Assurance of Student Learning 2018-2019					
Ogden	School of Engineering and Applied Sciences				
Mechanical Engineering, 543					

Use this page	to list learning outcomes, measurements, and summarize results for your program. Detailed information	ion must b	e completed
	in the subsequent pages.		
Student Lear	ning Outcome 1: Ability to identify, formulate, and solve complex engineering problems by applying principal	ples of engi	ineering,
science, and n	nathematics.		
Instrument 1	Apply rubric to solution examples from selected course exams		
Instrument 2	Enit annuage of ME Conious		
Instrument 2	Exit surveys of ME Seniors		
Instrument 3	Average grades in relevant courses		
Based on your r	esults, circle or highlight whether the program met the goal Student Learning Outcome 1.	Met	Not Met
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	ning Outcome 2: Ability to apply engineering design to produce solutions that meet specified needs with co	nsideration	of public
health, safety,	and welfare, as well as global, cultural, social, environmental, and economic factors.		
Instrument 1	Apply Rubric to Design Reports from selected courses		
Instrument 2	Exit surveys of ME Seniors		
Instrument 3	Average grades in relevant courses		
Based on your r	esults, circle or highlight whether the program met the goal Student Learning Outcome 2.	Met	Not Met
C4			
	ning Outcome 3: Ability to communicate effectively with a range of audiences.		
Instrument 1	Apply Rubrics to Artifacts (reports, posters, presentations)		
Instrument 2	Exit surveys of ME Seniors		
Based on your r	esults, circle or highlight whether the program met the goal Student Learning Outcome 3.	Met	Not Met
Program Sun	nmary (Briefly summarize the action and follow up items from your detailed responses on subsequent pages.)		
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	nt of student performance under Student Learning Outcomes 1, 2 and 3 is acceptable according to rubric-base		
	ion, graduates are completing relevant courses with good grades, and student positive perception of skills learn	_	
indicates the o	curriculum for Mechanical Engineering prepares graduates with the abilities and skills needed to be success	ful practicin	ng engineers.
The WKU Me	chanical Engineering Program will continue to prepare graduates with the same Student Learning Outcome a	ctivities and	d measures.

		Student Learning Outcon	ne 1			
Student Learning Outcome	Graduates of the mechanical engineering program should show an ability to identify, formulate, and solve complex					
	engineering p	roblems by applying principles of enginee	ering, science, and mathematics			
Measurement Instrument 1	A scoring rub	ric specifically structured to directly asses	s the attributes stated in the outcome	is applied to final exam		
	questions in tl	he engineering science courses EM303, M	E220, ME325, which capture key asp	pects of both the		
	mechanical sy	ystems and thermo-fluid systems mechanic	cal engineering students' study. The	rubric assesses 4 main		
	attributes of p	problem solving. The selected courses have	re math and physics pre-requisites and	d utilize those specific		
		olution of engineering problems. The mecl	• • •	•		
		systems component is captured by both M				
		nd students have by then developed strong		applying math and		
	science conce	epts in earlier design course projects and in	earlier engineering science courses.			
Criteria for Student Success	NT : 1	1. 6. 1. 1. 1. 1. 1. 1. 1.		4.0 1.0 1.1		
Criteria for Student Success		sults from applying the rubric to student w				
		of sophomore/junior level work may be s	omewnat lower, which can be used to	track student		
	development	in the curriculum.				
Program Success Target for this	Measurement	Cohort average of 3.0 on a 4.0 scale	Percent of Program Achieving Target	Cohort score of 3.1		
Methods	The final area	us calletians from each student in the course	a is marriaged a smallest flagge assumes	andina Calast		
Wethous		m solutions from each student in the cours identified and the outcome rubric applied				
	-	a class average is determined. This appro-				
		who are rising to senior status. As such M				
		emic year since it is offered once per year.	•	0		
		ge at 48 students.	over the years the graduating conort	is have been as sman as		
		6				
Measurement Instrument 2	•	of ME Seniors. One question on the Senio	•	• • • •		
		mathematics, science, and engineering, as		eness of this knowledge		
	focused training in their program and their resulting ability to apply effectively.					
Criteria for Student Success		s self-report that they know about the math		ining they were		
	receiving and are capable of performing at a level indicated by a numerical scale.					
Program Success Target for this	s Measurement	Score of 4.0 or higher on a 5.0 scale	Percent of Program Achieving Target	Score of 4.3 on a 5.0 scale		
Methods	Graduating st	udents complete a survey of their academi	c experience in the program while en	rolled in their capstone		
	Graduating students complete a survey of their academic experience in the program while enrolled in their capstone course. A part of this survey is their assessment of the program learning outcomes. The December 2018 and the					
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	May 2019 ME graduates self-reported that they knew about the mathematics, science, and engineering training they were receiving and could perform at a level of 4.3/5.0. This self-assessed value is fairly consistent with the other measurements for this outcome.					
Measurement Instrument 3	Average grades in relevant courses. The mechanical engineering curriculum builds upon math and science courses with engineering science courses in both mechanical systems and thermo-fluids systems courses. These courses are indicators of student capabilities in this student learning outcome.					
Criteria for Student Success Program Success Target for this	The mechanical engineering student performance in these core classes are expected to be at a high C grade on average. This indirect instrument method helps to identify areas of weakness in student performance and is used on a continual basis to track student learning.					
Methods Grades in the math, science and engineering science courses are assembled and reviewed for each graduating mechanical engineering student. This includes the courses ME220, ME240, ME310, ME325, ME330, ME344, EM222, EM303, EM313, Math136, Math137, Math237, Math331, Phys255, Phys265, Chem120 (or Chem116). Fo the 2019 cohort average course grades ranged from 2.56/4 for both Phys265 and EM313, to 3.16 for ME344. The overall average was 3.03/4.				344, 1116). For		
Based on your results, circle or	ased on your results, circle or highlight whether the program met the goal Student Learning Outcome 1. Met Not M				Not Met	

