

**Outcome 12.** Students have an ability to identify, formulate, and solve engineering problems.

The faculty assessment is performed with respect to the Performance Indicators for the students in the specific courses that have been identified to assess this outcome.

Course	Performance indicators
MinE 306, 331, 471, 480	Knowledge of economic, environmental, health, and safety issues in mining.
	Considers the impact of economic, environmental, health, and safety issues on the engineering solution.
	Personal and social responsibility to the environment and miner health and safety.

- Tools used:** Scheduled course assessments by faculty, student course assessments, and senior exit survey.
- Data Collection:** The data for the course assessments by the faculty are collected on a planned multi-year schedule. The individual faculty select specific class activities in the specific courses upon which to perform the assessment. The faculty may choose to assess student performance in: homework, examinations, projects, presentations, etc.
- Frequency of data collection:** The faculty course assessments are performed on a planned tri-annual schedule for each outcome. The student course assessments are collected for every course, for every semester that the course is offered. The senior exit surveys are given to the seniors at the end of their final term.
- Data Analysis:** The collected data are analyzed in the academic year they are obtained, and in longitudinal analyses after that.
- Closing the loop:** The faculty outcome assessments, student outcome assessments and senior exit surveys are reviewed on both a term and annual basis with the faculty and visiting committee. As needed, the courses and curriculum are revised to update and improve student outcomes. Metrics for successful fulfillment of the outcome in course assessments are determined by the individual faculty for that course, in conjunction with the outcome grading rubric and their individual grading technique.

*Performance criteria and metrics:*

- a) The student performance assessments provide the rating of student performance on a scale of 1 to 5 for each Performance Indicator. A score of 5 indicates “Exceeds Expectations” of performance, a score of 3 indicates “Meets Expectations” of performance, and a score of 1 indicates “Unsatisfactory” performance.
- b) The student course assessments rate each of the 13 outcomes on a scale of 1 to 4: 1 indicates “little or none” contribution, 2 indicates “low” contribution, 3 indicates “medium” contribution, and 4 indicates “high” contribution.
- c) The senior exit surveys are given to the seniors at the end of their final term. The survey contains questions that ask the students to rate their abilities in each of the 13 Mining Engineering outcome areas. These student abilities are rated on a scale of 1 to 5, with a score of 5 indicates the highest level of ability while 1 indicates the lowest.

**Assessment Tool:**

**Scheduled Course Assessment by Faculty**

## Grading Rubric for Understanding Importance of Econ., Env. and H&S on Mining (Outcome 12)

Performance Indicators	1	2	3	5
	Unsatisfactory	Developing	Meets Expectations	Exceeds Expectations
<b>Knowledge of Econ/Env/H&amp;S Issues in Mining</b>	Has little knowledge of the economic, environmental and/or health and safety issues which affect mining.	Has only a basic understanding of the economic, environmental and/or health and safety issues which affect mining.	Has a thorough understanding of the major economic, environmental and/or health and safety issues which affect mining.	Has a deep knowledge of the historic and contemporary economic, environmental and/or health and safety issues that effect mining. Has knowledge of state-of-the-art methods to address these issues.
<b>Considers the Impact of Econ/Env/H&amp;S on the Engineering Solution</b>	fails to consider how economics, environmental issues and/or health and safety might influence the design of a system or product.	Briefly considers how econ/env/H&S issues might impact the design.	Carefully considers how most several econ/env/H&S issues might impact the design, and makes design decisions accordingly.	Applies knowledge and skills of econ/env/H&S to implement sophisticated, appropriate, and workable solutions to address complex mining design problems.
<b>Personal and Social Responsibility to Environment, and Miner Health and Safety</b>	Is not aware of any personal or social responsibility to safeguard the environment, or health and safety of miners.	Is aware of personal or social responsibility to safeguard the environment or health and safety of miners, but not knowledgeable of how to implement, nor feels a strong personal responsibility.	Analyzes the environmental and H&S consequences of mining systems and identifies a range of potential corrective actions informed by one's sense of personal and civic responsibility.	Uses informed and responsible designs to address environmental and H&S challenges in the mining industry. Responsible evaluates the environmental and H&S consequences of designs.

**Assessment Tool:**

**Student Course Assessment**

**Department of Mining Engineering  
Student Course Assessment  
MinE \_\_\_\_\_**

\_\_\_\_\_ **Semester, 20** \_\_\_\_\_

**Students: Please rate the level of this course's contribution to your educational development with regard to the following educational objectives. Rate the course as: 1) little or none, 2) low, 3) medium, or 4) high. Fill in the rating on the line provided. Space is provided for comments.**

<b>This course contributed to my educational objectives to...</b>	<b>Rating</b>			
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
"This course's contribution was _____ to my educational development."				
1. become well prepared in the application of mathematics, science, and engineering				
2. become well prepared to design and conduct experiments, as well as to analyze and interpret data				
3. become well prepared to design a system, component, or process to meet desired needs.				
4. become functional on multidisciplinary teams				
5. identify, formulate, and solve engineering problems.				
6. have an understanding of professional and ethical responsibility.				
7. communicate effectively.				
8. have the broad education necessary to understand the impact of engineering solutions in a global and societal context.				
9. have a recognition of the need for, and a desire to engage in life-long learning.				
10. have a knowledge of contemporary issues.				
11. use the techniques, skills, and modern engineering tools necessary for engineering practice.				
12. understand the importance of economics, environmental, health, and safety issues in the operations of modern mines.				
13. learn independently.				

