

NORTHERN
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College of Engineering, Forestry, and Natural Sciences

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NAU Engineering & 1+2+1 Program

What Engineering Programs
offer the 1+2+1 program, and
some issues, lessons, and
solutions.

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Environmental Engineering

Seminar on STEAM
June 21, 2011, Chengdu, Sichuan

Outline

- NAU's Engineering & 1+2+1
 - Programs
 - Design-4-Practice
- Issues, Lessons, and Solutions
- Integrating Curricula – A Pilot Study
- Pilot study finding & overall thoughts

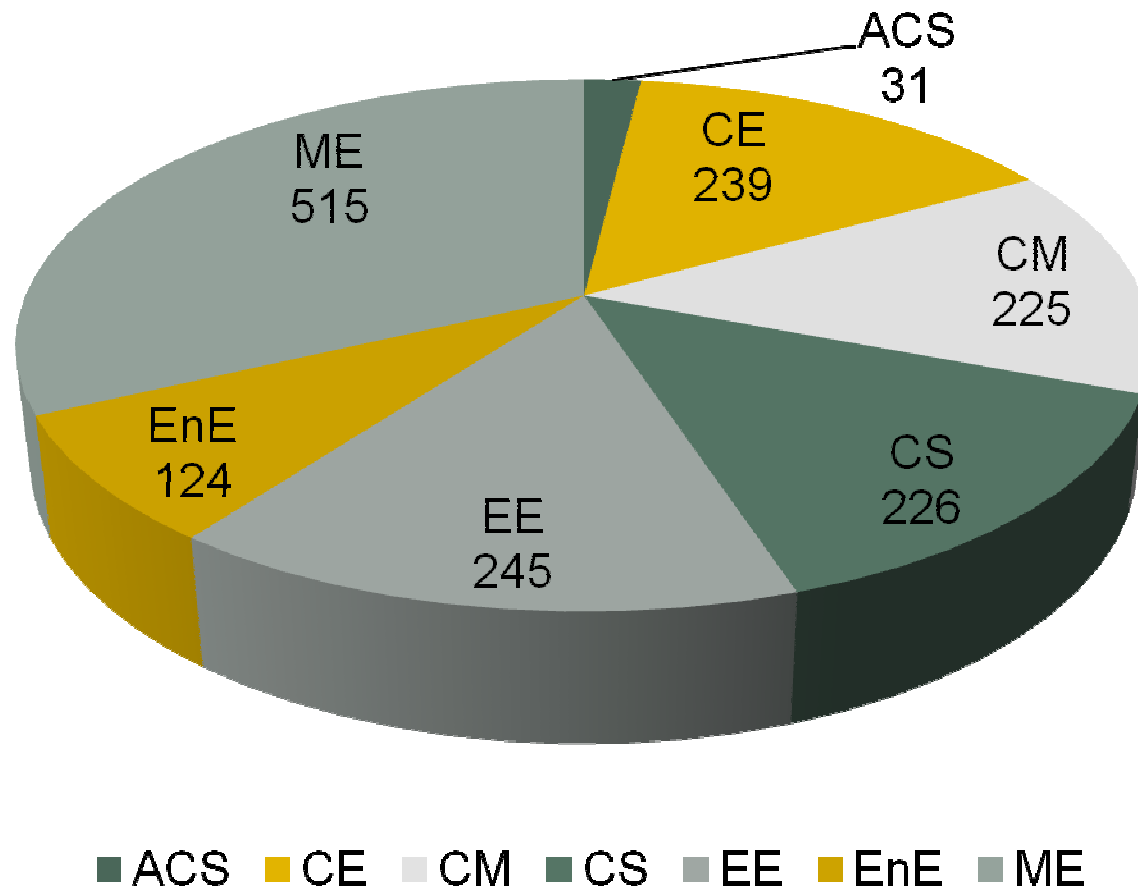
Acknowledgement

- Christine Drake
 - Academic Advisor for Engineering
 - Works with all 1+2+1 engineering students

