function statement: "To dump material out of a trailer bed by using a small cylinder contented [sic] to a scissor device that lays flat when not in use and able to extends up." The student reviewed the survey and felt that they had indeed provided a correct function statement. When this was reviewed by the professor, the professor refuted the student's assertion of correctness. The professor also provided feedback as to why this was not a correct function statement. The student was then able to provide the following: "To tilt six foot platform to a 40º with a load of 500lb." The student is still including requirements, but it is an improved

function statement. The final function statement is “To tilt a six foot platform.” The 40° and load of 500lb were moved to the requirements.

The following were evaluated when looking at student’s proposal: poorly defined problem, creating a technical device, building a system, and testing issues. A poorly defined project, at the beginning, was a solar HVAC unit. A student wanted to build the system for the University of Washington Environmental Innovation challenge. Two problems, it is starting out as a project and it is a system. The student was instructed to recruit a couple of team members. Second was determining the individual engineering problems within the system for each student. There were several issues that made defining the engineering problem for this proposal difficult. Wanting to work with ammonia quickly became an issue of expense and safety. The heat exchanger is more a matter of specification than design engineering. Eventually, the engineering problems became the heating coil (Energy provided by the sun), the evaporative chiller, and the fan coil unit.

Wanting to create a technical device is a common problem. A student, interested in aviation, wanted to build an R/C model that was a Vertical Take Off and Landing (VTOL) aircraft. Great project, but how do you accomplish the measurement of, “The transition from vertical to horizontal flight modes will be more stable and smoothly…” with limited resources. Without question there is plenty of engineering in this technical device, it’s just that it will be difficult for the student to complete all that is required to produce this ‘Death Star’ project. An air worthy air frame has to be designed around two different propulsion systems (An engineering project alone). The student could propose a design and build it, but without the predicted engineering result – it’s just a technical device. Another student wanted to build a bike rack for an apartment. There are many bike racks on the market. How to define or create an engineering problem associated with a ‘bike rack?’ We can focus on requirement, manufacturing, loads, functionality, etc. For manufacturing the requirement could be the unassembled unit fit in a shipping box of 165 inches of length and girth combined with length less than 108 inches. Weight and assembly with hand tools commonly found in the home could be additional constraints to force this out of the technical device realm.

The HVAC and a gear box proposal fall into the system category. These were managed by creating teams and dissecting the project into a defined area that each student is responsible for. The interesting part is creating dividing lines that if one student fails to perform, the other students can still complete a project.

The issue of testing often modifies or changes a project. There are many reasons for this. The university does not have the facilities to perform the requisite tests. The student cannot afford the test. Or, it would be time consuming and difficult to determine the results. A student was considering a wood chip feeder for a commercial smoking operation. The customer wanted to automate the process of feeding wood chips into the smoker, they also wanted the most amount of smoke/chip of wood, efficient transfer of heat to the wood chip, and the removal of the ash. This engineering problem would involve energy balance and efficiencies, transfer of heat, transfer of mass, conversions of energy. A multi discipline approach (thermodynamics, chemistry, heat transfer, structural components, and electro-mechanical components) would be

required to solve this engineering problem. Testing the above becomes a project unto itself. This is much more than a single student can handle in 30 weeks of work.

Each week feedback is provided to the students. As the quarter progresses, the focus shifts down through the survey questions. The responses on the survey did not affect the students score on the survey. They received full credit for completing the survey.

Results:

The RADD results in Table 1 shows data for the past 10 years. From Fall of 2004 to Fall of 2014 the results show an improvement demonstrating that as an assessment tool, RADD is working.

Table 1. RADD Results.

YEAR	Require -ments 3i (Ave)	Stdev 3i Sample Size	Analysis 3k (Ave)	Stdev 3k Sample Size	Design 3d (Ave)	Drawing 3g (Ave)	Sample Size
2004-5, Fall	60.0		67.0		51.0	39.0	13
2005-6, Fall	73.0		69.0		83.0	77.0	13
2006-7, Fall	75.0		74.0		72.0	71.0	24
2007-8, Fall	71.0		54.0		72.0	79.0	16
2008-9, Fall	83.0		86.0		84.0	85.0	11
2009-10 Fall	81.2		70.6		80.6	83.5	16
2010-11 Fall	80.9		83.6		89.1	80.0	11
2011-12 Fall	83.8	24.3	46.4	15.9	81.1	18.6	14
2012-13 Fall	82.6	19.6	55.2	20.4	43.0	42.6	22
2013-14 Fall	84.5	33.0	74.1	39.2	75.9	82.8	30

Appendix A lays out the survey questions. The Required Element column lists the items to be assessed. Some additional information under Beneficial Elements was also included. The Questions column gives the questions that the students responded to. The Metric Description lists the choices the students could use to respond to the questions. The Researcher Response Metric column information was used by the professor to review the student proposal. Appendix B shows the results of the student survey. Each numbered row corresponds to a student and his or her responses. The column headings (C through W) are the questions. The individual student responses are below the headings. The professor's review of the same student proposal with the professor's assessment can be found in Appendix C.

Discussion:

Because of the survey, the RADD data scores for ABET 3i improved. The results in Table 1 indicate a 2.3% increase in the ABET 3i score (So far the highest recorded).This is the first year

the survey was implemented. Since the increase is within the standard deviation, the increase may not be attributed to the survey.

The survey questions were excellent in forcing the students to think about their project in the correct engineering terms. The questions provided a tool for the professor to refer to when asking the student questions concerning their proposal. As seen in the survey results (see Appendix B & C), the student's self-assessment differs from the professor assessment. It seems the professor sees the potential of the engineering merit in the project before the student does. The problem statement responses coincide more closely. The largest discrepancy begins at the function statement. The professor often refers the students to their textbook[3] for the definition and example of function statements. The requirements column is another place that the professor often did not agree with the students. These points of disagreement are where students need the most guidance and assistance.

This current assessment process requires a lot of interaction on a lot of different proposals. This is necessary to properly guide the student to a good proposal. Providing meaningful feedback to the students in a timely manner is difficult at times and this may have had an effect on the data. As can be seen by Table 1, the class size has grown significantly in the last two years. Since faculty resources have not been increased commensurately, this unfortunately means that the time spent with each individual student has been greatly reduced.

Conclusion:

This survey was created to support improvement of outcomes ABET 3i and 3k as applied to our senior capstone course for a Mechanical Engineering Technology program. The results in Table 1 indicate a 2.3% increase in the ABET 3i score. The students and faculty reviewed the survey questions providing the students with feedback on their progress towards a good senior project. This process was considered a success and future work will continue to refine the process.

References:

1. ABET, http://www.abet.org/ . 2015.
2. Oncina, C., Johnson, C. (2005). "Use of MET Capstone Course RADDical Metric." 2005 Annual ASEE Conference.
3. Mott, R. L., (5th Ed.). (2014). Machine Elements in Mechanical Design. Boston, MA: Pearson.

Appendix A: Survey Questions

Required Elements	Questions	Metric Description	Researcher Response Metric
Engineering Merit	Does your proposal have engineering merit that can be exemplified through the use of Requirements, Analysis, Design Parameters, and Documentation (RADD)? Is your engineering merit...	Poor	This project could be easily "spec'd." The opportunity for RADD would be difficult to obtain.
		Good	There is opportunity for RADD, but it may require additional requirements to produce the RADD opportunities.
		Excellent	This project has RADD.
Problem statement	Does your proposal have a problem statement? Is your problem statement...	Poor	There is no engineering problem, it is hard to deduce the engineering problem, or this appears to be more of a spec'd problem
		Good	There is an engineering problem, but it may need to be refined or changed in scope.
		Excellent	There is a an engineering problem
Function statement	Does your function statement tell what the device must do?	Disagree	There is no apparent functions statement. The student has written something, but it is not a proper function statement.
		Neither agree or disagree	There is a function statement, but it may not be complete or it includes requirements
		Agree	A proper function statement: What must the device do?
Requirements	Does your proposal include quantitative requirements that your device must meet?	Disagree	<= 15% of the requirements have numbers
		Neither agree or disagree	15.1 - 84.9% of the requirements have numbers
		Agree	>= 85% of the requirements have numbers
Requirements		2 or less	2 or less

