Problem Based Learning: Key Learnings From An Instructional Model Implementation With Client Partners

Zain Ali
Nanxi Meng
Lin Lin
Fu-Ling Chung

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Is traditional higher education failing our students?

- According to College Atlas (2018)
  - 70% of Americans will study at a four-year college
  - Less than 62% will graduate with a degree in 6 years
  - 30% of the students drop out of college at the end of the first year across all the universities in the United States.

- According to LendEDU (2018)
  - 55% of students in United States struggled to find the money to pay for college
  - 51% dropped out of college because of financial issues.

Many Post-Secondary institutes have prioritized soft skills acquisition to increase student employment probability

- Top three desired skills by employers according to National Association of Colleges and Employers (NACE, Peck, 2017)
  - Communications
  - Problem-solving
  - Collaboration

- According to Krause (2009)
  - Employers want to hire graduates that already have eight NACE identified essential skills
  - Essential skills should have been developed in college

- Bauer-Wolf study (2019) found employers reported having difficulty finding such candidates for their openings.

Vision for UNT at Frisco

- UNT Background:
  - Tier One research university by the Carnegie Classification
  - 130 years old, ~ 39,000 students, 14 Colleges, 74 Majors
  - Minority Majority School
  - Satellite campus at Frisco since 2014
  - Partnership with City of Frisco to open new campus on 100 Acres (May 2018)
- Vision of New College for UNT at Frisco
  - Offer appropriate majors and classes from 13 colleges
  - President's Neal Smatresk Vision – Applied Learning
  - Dean Randall – Partner with industry
  - Committee - Incorporate challenges faced in higher education

Reform for New College

- Create a new undergraduate BS degree (2018)
  - Expose students to real-world scenarios
  - Develop problem solving, communication and collaboration skills
  - Graduate in three years
  - Career ready on Day 1 after graduation

- Recruit Students and Faculty
  - Cohort 1 in Fall 2019 with 22 students
  - Cohort 2 in Fall 2020 with 27 students
  - Nine faculty hired to teach for PD&A and other programs

Instructional Pedagogy: Problem Based Learning

- Rooted in constructivist learning theory (Savory & Duffy, 1995).
- Instructional method from medical education
- Significantly different from traditional teacher-centered and lecturing based teaching methods
- Relies largely on student autonomy
- Requires students to work autonomously in learning goal setting, taking responsibilities in learning, collaboration and communications (Wijnia, Loyens & Derous, 2011).

Eight Instructional Principles in PBL

1. Anchor all learning activities to a larger task or problem
2. Support the learner in developing ownership for the overall problem or task
3. Design an authentic task
4. Design the task and learning environment to reflect the complexity of the environment that they should be able to function in at the end of the learning
5. Give the learner the ownership of the process used to develop a solution
6. Design the learning environment to support and challenge the learner's thinking
7. Encourage testing ideas against alternate views and alternate contexts
8. Provide opportunity for and support reflection on both the content learned and the learning process