Actions (Describe the decision-making process and actions planned for program improvement. The actions should include a timeline.)

The assessment of student performance under Outcome 1 is acceptable according to rubric-based direct evaluation of student work. Graduates are completing relevant courses with satisfactory grades in the curriculum assuring that ME graduates have the ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. The WKU Mechanical Engineering Program will continue to prepare graduates with the same curriculum content, and monitor this student learning outcome with these measures. No need for programmatic adjustments has been found.

Follow-Up (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.)

The mechanical engineering faculty will continue with program assessment on an annual basis. The accrediting agency, ABET, requires continual improvement through systematic assessment of student learning outcomes.

		Student Learning Outcom	me 2			
Student Learning Outcome	solutions that cultural, socia	the mechanical engineering program show meet specified needs with consideration of al, environmental, and economic factors.	of public health, safety, and welfare, a	as well as global,		
Measurement Instrument 1	Program faculty apply a scoring rubric, specifically structured to directly assess the attributes stated in the outcome, to selected student work from junior design (ME300) and senior capstone design (ENGR490 and ENGR491). These courses capture the many aspects of complicated design projects that are undertaken to prepare the students to be capable engineers. The rubric assesses 6 main attributes of design. The selected courses have engineering science pre-requisites and utilize those specific skills in the creation of feasible mechanical designs.					
Criteria for Student Success	work. Scores development	sults from applying the rubric to student w of sophomore/junior level work may be s in the curriculum	somewhat lower, which can be used to			
Program Success Target for this	Measurement	Score of 3.2 out of 4.0	Percent of Program Achieving Target	Score 3.6 out of 4.0		
Methods	applied to ass	ports from each team in the course is reviews achievement. Values from each reportures every student graduating in the asses 90/ENGR491 results give a representation	t are recorded, and a class average is sment year, and students who are risi	determined. This ng to senior status. As		
Measurement Instrument 2	assess their to health, safety,	of ME Seniors are used as an indirect mean apply engineering design to produce solution and welfare, as well as global, cultural, systemess of this knowledge focused training	ations that meet specified needs with ocial, environmental, and economic f	consideration of public actors. They are asked		
Criteria for Student Success		self-report that they know about the engial a level indicated by a numerical scale.	neering design training they were rec	eiving and are capable of		
Program Success Target for this		4.0 on a 5.0 scale	Percent of Program Achieving Target	Score of 4.2 out of 5.0		
Methods	Graduating students complete a survey of their academic experience in the program while enrolled in their capstone course. A part of this survey is their assessment of the program learning outcomes. The December 2018 and the May 2019 ME graduates self-reported that they knew about the engineering design training they were receiving and could perform at a level of 4.2/5.0. This self-assessed value is fairly consistent with the other measurements for this outcome					
Measurement Instrument 3	0 0	es in relevant courses. The mechanical en cience courses with engineering design co				

