

Clemson University
Nieri Family Department of Construction Science & Management (N_JCSM) - Undergraduate Program

2021-2022 Quality/Outcome Assessment Plan

The Nieri Family Department of Construction Science and Management (N_JCSM) faculty and staff use information obtained through program and course-level assessment mechanisms and perception surveys to continuously evaluate and improve on the quality of the program curriculum and operations. Modifications are made only after careful consideration of data are obtained from all constituencies, including students, employers, alumni, advisory board members, and faculty. The continuous improvement plan employed by the N_JCSM undergraduate degree program is outlined below in Figure 1.

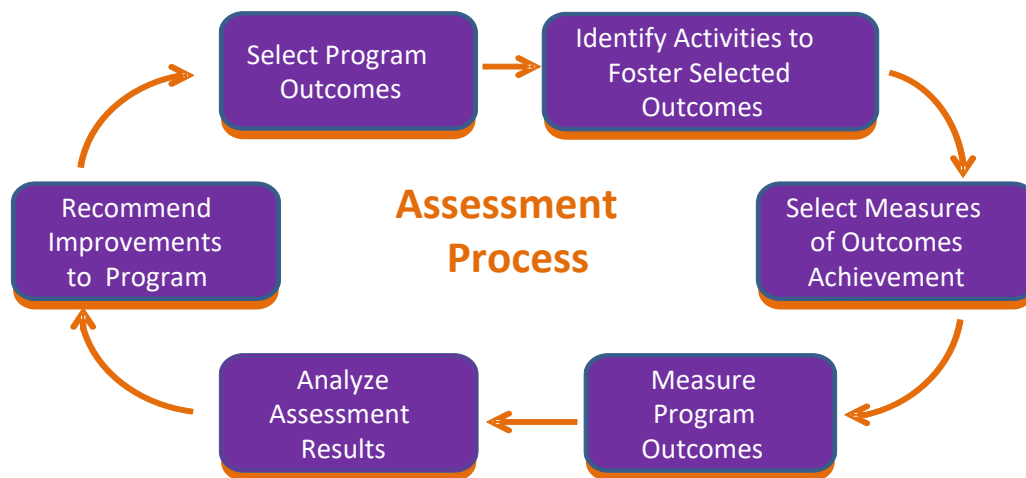


Figure 1. N_JCSM Undergraduate Degree Program Quality/Outcome Assessment Process

N_JCSM Undergraduate Degree Program Mission/Purpose - The mission of the Nieri Family Department of Construction Science and Management undergraduate CSM degree program is to offer a comprehensive program of education, scholarly and service activities, consistent with the Mission of Clemson University and the College of Architecture, Arts and Humanities, for the purpose of improving the quality of the construction industry and thus the built environment.

N_JCSM Undergraduate Degree Program Goals (G's)

- G 1: Excel in the education of undergraduate CSM majors through a vigorous program of academic learning designed to produce motivated, well-educated, responsible citizens with the management and technical skills requisite for leadership positions in the construction industry.
- G 2: Foster Clemson University's service mission by providing outreach activities for the construction industry and the public, both nationally and internationally.

G 3: Assist in attaining Clemson University's funded research goals by conducting and disseminating the results of research and development, and/or conducting educational courses for the construction industry.

N₇CSM Undergraduate Degree Program Objectives/Outcomes (PO's)

- PO 1: Oral and written communication skills - Upon graduation, students will be able to demonstrate the ability to effectively communicate orally and in writing (G1).
- PO 2: Practices of effective management - Upon graduation, students shall be able to describe practices of effective management of personnel, materials, equipment, costs and time (G1).
- PO 3: Facilitate Advancement of Knowledge - Upon graduation students will facilitate advancement within the field of the management of construction processes by demonstration of ability to define problems and recognize solutions; further students will demonstrate an ability to apply creativity, teamwork and evaluation in their work (G1).
- PO 4: Professional Ethics - Upon graduation, students will demonstrate an understanding of professional ethics (G1).
- PO 5: The undergraduate program will retain its accreditation by the American Council for Construction Education (G1 & G2).
- PO 6: Faculty will have papers published in peer-reviewed publications (G2 & G3).

N₇CSM Undergraduate Degree Program Student Learning Outcomes (20 ACCE SLO's):

- SLO 1: Create written communications appropriate to the construction discipline;
- SLO 2: Create oral presentations appropriate to the construction discipline;
- SLO 3: Create a construction project safety plan;
- SLO 4: Create construction project cost estimates;
- SLO 5: Create construction project schedules;
- SLO 6: Analyze professional decisions based on ethical principles;
- SLO 7: Analyze construction documents for planning and management of construction processes;
- SLO 8: Analyze methods, materials and equipment used to construct projects;
- SLO 9: Understand construction management skills as an effective member of a multi-disciplinary team;
- SLO 10: Apply electronic-based technology to manage construction projects;
- SLO 11: Apply basic surveying techniques for construction layout and control;
- SLO 12: Understand different methods of project delivery and the roles and responsibilities of all constituents involved in the design and construction process;
- SLO 13: Understand construction risk management;
- SLO 14: Understand construction accounting and cost control;
- SLO 15: Understand construction quality assurance and control;
- SLO 16: Understand construction project control processes;
- SLO 17: Understand the legal implications of contract, common and regulatory law to manage a construction project;
- SLO 18: Understand the basic principles of sustainable construction;
- SLO 19: Understand the basic principles of structural behavior;
- SLO 20: Understand the basic principles of mechanical, electrical and plumbing systems.

Table 1 Correlations between N_JCSM Goals, Program Outcomes, and Student Learning Outcomes

N _J CSM Undergraduate Degree Program Goals (G 1-G 3)	N _J CSM Undergraduate Degree Program Objectives/Outcomes (PO 1- PO 6)	N _J CSM Undergraduate Degree Program Student Learning Outcomes (SLO 1-SLO 20)	Other N _J CSM Undergraduate Degree Program Requirements/ Activities
G 1 – Excellent Undergraduate CSM Education	PO 1 – Effective Communication Skills	SLO 1 & SLO 2	1) Required 800 hours of Construction Industry Internship/Experiential Learning.
	PO 2 – Effective Construction Management Skills	SLO 12-SLO 20	
	PO 3 – Facilitate Advancement of Construction Management Knowledge	SLO 3-5 & SLO 7-11	
	PO 4 – Professional Ethics	SLO 6	
G 1, G 2 & G 3	PO 5 – Maintain Program National Accreditation	SLO 1-SLO 20	ACCE Accreditation
G 2 - Industry Outreach & G 3 - Research	PO 6 – Faculty Publications & Presentations		1) Annual Clemson Construction Symposium; 2) Annual CSM Alumni Golf Tournament; and 3) Faculty Publications.

Constituencies: N_JCSM Students , Faculty, Industry Advisory Board Members, Alumni, and Employers.

Targets: At least 70% achieve/respond \geq 70% on all noted measures.

Frequency of Data Collection: Student performance data from N_JCSM department courses are collected and assessed annually; N_JCSM Alumni and Employer survey data are collected every three years, and assessed on a three-year cycle (i.e. Fall 2021 and again in Fall 2024).

Frequency of Comprehensive N_JCSM Program Assessment: N_JCSM Program Assessment is conducted on a three-year cycle, (i.e. Fall 2021 and again in Fall 2024).

Measures: See Figure 2, and the following pages for specific ACCE Student Learning Outcomes (SLO's), as measured and assessed annually.