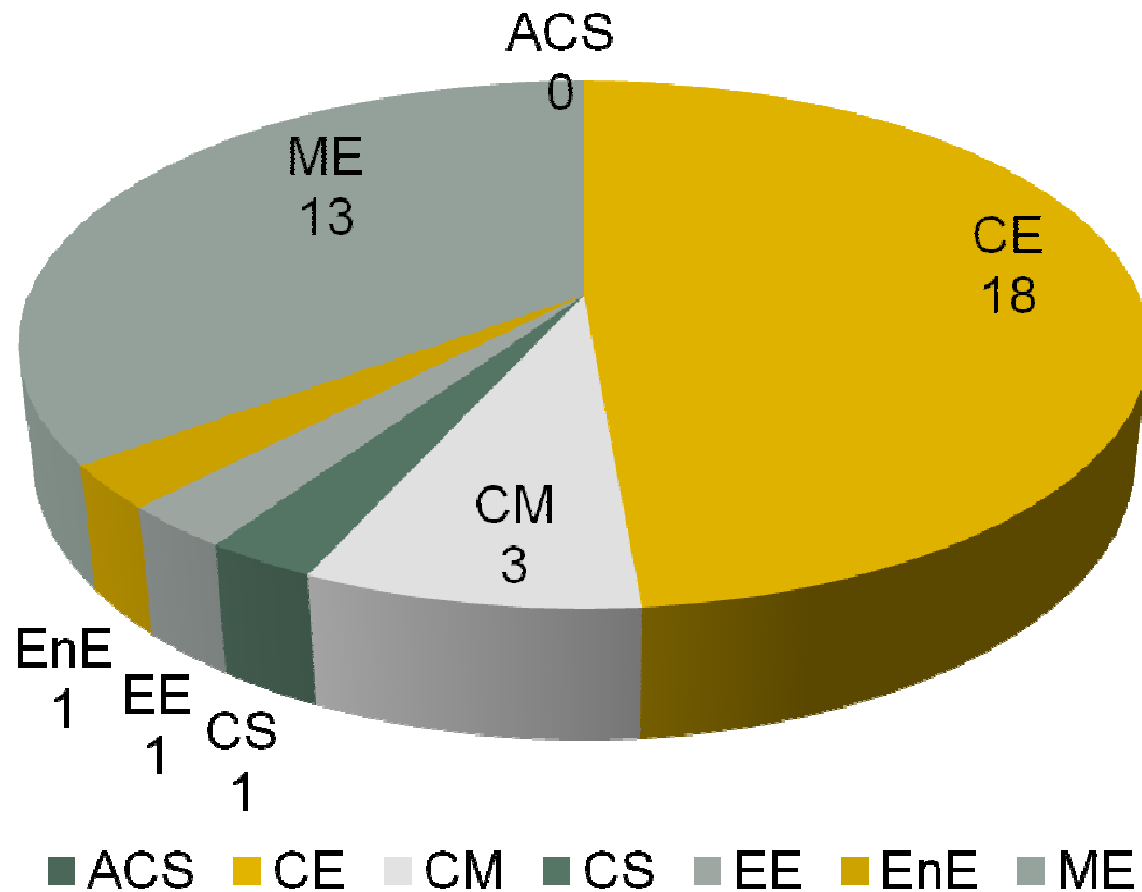
NAU Engineering Program Degrees

Degree Program	BS	Minor	MS	MEng
Civil Engineering	✓	✓	✓	✓
Computer Science & Applied Computer Science	✓ ✓	✓	✓	
Construction Management & Construction Planning	✓	✓ ✓		
Electrical Engineering	✓	✓	✓	✓
Environmental Engineering	✓	✓	✓	✓
Mechanical Engineering	✓	✓	✓	✓

NAU Engineering Students



Distribution of 1+2+1 Students



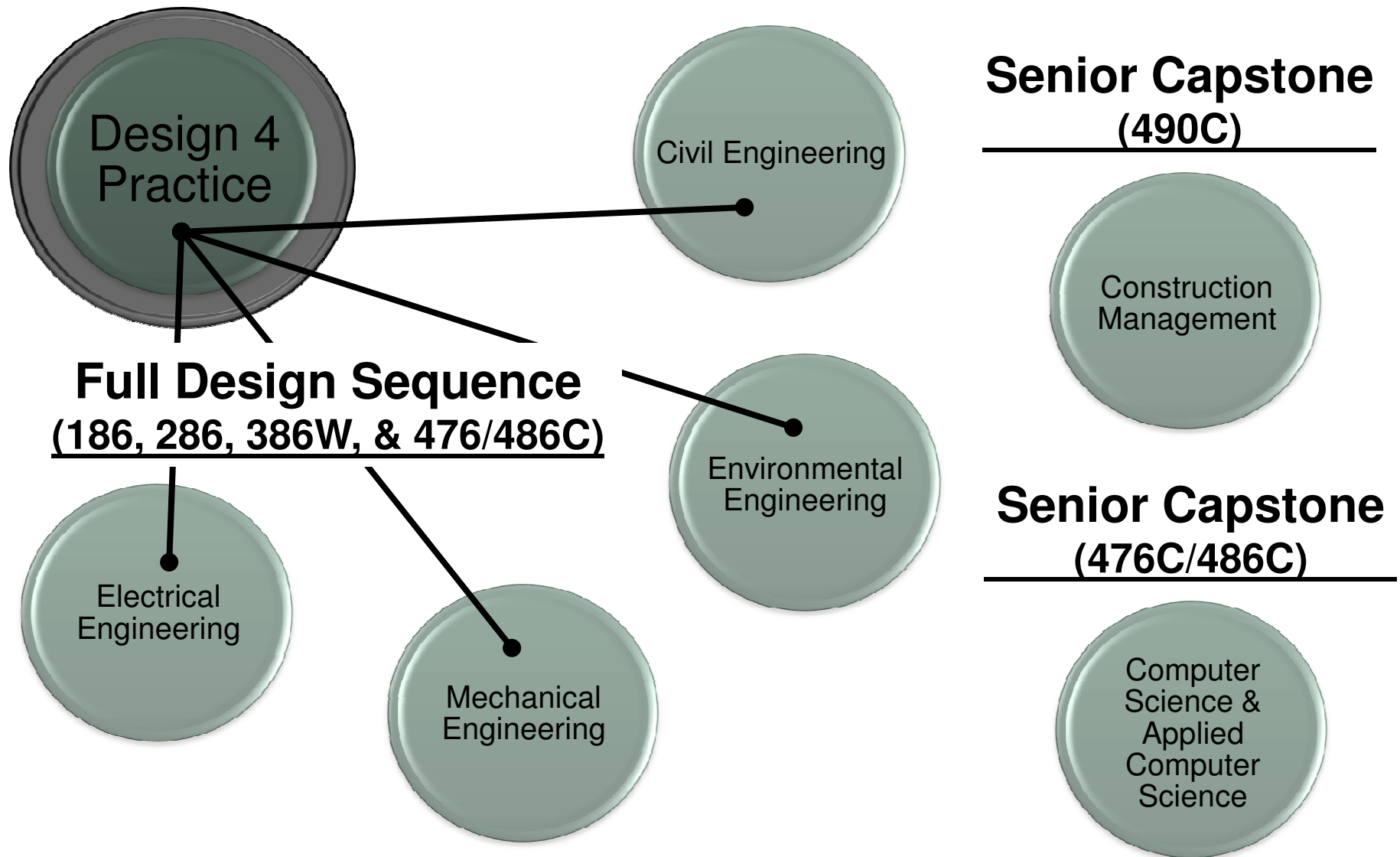
NAU Engineering – other features

- Ranked 5 consecutive years in top 50 undergraduate programs (*U.S. News and world Report*)
- New Integrated Masters program
- Design 4 Practice Program

NAU Engineering & D4P Program

- Design 4 Practice Program
 - 4-year sequence of design courses
 - CE, EE, EnE, & ME
 - Essential “hands-on” design experiences
 - Develops skill in design process and methods, and synthesis of knowledge
 - Encourages creative and innovative solutions to open-ended problems