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	These course	s are indicators of student capabilities in	this student learning outcome.			
Criteria for Student Success	The mechanic	The mechanical engineering student performance in the core design courses are expected to be at a B grade on				
	average. Thi	s indirect instrument method helps to idea	ntify areas of weakness in student perf	ormance and is used on a		
	_	is to track student learning and developm	•			
Program Success Target for this		3.0 out of 4.0	Percent of Program Achieving Target	Score of 3.5 out of 4.0		
Methods	Grades in the	design courses are assembled and review	l ved for each graduating mechanical en	gineering student. This		
	includes the	courses ME200, ME300, and the 2 semes	ter capstone sequence ENGR490/ENG	R491. For the 2019		
		ge course grades ranged from 3.2/4 for M				
	3.5/4.		,	C		
Based on your results, circle or l	nighlight whethe	r the program met the goal Student Learning (Outcome 2.	Met Not Met		
Actions (Describe the decision-ma	aking process and	actions planned for program improvement. The	actions should include a timeline.)			
The assessment of student pe	erformance un	der Outcome 2 is acceptable according to	rubric-based direct evaluation of stud	lent work. Graduates are		
completing relevant courses	with satisfacto	ory grades in the curriculum assuring tha	t ME graduates have the ability to app	oly engineering design to		
produce solutions that meet s	specified needs	with consideration of public health, safet	y, and welfare, as well as global, cultur	al, social, environmental,		
and economic factors. The V	and economic factors. The WKU Mechanical Engineering Program will continue to prepare graduates with the same curriculum content, and monitor					
this student learning outcome with these measures. No need for programmatic adjustments has been found.						
		f follow-up has occurred, describe how the actions				
The mechanical engineering faculty will continue with program assessment on an annual basis. The accrediting agency, ABET, requires continual						
improvement through systen	natic assessmer	nt of student learning outcomes.				

	Student Learning Outcome 3						
Student Learning Outcome	Outcome Graduates of the mechanical engineering program should show an ability to communicate effectively with a range of						
	audiences						
Measurement Instrument 1	Program faculty apply scoring rubrics, specifically structured to directly assess 4 major attributes supporting the outcome, to selected student work from several key mechanical engineering courses. These courses capture the many aspects of engineering communication that prepare the students to be effective communicators. The rubrics assess the Written, Oral, Graphical and Visual aspects of communication. The selected courses have students create artifacts which represent those specific skills.						
Criteria for Student Success	Numerical results from applying the rubric to student work should reach a value of 3.2 on a 4.0 scale for senior level						
	work. Scores of sophomore/junior level work may be somewhat lower, which can be used to track student						

	development in the curriculum.					
Program Success Target for this	s Measurement	3.2 out of 4.0	Percent of Program Achieving Target	Score of 3.49 out of 4.0		
Methods	The written reports from each team in the course is reviewed separately from course grading. The outcome rubric is applied to assess achievement. Values from each report are recorded, and a class average is determined. This approach captures every student graduating in the assessment year, and students who are rising to senior status. As such ENGR490/ENGR491 results give a representation of the graduating cohort through this capstone experience. The Written communication was assessed by artifacts from ME200, ME300 and ENGR490, which gave a combined average score of 3.4. The Oral communication was assessed by presentations in ME200, ENGR490 and ENGR491 which gave a combined score of 3.54. The Graphical communication was assessed by CAD drawings in ME180 and gave a combined score of 3.77. The Visual communication was assessed by poster presentations from ME347 and ENGR491 which gave a combined score of 3.23.					
Measurement Instrument 2	Exit surveys of ME Seniors are used as an indirect measure. One question on the Senior Exit Survey is used to assess their to ability to communicate effectively with a range of audiences. They are asked about their awareness of this knowledge focused training in their program and their resulting ability to apply effectively.					
Criteria for Student Success	_	s self-report that they know about the eng	ineering design training they were reco	eiving and are capable of		
Program Success Target for this		a level indicated by a numerical scale.	Donout of Ducasan Ashieving Touget	0 0414 4 070		
Frogram Success Target for till	s Measurement	4.0 out of 5.0	Percent of Program Achieving Target	Score of 4.14 out of 5.0		
Methods	Graduating students complete a survey of their academic experience in the program while enrolled in their capstone course. A part of this survey is their assessment of the program learning outcomes. The December 2018 and the May 2019 ME graduates self-reported that they knew about the communication training they were receiving and could perform at a level of 4.14/5.0. This self-assessed value is fairly consistent with the other measurements for this outcome					
Based on your results, circle or	highlight whether	the program met the goal Student Learning C	Outcome 3.	Met Not Met		
Actions (Describe the decision-m	aking process and	actions planned for program improvement. The a	actions should include a timeline.)			
The assessment of student performance under Outcome 3 is acceptable according to rubric-based direct evaluation of student work. Graduates are completing relevant courses which produce assessable communication artifacts with in the ME curriculum assuring that ME graduates have the ability to communicate effectively with a range of audiences. The WKU Mechanical Engineering Program will continue to prepare graduates with the same curriculum content, and monitor this student learning outcome with these measures. No need for programmatic adjustments has been found.						
Follow-Up (Provide your timeline for follow-up has occurred, describe how the actions above have resulted in program improvement.)						
		ntinue with program assessment on an ar				
		at of student learning outcomes.	muai oasis. The accreating agency, A	1DD1, requires continuar		
improvement unough system	mane assessiner	it of student learning outcomes.				