Required Elements	Questions	Metric Description	Researcher Response Metric
	How many significant requirements does your proposal include?	3 to 5 statements	3 to 5 requirements
		6 or greater	6 or greater
Analysis	Does your proposal include analyses that determine parameters of your device?	Disagree	< 15% of the analysis determines parameters of the device
		Neither agree or disagree	15.1 - 84.9% of the analysis determines parameters of the device,
		Agree	85% of the analysis determine parameters of the device.
Performance predictions	Does your proposal include quantitative predictions of performance by your device?	Disagree	Disagree
		Neither agree or disagree	Neither agree or disagree
		Agree	Agree
Performance predictions	How many quantitative predictions of performance does your proposal include?	2 or less	2 or less
		3 to 5 statements	3 to 5 statements
		6 or greater	6 or greater
Evaluation methods	How many evaluation methods do you describe in your proposal?	2 or less	2 or less
		3 to 5 statements	3 to 5 statements
		6 or greater	6 or greater
Evaluation methods	Include descriptions of resources needed to evaluate your device.	No	
		Yes	
Scope	The scope that is written in your proposal; is the engineering merit...	Poor	Scope is a spec'd project.
		Good	The engineering merit is too small or easy.
		Excellent	There is engineering merit.
Cost	What is the estimated cost of your project?	less than $500	
		$500 to $1000	
		greater than $1000	
Size	What is the estimated size of your project?	fit in a school locker	

Required Elements	Questions	Metric Description	Researcher Response Metric
		fit in a school classroom	
		larger than a classroom	
Individual Commitment	What is your individual commitment to the project?	little	See if word count can be used to evaluate their level of effort.
		some	
		complete	
Individual Commitment	Include a narrative reflecting your commitment to this project.		
Beneficial Elements			
External interaction	Will this project have any external interaction (Outside CWU)?	no	no
		yes	yes
External interaction	If your project does include external interaction, please include information regarding the external support tor interaction, otherwise leave blank.		
Commercial Aspects	Will this project have any commercial aspects?	no	no
		yes	yes
Commercial Aspects	If your project does include commercial aspects, please include information regarding the commercial aspect, otherwise leave blank.		
Publishable	Will this project be published or do you intend it to be published?	no	no
		yes	yes

Required Elements	Questions	Metric Description	Researcher Response Metric
Publishable	If your project will be published, please include information regarding your intention to publish or disseminate your project, otherwise leave blank.		