NAU Engineering & D4P Program



NAU Engineering & D4P Program

- Design 4 Practice Program (cont.)
 - Interdisciplinary design collaboration



NAU Engineering & D4P Program

- Design 4 Practice Program (cont.)
 - Interdisciplinary design collaboration
 - Non-technical skills
 - Teams
 - Management
 - Communications



Some 1+2+1 Issues

- English Language Preparation
- Receipt of Final Chinese Transcripts
- Chinese Course Descriptions
- Timely Completion of Program Curricula

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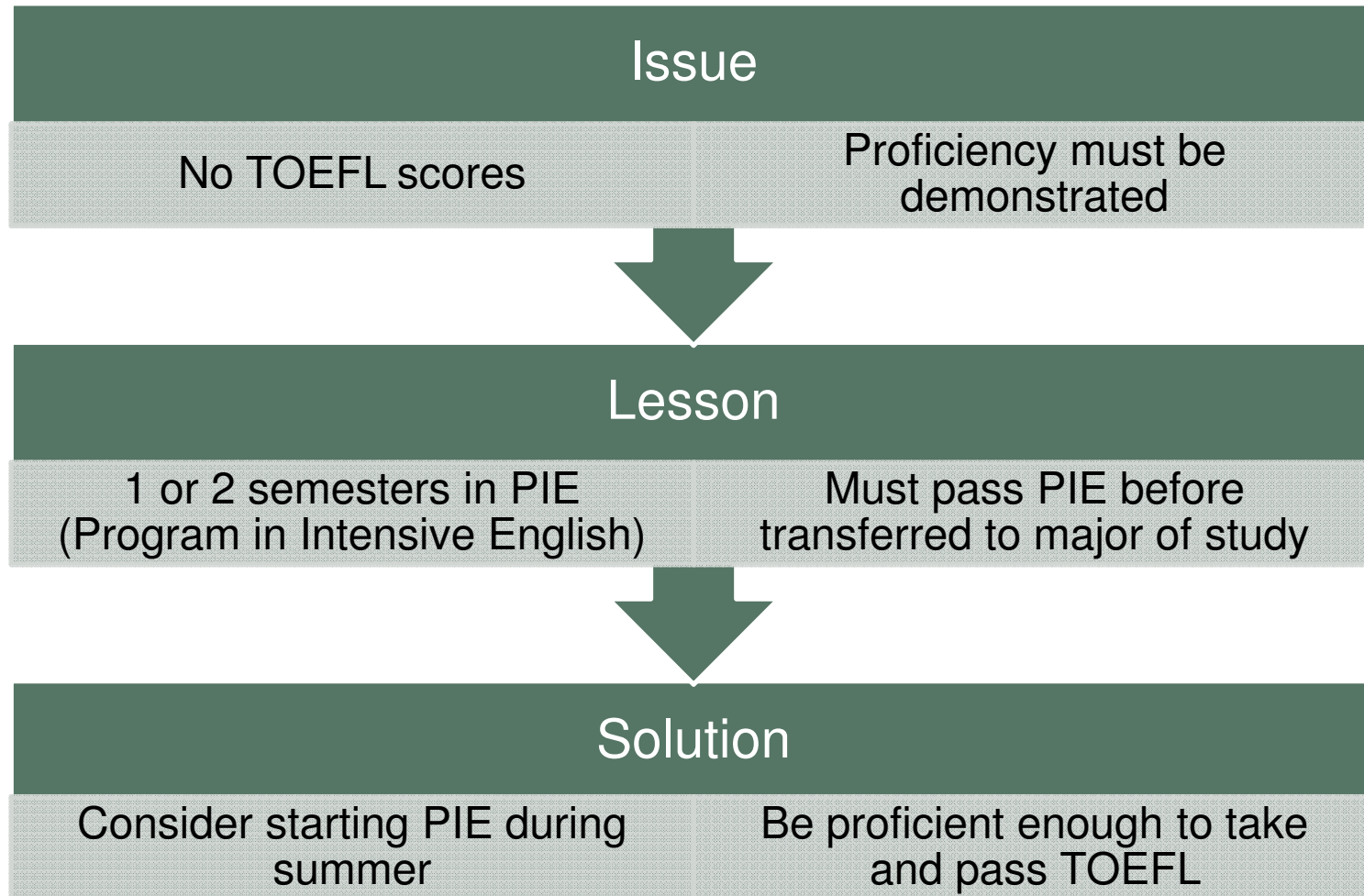
XUST Pilot Project