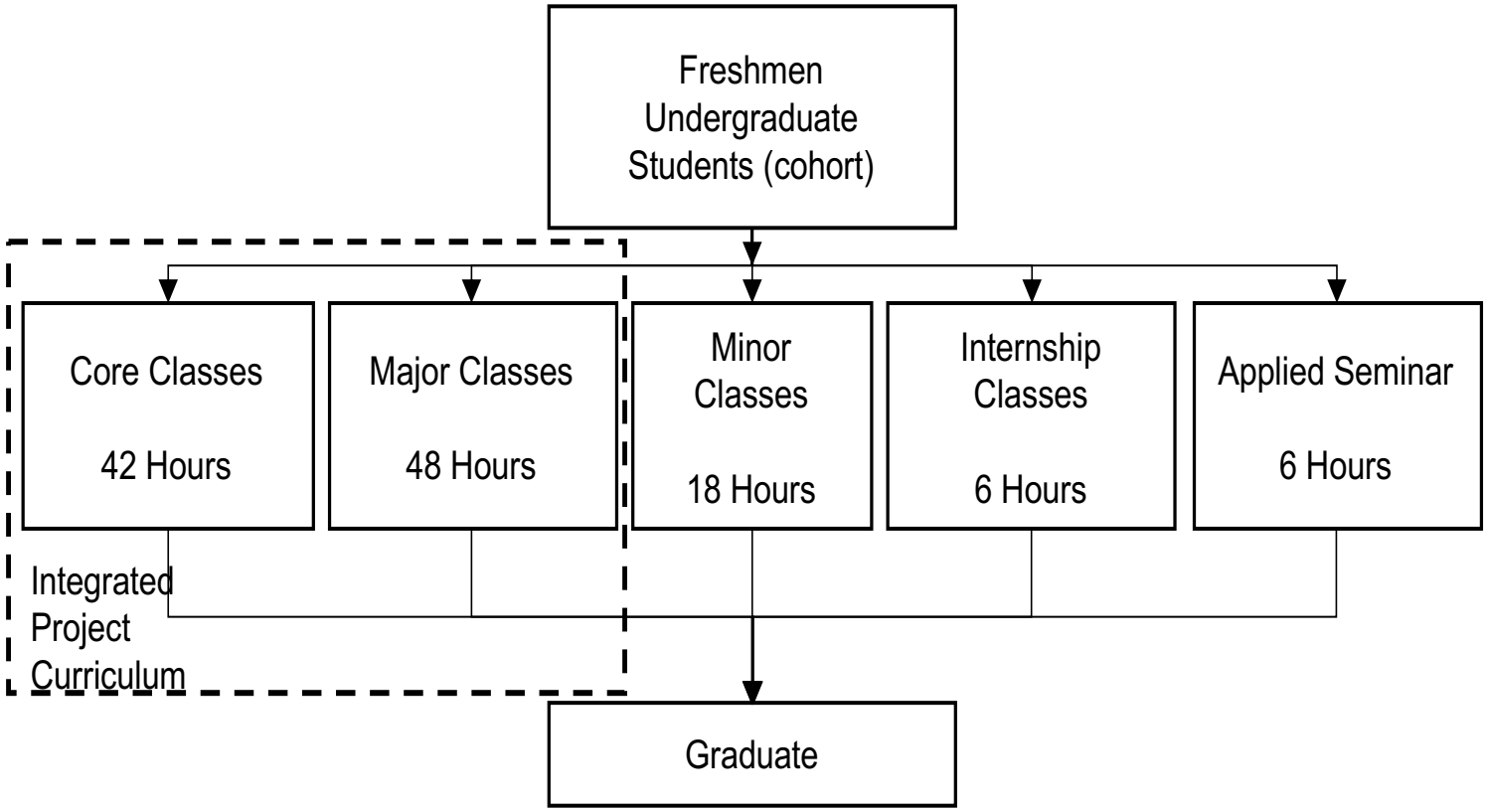
Savery, J. R., & Duffy, T. M. (1995). Problem based learning: An instructional model and its constructivist framework. Educational technology, 35(5), 31-38.

Project Design & Analysis Incorporated Eight Competencies Identified By NACE

- National Association of Colleges and Employers (NACE)
- NACE through task force has identified eight competencies associated with career readiness
- Incorporated eight competencies as part of new BS degree

https://www.naceweb.org/career-readiness/competencies/career-readiness-competencies-employer-survey-results/