BCSM 2021-2022 Outcome Assessment Plan

Courses / ACCE SLO's	SLOs																				
	1. Create written communications appropriate to the construction discipline.	2. Create oral presentations appropriate to the construction discipline.	3. Create a construction project safety plan.	4. Create construction project cost estimates.	5. Create construction project schedules	6. Analyze professional decisions based on ethical principles.	7. Analyze construction documents for planning and management of construction processes.	8. Analyze methods, materials, and equipment used to construct projects.	9. Understand construction management skills as a member of a multidisciplinary team.	10. Apply electronic-based technology to manage the construction process.	11. Apply basic surveying techniques for construction layout and control.	12. Understand different methods of project delivery and the roles and responsibilities of all constituencies involved in the design and construction process.	13. Understand construction risk management.	14. Understand construction accounting and cost control.	15. Understand construction quality assurance and control.	16. Understand construction project control processes.	17. Understand the legal implications of contract, common, and regulatory law to manage a construction project.	18. Understand the basic principles of sustainable construction.	19. Understand the basic principles of structural behavior.	20. Understand the basic principles of mechanical, electrical and piping systems.	
CSM 1000			CO-3,9		CO-3	CO-1,4,5						CO-2			CO-3						
CSM 2010								CO-2,6													
CSM 2030								D							CO 1-7						
CSM 2040							CO 1-10											CO-9,10			
CSM 2050								D							CO 1-7			CO-9			
CSM 2060										D										D	
CSM 2070						CO-5						CO 2-3		CO-1				CO-4			
CSM 3040							CO-3,4,6											CO-12			D
CSM 3050							CO-5,7,14											CO-1,10	CO-11-13		D
CSM 3060										D											
CSM 3070																		CO 1-9			
CSM 3510					CO 1-4	CO-5	D				CO-3										
CSM 3520					D	CO-12					CO-10										
CSM 3530				D		CO-4		CO-1,2		D				CO-5							
CSM 4110			D																		
CSM 4500	D	D	I	I	I	I	I	I	D	I	I	D	D	I	D	D	D	D	D	D	I
CSM 4530	I	I	CO-15			CO-7			CO-5,6	CO-10,11		D	CO-3	D	D	D	CO 1-4,16	CO-9			
CSM 4610						D							D	D							
LEED G.A. Exam																		D			

Direct Assessment: Direct Indirect Assessment: Indirect Course Outcomes (CO): CO

Figure 2. 2021-2022 ACCE Student Learning Outcomes and Associated Assessment Measures & Results.

Quality Assessment Plan for 2021-2022

Student Learning Outcomes/Objectives, Measures and Achievement Targets:

1. Create written communications appropriate to the construction discipline (ACCE SLO #1/PO 1).

Direct Measure: Student performance on specific written assignments in CSM 4500 using a standard grading rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4500 - Construction Internship - Direct Measure	84%	100%	100%	
CSM 4500 - Construction Internship - Indirect Measure	84%	90%	90%	

Notes: Targets met for the past 3 years – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_fCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

2. Create oral presentations appropriate to the construction discipline (ACCE SLO #2/PO 1).

Direct Measures: Student performance on oral presentations in CSM 4500 using a standard grading rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4500 - Construction Internship - Direct Measure	84%	100%	100%	
CSM 4500 - Construction Internship - Indirect Measure	84%	90%	90%	

Notes: Targets met for the past 3 years – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_fCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

3. Create a construction project safety plan (ACCE SLO #3/PO 3).

Direct Measure: Student performance on specific course assignments in CSM 4110 using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4110 - Safety in Construction - Direct Measure	100%	100%	86%	
CSM 4500 - Construction Internship - Indirect Measure	64%	85%	77%	

Notes: Targets met for the past 3 years – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_fCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

4. Create construction project cost estimates (ACCE SLO #4/PO 3).

Direct Measure: Student performance on specific course assignments in CSM 3530 using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 3530 - Construction Estimating II - Direct Measure	89%	86%	85%	
CSM 4500 - Construction Internship - Indirect Measure	94%	94%	92%	

Notes: Targets met for the past 3 years – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