Student Learning Outcome 1: Upon graduation, our students have the ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

	Capstone	Miles	tones	Benchmark
	4	3	2	1
Calculation (Quantitative Literacy VALUE Rubric)	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem. Calculations are also presented elegantly (clearly, concisely, etc.)	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem.	Calculations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem.	Calculations are attempted but are both unsuccessful and are not comprehensive.
Define Problem (Problem Solving VALUE Rubric)	Demonstrates the ability to construct a clear and insightful problem statement with evidence of all relevant contextual factors.	Demonstrates the ability to construct a problem statement with evidence of most relevant contextual factors, and problem statement is adequately detailed.	Begins to demonstrate the ability to construct a problem statement with evidence of most relevant contextual factors, but problem statement is superficial.	Demonstrates a limited ability in identifying a problem statement or related contextual factors.
Identify Strategies (Problem Solving VALUE Rubric)	Identifies multiple approaches for solving the problem that apply within a specific context.	Identifies multiple approaches for solving the problem, only some of which apply within a specific context.	Identifies only a single approach for solving the problem that does apply within a specific context.	Identifies one or more approaches for solving the problem that do not apply within a specific context.
Evaluate Potential Solutions (Problem Solving VALUE Rubric)	Evaluation of solutions is deep and elegant (for example, contains thorough and insightful explanation) and includes, deeply and thoroughly, all of the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is adequate (for example, contains thorough explanation) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is brief (for example, explanation lacks depth) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is superficial (for example, contains cursory, surface level explanation) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.

Student Learning Outcome 2: Upon graduation, our students have the ability to apply engineering design to produce solutions that meet specific needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

	Capstone	Milestones		Benchmark
	4	3	2	1
Acquiring Competencies (Creative Thinking VALUE Rubric)	Reflect: Evaluates creative process and product using domain-appropriate criteria.	Create: Creates an entirely new object, solution or idea that is appropriate to the domain.	Adapt: Successfully adapts an appropriate exemplar to his/her own specifications.	Model: Successfully reproduces an appropriate exemplar.
Solving Problems (Creative Thinking VALUE Rubric)	Not only develops a logical, consistent plan to solve problem, but recognizes consequences of solution and can articulate reason for choosing solution.	Having selected from among alternatives develops a logical, consistent plan to solve the problem.	Considers and rejects less acceptable approaches to solving problem.	Only a single approach is considered and is used to solve the problem.
Embracing Contradictions (Creative Thinking VALUE Rubric)	Integrates alternate, divergent, or contradictory perspectives or ideas fully.	Incorporates alternate, divergent, or contradictory perspectives or ideas in a exploratory way.	Includes (recognizes the value of) alternate, divergent, or contradictory perspectives or ideas in a small way.	Acknowledges (mentions in passing) alternate, divergent, or contradictory perspectives or ideas.
Connecting, Synthesizing, Transforming (Creative Thinking VALUE Rubric)	Transforms ideas or solutions into entirely new forms.	Synthesizes ideas or solutions into a coherent whole.	Connects ideas or solutions in novel ways.	Recognizes existing connections among ideas or solutions.
Implement Solutions (Problem Solving VALUE Rubric)	Implements the solution in a manner that addresses thoroughly and deeply multiple contextual factors of the problem.	Implements the solution in a manner that addresses multiple contextual factors of the problem in a surface manner.	Implements the solution in a manner that addresses the problem statement but ignores relevant contextual factors.	Implements the solution in a manner that does not directly address the problem statement.
Identifying specific project objectives, standards, and constraints based on general project requirements	All important objectives, standards, and constraints are identified and clearly implemented	Most important objectives, standards, and constraints are identified and implemented with minor deficiencies	Some objectives, standards, and constraints are identified with some deficiencies	Objectives, standards, and/or constraints not clearly identified or contain significant deficiencies

Student Learning Outcome 3: Upon graduation, our students have the ability to communicate effectively with a range of audiences.					
Written Communication	Capstone 4	Miles 3	itones 2	Benchmark 1	
Context of and Purpose for Writing (Written Communication VALUE Rubric)	Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned task(s) and focuses all elements of the work.	Demonstrates adequate consideration of context, audience, and purpose and a clear focus on the assigned task(s) (e.g., the task aligns with audience, purpose, and context).	Demonstrates awareness of context, audience, purpose, and to the assigned tasks(s) (e.g., begins to show awareness of audience's perceptions and assumptions).	Demonstrates minimal attention to context, audience, purpose, and to the assigned tasks(s) (e.g., expectation of instructor or self as audience).	
Content Development (Written Communication VALUE Rubric)	Uses appropriate, relevant, and compelling content to illustrate mastery of the subject, conveying the writer's understanding, and shaping the whole work.	Uses appropriate, relevant, and compelling content to explore ideas within the context of the discipline and shape the whole work.	Uses appropriate and relevant content to develop and explore ideas through most of the work.	Uses appropriate and relevant content to develop simple ideas in some parts of the work.	
Control of Syntax and Mechanics (Written Communication VALUE Rubric)	Uses graceful language that skillfully communicates meaning to readers with clarity and fluency, and is virtually error free.	Uses straightforward language that generally conveys meaning to readers. The language in the portfolio has few errors.	Uses language that generally conveys meaning to readers with clarity, although writing may include some errors.	Uses language that sometimes impedes meaning because of errors in usage.	
Interpretation (Quantitative Literacy VALUE Rubric)	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information.	Provides accurate explanations of information presented in mathematical forms. For instance, accurately explains the trend data shown in a graph.	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units.	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means.	
Content	Technical/Professional information at an appropriate level for course, Key concepts and terms explained clearly. Research and/or analysis of topic clearly evident Reader gains significant new knowledge and insight	Technical/Professional information at an appropriate level for course, some concepts not completely clarified, research and/or analysis of topic generally evident. Reader gains some new knowledge and insight.	Technical/Professional information at a marginal level for course, many concepts unclear or not discussed. Reader gains little new knowledge or insight	Technical/Professional information unacceptable for course, most concepts unclear or not discussed, reader gains no new knowledge or insight	

Student Learning Outcor	Student Learning Outcome 3: Upon graduation, our students have the ability to communicate effectively with a range of audiences.						
Oral Communication	Capstone	Milestones		Benchmark			
	4	3	2	1			
Organization (Oral Communication VALUE Rubric)	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation.			
Language (Oral Communication VALUE Rubric)	Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience.			
Delivery (Oral Communication VALUE Rubric)	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable.			
Central Message	Central message is compelling	Central message is clear and	Central message is basically	Central message can be			
(Oral Communication VALUE Rubric)	(precisely stated, appropriately repeated, memorable, and strongly supported.)	consistent with the supporting material.	understandable but is not often repeated and is not memorable.	deduced, but is not explicitly stated in the presentation.			
Content	Technical/Professional information at an appropriate level for course, Key concepts and terms explained clearly. Research and/or analysis of topic clearly evident Audience gains significant new knowledge and insight	Technical/Professional information at an appropriate level for course, some concepts not completely clarified, research and/or analysis of topic generally evident. Audience gains some new knowledge and insight.	Technical/Professional information at a marginal level for course, many concepts unclear or not discussed. Audience gains little new knowledge or insight	Technical/Professional information unacceptable for course, most concepts unclear or not discussed, audience gains no new knowledge or insight			
Multimedia	Multimedia clearly enhances presentation. Concepts made clearer, most information easy to see and follow, details minimized and main points stand out	Multimedia contributes to the quality of the presentation. Most concepts made clearer, most information generally easy to read and follow, main points stand out, a few details difficult to follow	Multimedia poorly prepared or used inappropriately, generally do not enhance concepts, sometimes confusing, hard to see, read, and/or follow, may be confusing	Multimedia not used or so poor they are distracting, do not contribute to presentation.			

Question and Answer	Answers confidently and adequately	Answers adequately with some	Answers not always adequate	Questions either not answered
(if applicable)	with no hesitation or stumbling over	hesitation, may stumble over a	and show uncertainty, pauses	or done so with great difficulty,
	words.	few words, some slight lack of	more obvious, and somewhat	significant uncomfortable
		confidence, overall good at	distracting.	pauses, little to no confidence.
		answering questions		