PROJECT DESIGN & ANALYSIS CHR DISTRIBUTION
BS PROJECT DESIGN AND ANALYSIS



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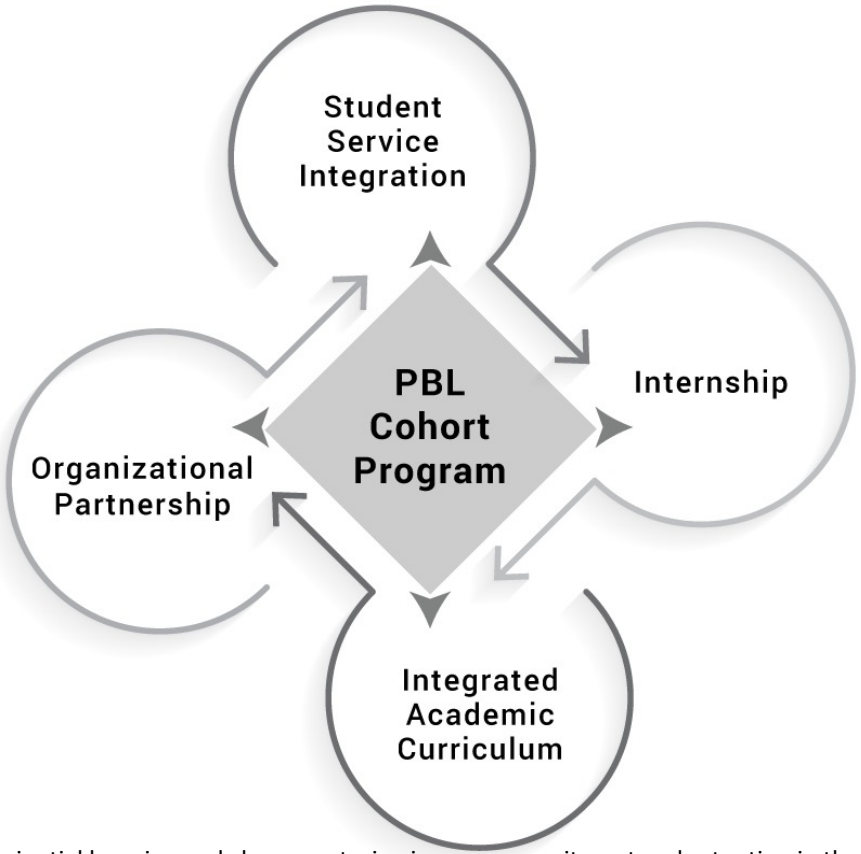
UNT at Frisco Problem Based Learning Cohort Model

1. PBL Cohort part of five program pillars
2. Design Based Research
3. Integrated Application



Jin, L., Doser, D., Lougheed, V., Walsh, E. J., Hamdan, L., Zarei, M., & Corral, G. (2019). Experiential learning and close mentoring improve recruitment and retention in the undergraduate environmental science program at an hispanic-serving institution. Journal of Geoscience Education, 67(4), 384-399.
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Degree-in-Three
Innovative yet highly-structured program.

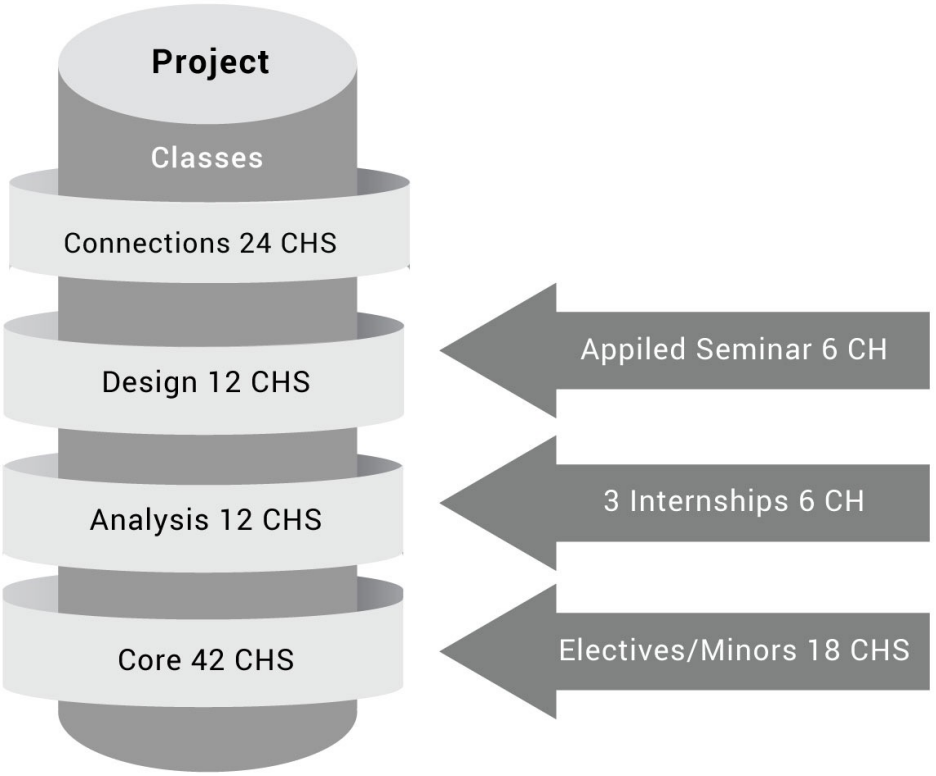
- Courses, topics, and tools that students encounter make them competitive even before graduation.

Degree	Project	Design	Analysis	Core	Internship	Applied Seminar
120 CH total 40 classes	24 CH 6 classes (+6 labs)	12 CH 4 classes	12 CH 4 classes	42 CH 14 classes	6 CH 3 classes	6 CH 3 classes

	Year 1 Fall	Year 1 Spring	Internship 1	Year 2 Fall	Year 2 Spring	Internship 2	Year 3 Fall	Year 3 Spring	Internship 3
Cohort Classes	Collab. Thinking + Lab Design Thinking Data Analytics College Writing General Chemistry	Profess. Comm + Lab Stochastic Process College Writing II Public Speaking General Chemistry II		Problem Analysis + Lab Creative Design US Political Behavior General Psychology Elective	Team Creativity + Lab Modeling Ops. Res. US & TX Constitutions Music of the World Elective		Global Design + Lab Design Thinking in Orgs Analytics Ops. Res. US History to 1865 Elective	Leadership + Lab Design and Innovation Analytics Ops. Res. II US History since 1865 Elective	
Total Credit Hours	17	17	6	17	17	6	17	17	6
Seminars	Decision Making			Applied Innovation			Advanced Decision Making		
Tools	MS PowerPoint, Excel, Teams Zoom Slack, Discord			Advanced Excel JIRA Mini Tab (Six Sigma) Azure			Product Development Tableau Adobe XD, Figma		
Possible Certs				Agile Six Sigma Creative Design PMI-CAPM			International Association of Innovation Professionals Six Sigma Green Belt Project Management Professional SCRUM Master		

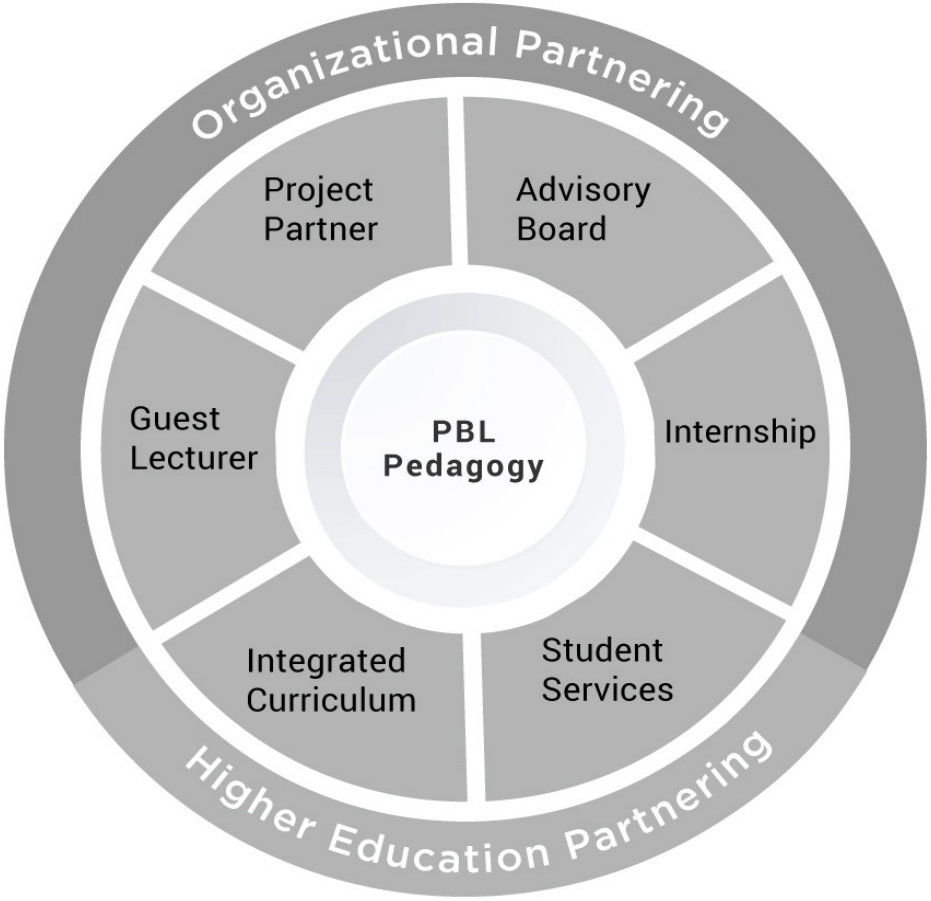
Problem Based Learning – Cohort Model
BS Project Design & Analysis

- Project is at center of the program
- Major and CORE classes wrap around the project
- Student services is integrated in program

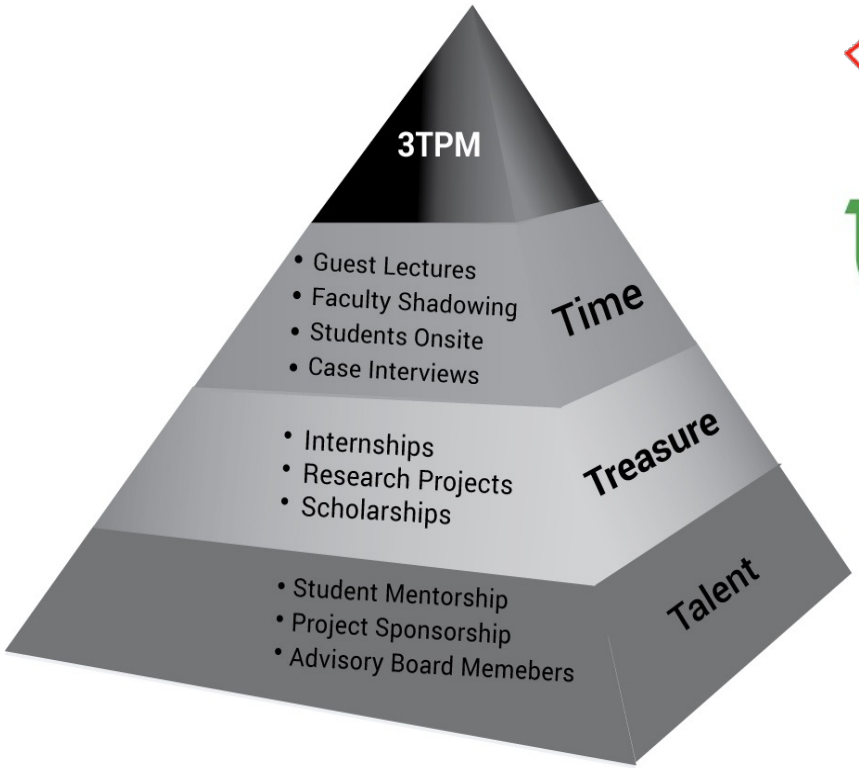


ORGANIZATIONAL PARTNERSHIPS

- External
- Internal



3T Partnering Model



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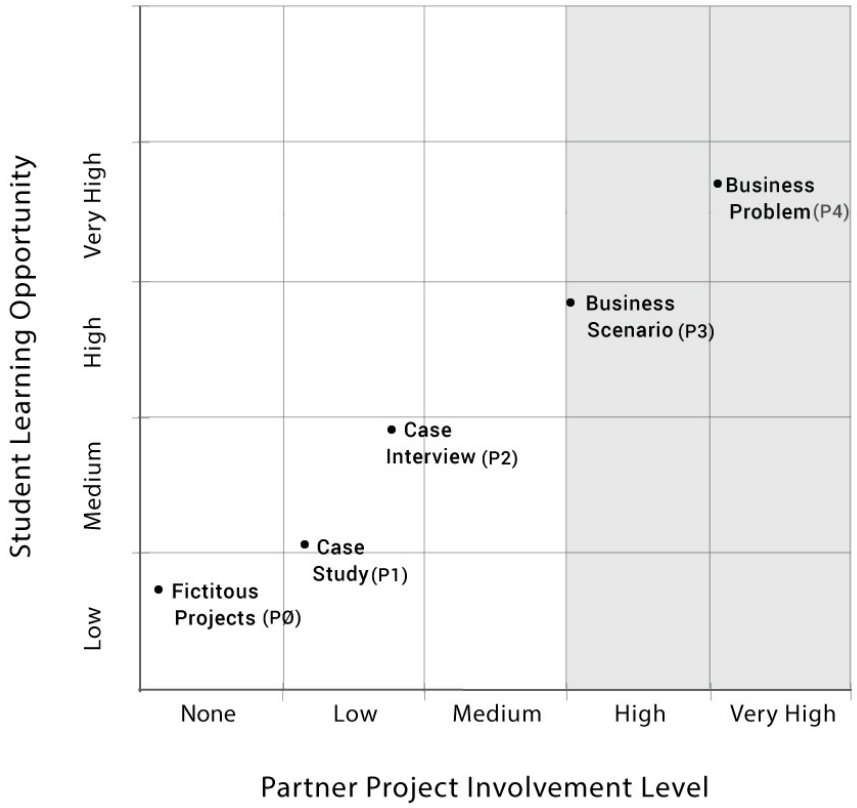
Problem Based Learning Options

1. Both cohort projects are Business Problem

2. Project Partners
   1. City of Frisco
   2. nThrive

3. Projects extended from one semester to semester



Note: Hypothetical model not tested

Key Lessons Learned:

1. Dual Credit Management

2. Integrated curriculum

3. Semester project time constraints

DUAL CREDIT MANAGEMENT

Challenge: 70% of students bring AP class credit into program:

1. Cohort 1 - attend all classes as audit.
2. High AP led to less then 12 CHR in first semester
3. Introduction of minors and certificates

	FALL I	CHR	SPRING I	CHR
YEAR I	☐ SPDA 2020: Connections - Collaborative Thinking	3	☐ SPDA 3020: Connections - Professional Communications	3
	☐ SPDA 2021: Connections - Collaborative Thinking Lab	1	☐ SPDA 3021: Connections - Professional Communications Lab	1
	☐ SPDA 2010: Applied Industry Seminar - Introduction to Decision Making	1	☐ SPDA 2010: Applied Industry Seminar - Introduction to Decision Making	1
	☐ SPDA 3300: Project Design Thinking	3	☐ ACSO 4410: Introduction to Stochastic Processes	3
	■ ENGL 1310 / 1311: College Writing I / Honors Composition I	3	■ ENGL 1320 / 1321: College Writing II / Honors Composition II	3
	■ DSCI 2710: Mathematics Data Analysis w/ spreadsheets	3	■ COMM 2040: Public Speaking	3
	■ CHEM 1410/ 1430: Lab General Chemistry for Science Majors I	3	■ CHEM 1420 / 1440: Lab General Chemistry for Science Majors II	3
		17		17
	SUMMER I			
	■ MKTG 3010: Professional Selling	3		
	◇ Internship I - SPDA 2011	3		
		6	*Total Number of Required Hours, Year I*	40
	FALL II	CHR	SPRING II	CHR
YEAR II	☐ SPDA 3120: Connections - Problem Analysis	3	☐ SPDA 3220: Connections - Team Creativity	3
	☐ SPDA 3120: Connections - Problem Analysis Lab	1	☐ SPDA 3220: Connections - Team Creativity Lab	1
	☐ SPDA 3010: Applied Industry Seminar: Operational Decision Making	1	☐ SPDA 3010: Applied Industry Seminar: Operational Decision Making	1
	☐ SPDA 3350: Creative Design	3	☐ ACSO 4510: Deterministic Modeling for Operations Research	3
	■ PSCI 2305 /2315: US Political Behavior and Policy / Honors	3	■ PSCI 2306 / 2316: US and Texas Constitutions and Institutions / Honors	3
	■ PYSC 1630: General Psychology	3	■ MUET 3030: Music of World	3
	◆ Elective I	3	◆ Elective II	3
		17		17
	SUMMER II			
	◆ Elective III	3		
	◇ Internship II - SPDA 3011	3		
		6	*Total Number of Required Hours, Year II*	40
	FALL III	CHR	SPRING III	CHR
YEAR III	☐ SPDA 4020: Connections - Global Design	3	☐ SPDA 4120: Connections - Thinking in Leadership	3
	☐ SPDA 4020: Connections - Global Design Lab	1	☐ SPDA 4120: Connections - Thinking in Leadership Lab	1
	☐ SPDA 4010: Applied Industry Seminar: Strategic Decision Making	1	☐ SPDA 4010: Applied Industry Seminar: Strategic Decision Making	1
	☐ SPDA 4300: Design Thinking in Organizations	3	☐ SPDA 4600: Design and Innovation	3
	☐ ACSO 4610: Applications in Analytics and Operations Research I	3	☐ ACSO 4620: Applications in Analytics and Operations Research II	3
	■ HIST 2610: United States History to 1865	3	■ HIST 2620: United States History Since 1865	3
	◆ Elective IV	3	◆ Elective V	3
		17		17
	SUMMER III			
	■ UNT Creative Arts (e.g. THEA 2340) - Theatre Appreciation	3		
	◇ Internship III - SPDA 4011	3		
		6	*Total Number of Required Hours, Year III*	40
	☐ Major Requirement - 54 Credit Hours			
	■ UNT Core Requirement - 42 Credit Hours		*Total Number of Required Hours, Years I-III*	120
	◆ Elective - 15 Credit Hours			
	◇ Internship - 3 Credit Hours			
	◇ Prescribed Electives - 6 Credit Hours (internship or elective based on approval)			

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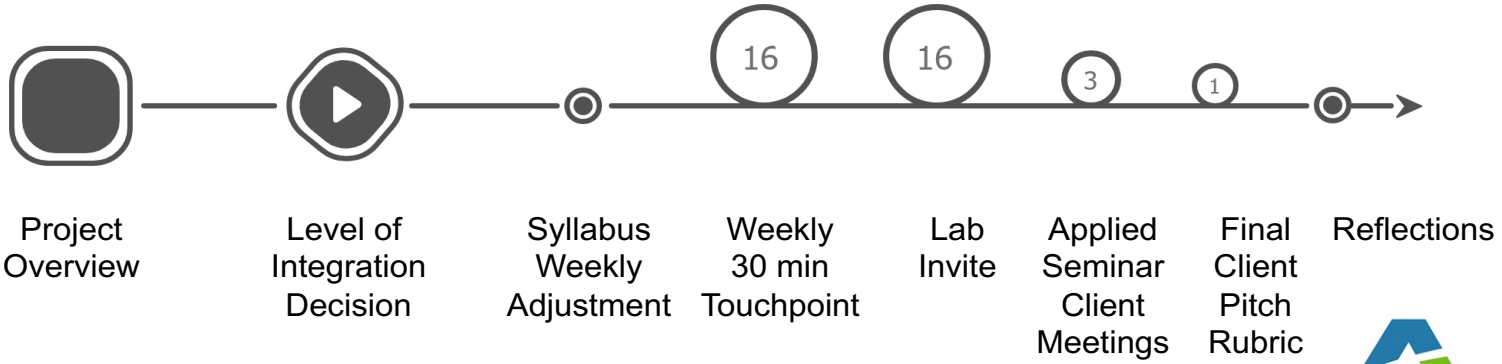
Integrated Curriculum Methodology

Challenges:

1. All faculty get 2 course load for being part of connections lab.
2. Mismatch of credit hours with actual hours in classroom

Applied Changes:

1. Democratic semester integration methodology
2. Cohort 1 ~ feedback is less integrated
3. Realigned some credit hours
4. Balance of course load and need to be in class together



Semester Project Time Constraints

Challenge: Projects are authentic, encountering 3 key challenges in 16 weeks.

1. Shifting business problem definition
2. Stakeholders identification
3. Data acquisition

New Approach: Deliver project over 2 semesters (32 weeks):

1. Define, acquire data, measure and analyze to make recommendations while building relationships.
2. Deep dive and implement solution in the following semester

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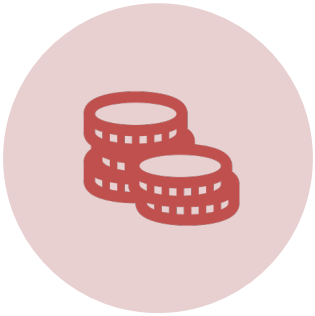
Future Studies

CAREER READINESS MEASUREMENTS



COST BENEFIT ANALYSIS

ORGANIZATIONAL PARTNERING MODEL

https://drive.google.com/drive/folders/12VucYPqNQvkHsGstzof8gDfesTBhnlEt

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