Integration of International Curricula

- Could 1+2+1 students complete last semester at home?
- Evaluate integration as part of program assessment process

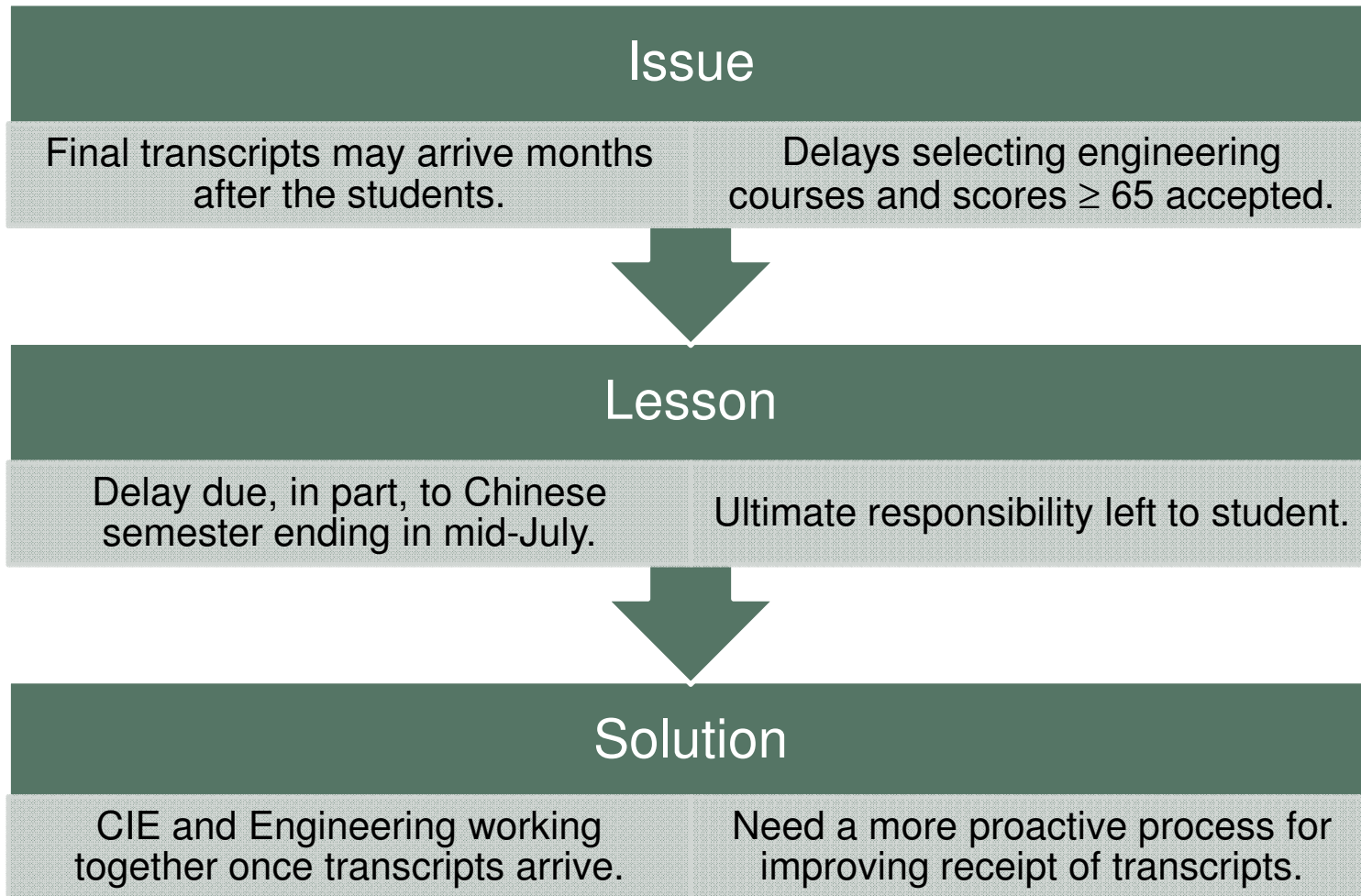
Issues, Lessons, & Solutions

- English Language Preparation



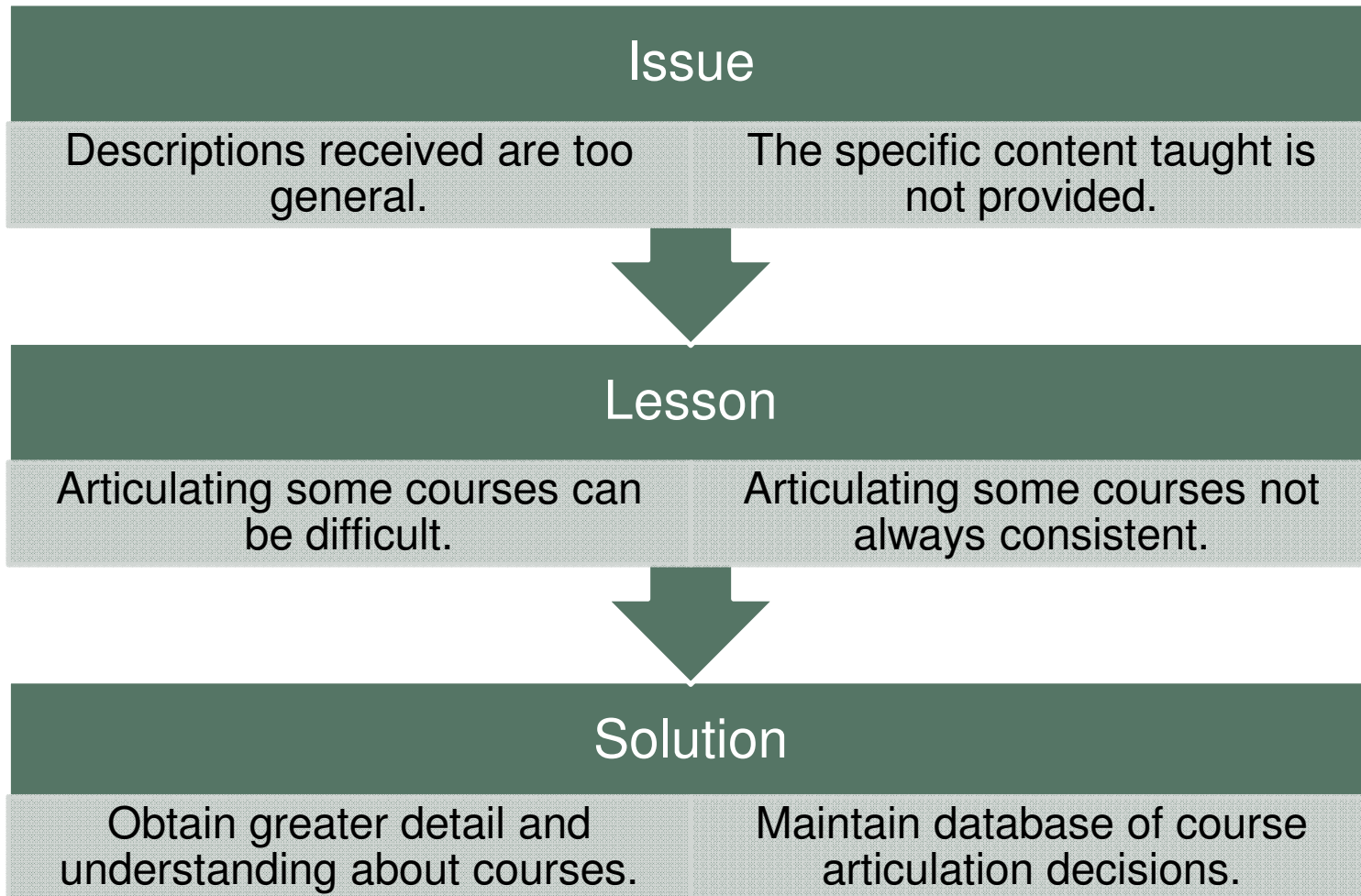
Issues, Lessons, & Solutions

- Receipt of Final Chinese Transcripts



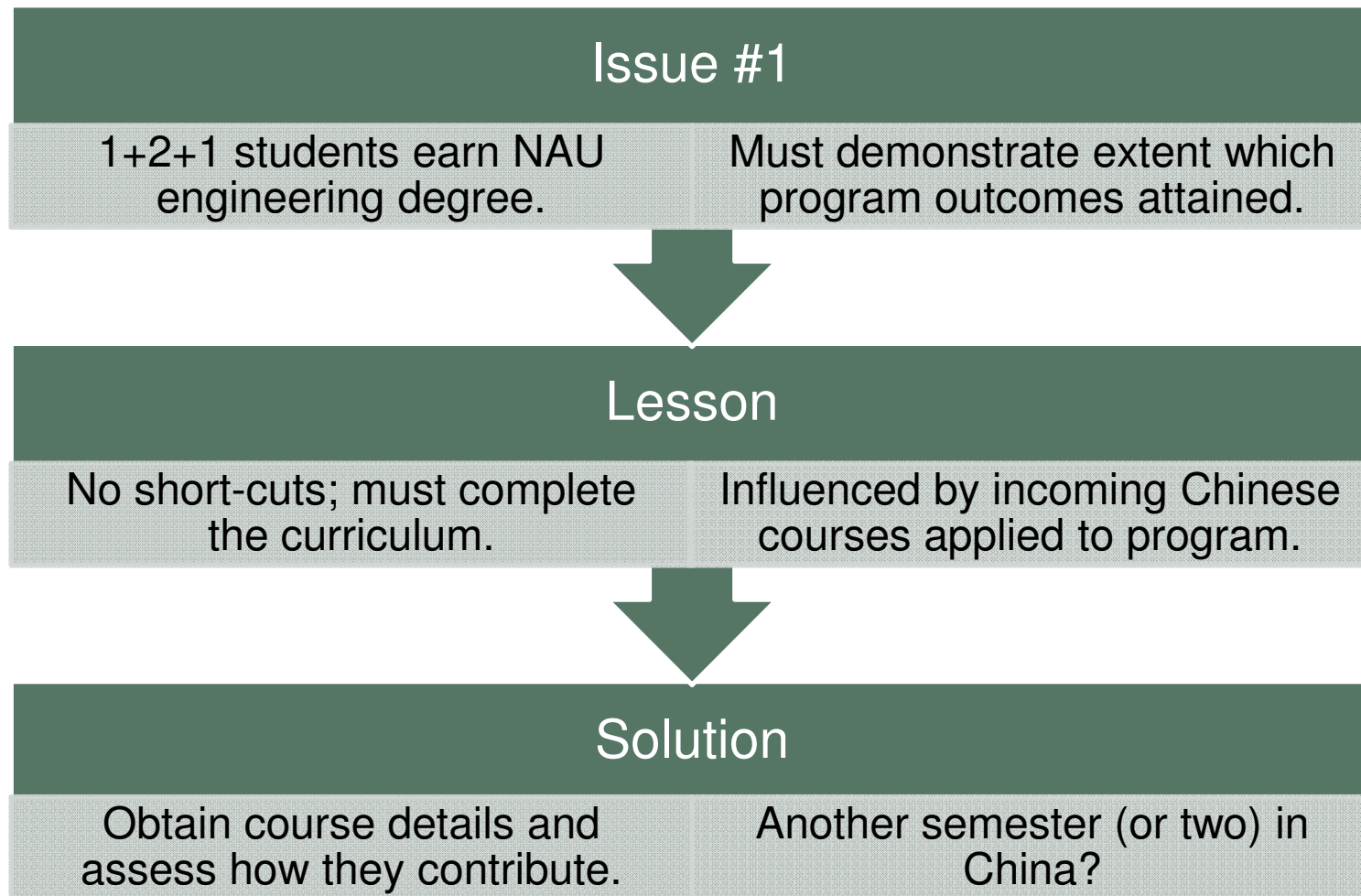
Issues, Lessons, & Solutions

- Chinese Course Descriptions



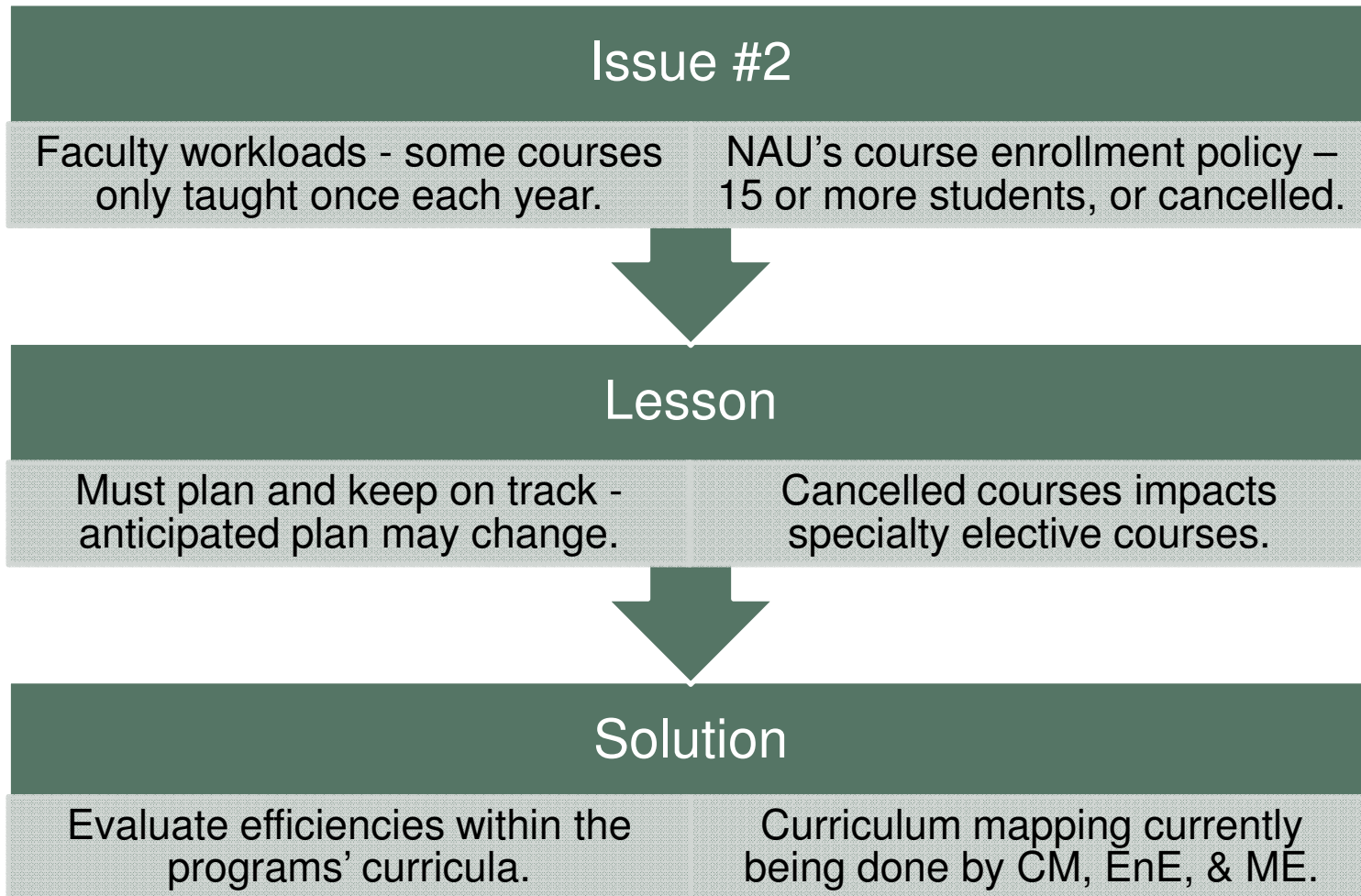
Issues, Lessons, & Solutions

- Timely Completion of Program Curricula



Issues, Lessons, & Solutions

- Timely Completion of Program Curricula



Integrating International Curricula

- Rationale and process to include international courses into a curriculum
 - Uses 3 ABET Engineering Accreditation Commission criteria
 - Uses new assessment tools
 - Evaluates course relevance and contribution to program
 - Any course – domestic or international

XUST Pilot Study -

- Evaluates 1+2+1 student examples
- Seeks to answer the questions . .
 - Could 1+2+1 students complete some upper-level coursework in China?
- Information needed
 - How XUST courses contribute to NAU program

XUST Pilot – CE & EnE Programs

- Initial data collected in March 2011

NORTHERN ARIZONA UNIVERSITY International Course Assessment Data
COLLEGE OF ENGINEERING, FORESTRY, AND NATURAL SCIENCES

Engineering Program: Civil Engineering (BSE) ABET Review Cycle: 2010-2011
Institution: Xi'an University of Science and Technology
Course Name: Bridge 1 (+ Bridge 2)
Course Code: B2042013-ACE 3208 Requirement: Required
Credit Hours: 4 Compiled by: [select] Print Date: 5/25/2011

A.I. ABET EAC Criterion 3. Program Outcomes (Major contribution) [Click cells to open list.](#)

- a. Mathematics, Science & Engineering
- e. Solve Engineering Problems
- j. Knowledge of Contemporary Issues

A.II. ABET EAC Criterion 3. Program Outcomes (Minor contribution)

- c. Ability to Design a System
- d. Multi-disciplinary Teams
- i. Lifelong Learning

B. ABET EAC Criterion 5. Curriculum. [Click cells to open list.](#)

Math & Science =	4
Engineering Topics	0
Engrg. Science =	0 Enter hours appropriate for course
Engrg. Design =	0 Enter hours appropriate for course
General Education =	0
Total =	4

C. ABET EAC Program Criteria for Civil Engineering

- i. Apply knowledge of mathematics through differential equations
Credit hours = 0.5 [Enter hours of knowledge applied](#)
Content: Mathematical analysis of arch bridge stress.
- ii. Apply knowledge of calculus-based physics [Type content that applies knowledge](#)
Credit hours = 0
Content:
- iii. Apply knowledge of chemistry
Credit hours = 0
Content:
- iv. Apply knowledge of at least one additional area of science (e.g., biology, geology)
Credit hours = 0
Content:



XUST Pilot – Analysis & Evaluation



COLLEGE OF ENGINEERING, FORESTRY, AND NATURAL SCIENCES

Print Date: 5/27/2011

Printed by: T. Baxter

ABET EAC Criterion 3 - Outcomes Map

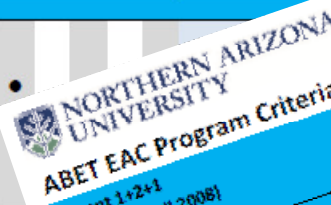
Current 1+2+1 Student A (Fall 2008)			Catalog Year: 2008 - 2009										Civil Engineering (BSE)			
			International Institution Transfers: Xi'an University of Science and Technology													
Course	Title	Credit Hrs.	ABET Criterion 3 Outcomes											GLOBAL		
			a	b	c	d	e	f	g	h	i	j	k	G	S	D
1st Semester (Courses Transferred into Program)		11	hours													
PHY 161	University Physics I (w/ Lab)	4	●	●												
MAT 136	Calculus I	4	●													
DBC 1102	Descriptive Geometry and Architectural Drawing I	3					⊙		●							



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ABET EAC Program Criteria

Current 1+2+1
Student A (Fall 2008)



ABET EAC Program Criteria for CE - Curriculum Component Map

Current 1+2+1
Student A (Fall 2008)

Print Date: 5/27/2011
Printed by: T. Baxter

Current 1+2+1 Student A (Fall 2008)		Catalog Year: 2008 - 2009										Civil Engineering (BSE)		
		International Institution Transfers: Xi'an University of Science and Technology												
Course	Title	Credit Hrs.	ABET Criterion 3 Outcomes											
			a	b	c	d	e	f	g	h	i	j	k	GLOBAL
														G S D
1st Semester (Courses Transferred into Program)		11	hours											
PHY 161	University Physics I (w/ Lab)	4	•	•										
MAT 136	Calculus I	4	•											
DBC 1102	Descriptive Geometry and Architectural Drawing I	3					⊙							

ABET EAC Program Criteria for CE - Curriculum Component Map

Current 1+2+1
Student A (Fall 2008)

Print Date: 5/27/2011
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COLLEGE OF ENGINEERING, FI

ABET EAC Criterion 5 - Professional Component Map

Current 1+2+1
Student A (Fall 2008)

Print Date: 5/27/2011
Printed by: T. Baxter

ABET EAC Criterion 5 - Professional Component Map														
Current 1+2+1														
Student A (Fall 2008)														
Course														
1st Semester (Courses Transferred into Program)														
PHY 161	University Physics I (w/ Lab)	4	•	•										
MAT 136	Calculus I	4	•											
DBC 1102	Descriptive Geometry and Architectural Drawing I	3					⊙							

Semester (Courses Transferred into Program)		Title		International Institution Transfers:			XUST		Catalog Year:			Civil Engineering	
				Credit Hrs.	(a) Math & Science	(b) Engrg. Science	(b) Engrg. Design	(c) Gen. Educ.					
				11	hours								
PHY 161	University Physics I (w/ Lab)	4		4	•	•							
MAT 136	Calculus I	4		4	•								
DBC 1102	Descriptive Geometry and Architectural Drawing I	3		0			•						
				17	hours								
CE 180	Computer Aided Drafting (w/Lab)	2		0.1									
CE 251	Applied Mechanics: Statics	3		1	1.9								
CE 351	General Chemistry I	4		4	2	•							
CE 351	General Chemistry I Lab	1		1	0	•							

2nd Semester		Computer Aided Drafting (w/Lab)
CENE 180		Applied Mechanics: Statics
CENE 251		General Chemistry I
CHM 151		General Chemistry I Lab
CHM 151L		

2nd Semester		Computer Aided Drafting (w/Lab)
CENE 180		Applied Mechanics: Statics
CENE 251		General Chemistry I
CHM 151		General Chemistry I Lab
CHM 151L		

2nd Semester		Computer Aided Drafting (w/Lab)
CENE 180		Applied Mechanics: Statics
CENE 251		General Chemistry I
CHM 151		General Chemistry I Lab
CHM 151L		

2nd Semester		Computer Aided Drafting (w/Lab)
CENE 180		Applied Mechanics: Statics
CENE 251		General Chemistry I
CHM 151		General Chemistry I Lab
CHM 151L		

2nd Semester		Computer Aided Drafting (w/Lab)
CENE 180		Applied Mechanics: Statics
CENE 251		General Chemistry I
CHM 151		General Chemistry I Lab
CHM 151L		

2nd Semester		Computer Aided Drafting (w/Lab)
CENE 180		Applied Mechanics: Statics
CENE 251		General Chemistry I
CHM 151		General Chemistry I Lab
CHM 151L		

XUST Pilot – Findings

- Upper-level XUST courses could be used
 - Capstone articulation should be evaluated
 - Integrated curricula requires articulation to occur both ways
 - Continuous assessment for improvements will be necessary



XUST Pilot – Findings (cont.)

- New assessment tools are valuable
 - Documents course contributions to criteria
 - Curriculum change decisions based on data not “gut feeling”
 - Provides method for faculty to reconsider value of course content



Overall Thoughts on 1+2+1

- 1+2+1 progra has been positive
- Seek efficiency & consistency
 - NAU engineering programs
 - 1+2+1 program process and transfer credits
- Useful considerations
 - Begin with English proficiency
 - Additional semester in China and more courses to transfer