5. Create construction project schedules (ACCE SLO #5/PO 3).

Direct Measure: Student performance on specific course assignments in CSM 3520 using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 3520 - Construction Scheduling - Direct Measure	100%	85%	89%	
CSM 4500 - Construction Internship - Indirect Measure	62%	46%	80%	

Notes: Targets met in 2020-21 – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

6. Analyze professional decisions based on ethical principles (ACCE SLO #6/PO 4).

Direct Measure: Student performance on a specific course assignment in CSM 4610 using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4610 - Construction Economics Seminar - Direct	---	---	91%	
CSM 4500 - Construction Internship - Indirect Measure	90%	95%	90%	

Notes: Targets met in 2020-21 – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

7. Analyze construction documents for planning and management of construction processes (ACCE SLO #7/PO 3).

Direct Measure: Student performance on specific course assignments in CSM 3510 using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 3510 - Construction Estimating I - Direct Measure	---	---	87%	
CSM 4500 - Construction Internship - Indirect Measure	96%	97%	94%	

Notes: Targets met in 2020-21 – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

8. Analyze methods, materials and equipment used to construct projects (ACCE SLO #8/PO 3).

Direct Measure: Student performance on the cumulative Final Exams in CSM 2030 and CSM 2050.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 2030 - Materials & Methods I - Direct Measure	---	---	77%	
CSM 2050 - Materials & Methods II - Direct Measure	---	---	79%	
CSM 4500 - Construction Internship - Indirect Measure	92%	91%	98%	

Notes: Targets met in 2020-21 – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

9. Understand construction management skills as an effective member of a multi-disciplinary team (ACCE SLO #9/PO 3).

Direct Measure: Student performance on specific written assignments in CSM 4500 using a standard grading rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4500 - Construction Internship - Direct Measure	---	91%	79%	
CSM 4500 - Construction Internship - Indirect Measure	88%	95%	90%	

Notes: Targets met for the past 2 years – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

10. Apply electronic-based technology to manage construction projects (ACCE SLO #10/PO 3).

Direct Measures: Student performance on specific course assignments in CSM 3060 and/or CSM 3530, using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 3060 - Emerging Technologies - Direct Measure	85%	89%	88%	
CSM 3530 - Construction Estimating II - Direct Measure	89%	96%	93%	
CSM 4500 - Construction Internship - Indirect Measure	82%	83%	82%	

Notes: Targets met for the past 3 years – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

11. Apply basic surveying techniques for construction layout and control (ACCE SLO #11/PO 3).

Direct Measures: Student performance on specific course assignments in CSM 2060 using a standard grading rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 2060 - Construction Science Workshop - Direct	---	---	---	
CSM 4500 - Construction Internship - Indirect Measure	63%	76%	76%	

Notes: Targets generally met in 2020-21 – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

12. Understand different methods of project delivery and the roles and responsibilities of all constituents involved in the design and const. process (ACCE SLO #12 /PO 2).

Direct Measures: Student performance on specific course assignments in CSM 4500 and CSM 4530, using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4500 - Construction Internship - Direct Measure	---	91%	90%	
CSM 4530 - Project Management - Direct Measure	---	---	95%	
CSM 4500 - Construction Internship - Indirect Measure	92%	93%	90%	

Notes: Targets met in 2020-21 – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

13. Understand construction risk management (ACCE SLO #13/PO 2).

Direct Measures: Student performance on specific course assignments in CSM 4500 and CSM 4610, using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4500 - Construction Internship - Direct Measure	---	85%	88%	
CSM 4610 - Construction Economics Seminar - Direct	---	---	95%	
CSM 4500 - Construction Internship - Indirect Measure	86%	80%	84%	

Notes: Targets met in 2020-21 – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

14. Understand construction accounting and cost control (ACCE SLO #14/PO 2).

Direct Measures: Student performance on specific course assignments in CSM 4530 and CSM 4610, using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4530 - Construction Project Management - Direct	---	---	75%	
CSM 4610 - Construction Economics Seminar - Direct	---	---	91%	
CSM 4500 - Construction Internship - Indirect Measure	84%	66%	72%	

Notes: Targets met in 2020-21 – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

15. Understand construction quality assurance and control (ACCE SLO #15/PO 2).

Direct Measures: Student performance on specific course assignments in CSM 4500 and CSM 4530, using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4500 - Construction Internship - Direct Measure	---	85%	84%	
CSM 4530 - Const. Project Management - Direct Meas.	94%	100%	80%	
CSM 4500 - Construction Internship - Indirect Measure	86%	79%	82%	

Notes: Targets met for the past 3 years – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

16. Understand construction project control processes (ACCE SLO #16/PO 2).

Direct Measures: Student performance on specific course assignments in CSM 4500 and CSM 4530, using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4500 - Construction Internship - Direct Measure	---	85%	84%	
CSM 4530 - Const. Project Management - Direct Meas.	100%	100%	75%	
CSM 4500 - Construction Internship - Indirect Measure	86%	85%	76%	

Notes: Targets met for the past 2 years – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

17. Understand the legal implications of contract, common and regulatory law to manage a construction project (ACCE SLO #17/PO 2).

Direct Measures: Student performance on specific course assignments in CSM 4500, using a standard grading rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4500 - Construction Internship - Direct Measure	---	88%	88%	
CSM 4500 - Construction Internship - Indirect (Post)	73%	75%	74%	

Notes: Targets met for the past 2 years – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

18. Understand the basic principles of sustainable construction (ACCE SLO #18/PO 2).

Direct Measures: Student performance on specific course assignments in CSM 4500, using a standard grading rubric.

Indirect Measures: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 4500 - Construction Internship - Direct Measure	---	88%	88%	
CSM 4500 - Construction Internship - Indirect Measure	94%	90%	80%	

Notes: Targets met in 2020-21 – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

19. Understand the basic principles of structural behavior (ACCE SLO #19/PO 2).

Direct Measures: Student performance on specific course assignments in CSM 2060 and CSM 4500, using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 2060 - Construction Science Workshop - Direct	---	---	---	
CSM 4500 - Construction Internship - Direct Measure	---	---	88%	
CSM 4500 - Construction Internship - Indirect Measure	68%	82%	78%	

Notes: Targets met in 2020-21 – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

20. Understand the basic principles of mechanical, electrical and plumbing systems (ACCE SLO #20/PO 2).

Direct Measures: Student performance on specific course assignments in CSM 3040 and CSM 3050, using standard grading rubrics.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2018-19	2019-20	2020-21	2021-22
CSM 3040 - Environmental Systems I -Direct Measure	---	---	82%	
CSM 3050 - Environmental Systems II -Direct Measure	---	71%	77%	
CSM 4500 - Construction Internship - Indirect Measure	88%	81%	96%	

Notes: Targets met in 2020-21 – Continue to Monitor Student Performance in 2021-22. To avoid potential grade inflation, the N_JCSM Faculty elected to maintain the performance Targets at 70% ≥ 70% again for 2021-22.

21. CSM Program Learning Outcomes (PO 1-4).

Indirect Measures: Alumni, Employer and Graduating Senior Perception Surveys.

Program Measures:	2016-17	2017-18	2018-19	2019-20	2020-21
Alumni Survey - Indirect Measure	---	91%	---	---	89%
Intern Employer Survey - Indirect Meas.	---	100%	---	---	---
Alumni Employer Survey - Indirect	---	100%	---	---	100%
Senior Exit Interview Survey - Indirect	---	---	100%	100%	95%
AC Exam - Direct Measure	86%	88%	80%	71%	81%

Notes: Targets met in 2020-21 – Continue to Monitor Student Performance in 2021-22. No longer use AIC AC Exam for assessment purposes going forward.

August 13, 2021