APPENDIX B: Survey Results

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
2	ID	EngMerit	ProbStatement	Function	Requirement	NumOfRequire	RADD	Predict	NumOfPredict	NumOfAnal	Resourses	Scope	Cost	Size	Commitment	CommResp	External	ExternResp	Commercial	CommerResp	Publish	PubResp
3	10354683	Poor	Good	Agree	Agree	3 to 5	Neither a	Neither a	2 or less	2 or less	I will requi	Good	$500 to $1000	fit in a school	locke Complete	Each waking r	Yes	Interactions	Yes	If the proof of	No	I am uncerta
4	22071955	Good	Excellent	Agree	Agree	3 to 5	Agree	Agree	3 to 5	2 or less	I will need	Good	less than $500	fit in a school	locke Complete	I am not partr	Yes	My parents	No		No	
5	22570063	Good	Good	Agree	Agree	6 or more	Agree	Agree	3 to 5	3 to 5	Prototype st	Good	less than $500	fit in a school	class Complete	Spending hou	No		Yes	E-commerce o	No	
6	23627496	Excellent	Good	Agree	Agree	3 to 5	Agree	Neither a	2 or less	2 or less	Resources r	Good	$500 to $1000	fit in a school	class Complete	I have to have	No		No		No	
7	23942904	Good	Excellent	Agree	Agree	3 to 5	Agree	Agree	3 to 5	3 to 5	To test the '	Excelle	less than $500	fit in a school	locke Complete	I will be the s	Yes	The support	Yes	My hope is th	No	I do not inte
8	23983737	Good	Excellent	Agree	Agree	3 to 5	Neither a	Disagree	2 or less	2 or less	strain gaug	Good	$500 to $1000	fit in a school	locke Some	I am designin	Yes	We are wor	Yes	The part we d	No	
9	23994644	Excellent	Good	Agree	Agree	3 to 5	Agree	Agree	2 or less	3 to 5	Marks' Stan	Good	greater than $1000	fit in a school	class Some	I am intereste	Yes	UW Foster S	Yes	Will be marke	Yes	We will be l
10	24040911	Excellent	Excellent	Agree	Agree	3 to 5	Agree	Agree	3 to 5	3 to 5	I will need	Excelle	less than $500	fit in a school	locke Complete	I am committe	No		Yes	My device can	No	
11	24042614	Excellent	Excellent	Agree	Agree	2 or less	Neither a	Agree	2 or less	3 to 5	Resources r	Excelle	$500 to $1000	fit in a school	locke Complete	My commitme	Yes	My interact	No		No	
12	24100035	Excellent	Good	Agree	Agree	6 or more	Agree	Agree	6 or more	6 or more	chronograp	Good	$500 to $1000	fit in a school	locke Complete	I will spend t	No		No		No	
13	24100386	Good	Excellent	Agree	Agree	3 to 5	Disagree	Agree	2 or less	2 or less	Torque wre	Good	less than $500	fit in a school	locke Some	Have been str	Yes	Helping my	Yes		No	
14	24137358	Good	Good	Agree	Agree	6 or more	Agree	Disagree	2 or less	3 to 5	The Electral	Good	less than $500	fit in a school	locke Complete	I am committe	Yes	I am not po	No		No	
15	24144495	Excellent	Excellent	Agree	Agree	3 to 5	Agree	Agree	2 or less	2 or less	To evaluate	Good	less than $500	fit in a school	locke Some	My commitme	No		No		No	
16	24147225	Good	Excellent	Agree	Agree	6 or more	Disagree	Agree	2 or less	2 or less	ASTM E8 is	Good	less than $500	fit in a school	class Complete	There is no bi	No		No		No	
17	24172705	Good	Excellent	Agree	Agree	3 to 5	Disagree	Neither a	2 or less	2 or less	Lot's of pre	Good	less than $500	fit in a school	class Complete	The failure or	Yes	I have the fi	Yes	This project is	No	
18	24184327	Excellent	Excellent	Agree	Agree	3 to 5	Agree	Agree	3 to 5	3 to 5	To evaluate	Excelle	less than $500	fit in a school	class Complete	Last year at th	Yes	This project	No		No	
19	24214578	Good	Poor	Agree	Agree	3 to 5	Agree	Agree	2 or less	2 or less	Three-point	Good	less than $500	fit in a school	locke Complete	I am fully com	Yes	I will be in	No		Yes	I have thoug
20	24233337	Good	Excellent	Agree	Agree	6 or more	Neither a	Agree	3 to 5	2 or less	Access to N	Good	less than $500	fit in a school	locke Complete	I feel like all	Yes	I am workin	Yes	It is a gearbo	No	
21	24247988	Good	Excellent	Agree	Agree	6 or more	Neither a	Agree	3 to 5	3 to 5	currently I a	Excelle	$500 to $1000	fit in a school	locke Complete	I personally o	Yes	The externa	No		No	
22	24301288	Good	Excellent	Agree	Agree	3 to 5	Neither a	Neither a	2 or less	2 or less	Weight to t	Good	$500 to $1000	fit in a school	locke Complete	I have relative	Yes	I plan on in	Yes	There will be	No	
23	24301457	Good	Good	Agree	Agree	6 or more	Agree	Agree	3 to 5	3 to 5	I will need	Good	less than $500	fit in a school	class Complete	When I was a	No		Yes	A bicycle that	No	
24	24342212	Good	Good	Agree	Agree	3 to 5	Agree	Neither a	2 or less	2 or less	Tension tes	Excelle	less than $500	fit in a school	locke Complete	I will be desi	Yes	For the test	No		No	
25	24447629	Good	Good	Agree	Agree	3 to 5	Neither a	Agree	2 or less	2 or less	In order to i	Good	less than $500	fit in a school	locke Complete	Although I do	Yes	Neil Hauff s	Yes	H.F. Hauff Co.,	No	I do not beli
26	24457860	Good	Good	Agree	Agree	3 to 5	Disagree	Disagree	2 or less	2 or less	Thermistors	Excelle	$500 to $1000	fit in a school	class Complete	My commitme	Yes	Our project	Yes	As part of the	No	
27	24487812	Good	Excellent	Agree	Agree	6 or more	Agree	Neither a	3 to 5	2 or less	The resourc	Excelle	less than $500	fit in a school	locke Complete	My commitme	No		No		No	
28	24489203	Excellent	Excellent	Agree	Agree	3 to 5	Agree	Agree	3 to 5	3 to 5	Thermocou	Good	greater than $1000	fit in a school	class Complete	I have been t	Yes	University o	Yes	Our particular	Yes	We are going
29	24525122	Good	Excellent	Agree	Agree	3 to 5	Agree	Disagree	2 or less	2 or less	Point of Vie	Good	$500 to $1000	fit in a school	class Complete	I enjoy the me	Yes	Rider Surve	Yes	Bolt in, lightw	No	
30	24537667	Excellent	Excellent	Agree	Agree	6 or more	Agree	Agree	3 to 5	3 to 5	I am using l	Good	less than $500	fit in a school	locke Complete	I am committi	Yes	I am in dire	Yes	It is to take th	No	Don't necess
31	24645619	Excellent	Good	Agree	Agree	2 or less	Neither a	Agree	3 to 5	3 to 5	Solidworks	Good	less than $500	fit in a school	locke Complete	By committer	Yes	External int	No		No	

Appendix C. Researcher Assessment of student survey questions

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
2	ID	EngMerit	ProbStatement	Function	Requirements	NumOfRequire	RAOD	Predict	NumOfPredict	NumOfAnal	Resources	Scope	Cost	Size	Commitment	CommRes	External	ExternResp	Commercial	CommerResp	Publish	PubResp
3	10354683	Excellent	Excellent	Agree	Neither agree	3 to 5	Disagree	Disagree	2 or less	2 or less	No		No information	fit in a school lock			No		No		No	
4	22570063	Excellent	Excellent	Neither a	Neither agree	6 or greater	Neither a	Agree	3 to 5	3 to 5	No		Less than $500	fit in a school clas			No		No		No	
5	23627496	Excellent	Excellent	Disagree	Neither agree	3 to 5	Disagree	Disagree	2 or less	2 or less	No		$500 to $1000	fit in a school clas			No		Yes		No	
6	23942904	Excellent	Excellent	Neither a	Neither agree	3 to 5	Disagree	Agree	2 or less	6 or greater	Yes		$500 to $1000	fit in a school lock			Yes		No		No	
7	23983737	Excellent	Good	Agree	Agree	6 or greater	Disagree	Agree	3 to 5	6 or greater	Yes		No information	fit in a school lock			Yes		Yes		No	
8	23994644	Excellent	Poor	Neither a	Neither agree	3 to 5	Disagree	Agree	2 or less	2 or less	Yes		No information	fit in a school clas			Yes		Yes		No	
9	24040911	Good	Poor	Neither a	Agree	2 or less	Disagree	Disagree	2 or less	2 or less	No		No information	fit in a school lock			No		No		No	
10	24040937	Excellent	Excellent	Neither a	Neither agree	3 to 5	Disagree	Disagree	2 or less	2 or less	No		Less than $500	fit in a school lock			No		No		No	
11	24042614	Excellent	Excellent	Neither a	Neither agree	3 to 5	Disagree	Disagree	2 or less	2 or less	No		No information	fit in a school clas			Yes		No		No	
12	24100035	Excellent	Excellent	Agree	Neither agree	6 or greater	Neither a	Agree	3 to 5	3 to 5	No		No information	fit in a school lock			No		No		No	
13	24100386	Excellent	Poor	Disagree	Neither agree	3 to 5	Disagree	Disagree	2 or less	2 or less	No		No information	fit in a school clas			No		No		No	
14	24137358	Excellent	Excellent	Neither a	Neither agree	6 or greater	Disagree	Disagree	2 or less	2 or less	No		No information	fit in a school lock			No		No		No	
15	24144495	Excellent	Excellent	Disagree	Agree	6 or greater	Disagree	Agree	2 or less	2 or less	Yes		No information	fit in a school clas			No		No		No	
16	24147225	Excellent	Excellent	Agree	Neither agree	6 or greater	Disagree	Disagree	2 or less	2 or less	No		No information	fit in a school clas			No		No		No	
17	24172705	Excellent	Excellent	Neither a	Neither agree	3 to 5	Disagree	Disagree	2 or less	2 or less	No		No information	fit in a school clas			Yes		Yes		No	
18	24184327	Excellent	Good	Disagree	Disagree	3 to 5	Disagree	Disagree	2 or less	2 or less	Yes		Less than $500	fit in a school lock			No		No		No	
19	24214578	Excellent	Good	Neither a	Agree	3 to 5	Disagree	Disagree	2 or less	3 to 5	No		$500 to $1000	fit in a school lock			No		No		No	
20	24233337	Excellent	Excellent	Disagree	Neither agree	6 or greater	Neither a	Disagree	2 or less	2 or less	Yes		No information	fit in a school lock			Yes		Yes		No	
21	24247988	Excellent	Excellent	Neither a	Neither agree	3 to 5	Disagree	Agree	3 to 5	2 or less	Yes		Less than $500	fit in a school lock			No		No		No	
22	24301288	Excellent	Excellent	Neither a	Neither agree	6 or greater	Disagree	Disagree	2 or less	3 to 5	No		No information	fit in a school clas			No		No		No	
23	24301457	Excellent	Excellent	Neither a	Neither agree	6 or greater	Disagree	Disagree	2 or less	3 to 5	Yes		No information	fit in a school lock			No		No		No	
24	24342212	Excellent	Excellent	Agree	Neither agree	6 or greater	Disagree	Disagree	2 or less	3 to 5	No		No information	fit in a school lock			No		No		No	
25	24447629	Excellent	Excellent	Agree	Neither agree	6 or greater	Disagree	Agree	2 or less	3 to 5	Yes		No information	fit in a school lock			Yes		Yes		No	
26	24457860	Excellent	Excellent	Neither a	Neither agree	3 to 5	Disagree	Disagree	2 or less	2 or less	No		No information	fit in a school clas			Yes		Yes		No	
27	24487812	Excellent	Excellent	Agree	Neither agree	6 or greater	Disagree	Disagree	2 or less	3 to 5	No		No information	fit in a school lock			No		No		No	
28	24489203	Excellent	Excellent	Neither a	Disagree	6 or greater	Disagree	Agree	2 or less	2 or less	Yes		$500 to $1000	fit in a school clas			Yes		Yes		No	
29	24525122	Excellent	Good	Neither a	Neither agree	6 or greater	Disagree	Agree	2 or less	3 to 5	No		No information	fit in a school clas			No		No		No	
30	24537667	Excellent	Excellent	Disagree	Neither agree	6 or greater	Disagree	Disagree	2 or less	2 or less	Yes		No information	fit in a school lock			Yes		Yes		No	
31	24645619	Excellent	Good	Disagree	Disagree	2 or less	Disagree	Disagree	2 or less	2 or less	Yes		No information	fit in a school lock			No		No		No	