**Comments:**

**Assessment Tool:**

**Senior Exit Survey**

**College of Engineering and Mineral Resources**  
**Department of Mining Engineering**  
Undergraduate Program

Outcomes Assessment

**Assessment Questionnaire – MinE Graduating Seniors**

As part of our educational objectives, we strive to continuously improve the quality and quantity of education we provide for our graduates. Therefore, the Department of Mining Engineering needs to gather information regarding the education received by WVU Mining Engineering students. As a WVU Mining Engineering graduating senior, you are in a unique position to provide critical feedback to the Department of Mining Engineering on the quality of your educational experience. Your feedback will be used to improve the future quality of education provided to WVU Mining Engineering students. All responses to this questionnaire are anonymous and will be held in the strictest of confidence. We sincerely thank you for your time and effort in this matter, and greatly appreciate your assistance.



**WVU Mining Engineering Graduating Seniors Exit Survey (Confidential)**

Semester (circle one): Fall    Spring    Summer    Year: 20\_\_\_\_\_

1. From 1 to 5, rate your understanding of the following modern and classical Mining Engineering topics as a result of the BS MinE degree that you are about to obtain at WVU. A score of 5 indicates the highest ability and 1 the lowest.

<b>Topics</b>	<b>Score</b>
Mine Surveying	
Underground Mining Systems	
Computer Programming and CAD	
Mineral Property Evaluation	
Surface Mining Systems	
Mine Power Systems	
Rock Mechanics and Ground Control	
Mine and Safety Management	
Ventilation	
Coal and Mineral Processing	
Mine Design	

Comments:

2. Rate the abilities that you have obtained as a result of the BS MinE degree that you are about to complete at WVU. A score of 5 indicates the highest level of ability while 1 indicates the lowest.

Abilities	Score
Design and conduct experiments	
Analyze and interpret data	
Develop implementation strategies	
Shape recommendations	
Apply math, science, and engineering to solve problems	
Computer Usage	
Oral communication	
Written communication	
Ability to work individually	
Ability to work on teams	
Formulate and solve problems	
Ability to work on multi-disciplinary teams	
Design, implement and improve integrated systems	
Ability to work on systems that include people, materials, information, equipment and energy	
Develop and maintain Professional Ethics	
Health and Safety Considerations	
Impact of engineering solutions on individuals and the society	

Comments:

3. On a scale of one to 5, indicate the possibility of you pursuing life long learning in your career, for example, attending conferences, professional development workshops, or attaining a graduate degree. A score of 5 indicates highest possibility while 1 indicates the lowest.

Ability	Score
Pursuit of life long learning	

4. To which degree do you think you have obtained the professional characteristics expected of a successful Mining Engineer as a result of the BS MinE degree you are about to complete at WVU? Give your answer on a scale of 1 to 5. A score of 5 indicates highest level while 1 indicates the lowest level.

Ability	Score
Professional and Ethical characteristics expected of a successful Mining Engineer	

### 5. Summer / Co-op / Internship Employment

If you have had an internship in mining engineering, please specify the dates, the companies, the job positions, and the amount of experience and knowledge gained in that particular position on a scale of 1 to 5.

	Period 1	Period 2	Period 3	Period 4
Dates?				
Company?				
Position Held?				
Experience Gained	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Knowledge Gained	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Comments:

## 6. Placement Information

- Have current job, not changing  Have current job, planning advancement
- Have job offer  Actively looking for job
- Will continue with graduate school  Will attend professional school (law, medicine)
- Other \_\_\_\_\_  
(please specify)

If you have a job, please complete the following

- Employer:  Private Industry  Government  Military  
 Self-Employed  Academia  Service Industry
- Salary:  < 40k  40k–49,999  50k-54,999  55k–59,999  
 60k-64,999  65k- 69,999  70k-74,999  > 75k
- Duties:  Training/Education  Consulting  Safety  
 Mine Engineering  Ergonomics  R&D  
 Sales/Marketing  Operations Research  Manufacturing  
 Personnel Supervision  Systems Analysis  Environ./Quality Control  
 Production Planning/Control  
 Other \_\_\_\_\_  
(please specify)
- Source of Job:  On Campus Interviews/Recruiting Fairs  Online/www  
 WVU Career Services  On my own  
 Summer Job/Internship  Networking
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Comments: