Enrollment Dynamics
Undergraduate Students

Mental Model of Dynamic Systems

Andrew Boyd   Center of Institutional Effectiveness
Gary Lowe   Center of Institutional Effectiveness
Justin Hicks   Economics

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Version 1.0

UC Merced

Engagement Overview

As of September 13, 2019

The model was shared as a working concept at the System Dynamics Conference in Albuquerque this July. The model was well received by those in attendance with one important recommendation that administrative burden be added as a factor impacting Student Decisions, which has been incorporated.

As of May 20, 2019

We have met with senior academic leadership to share the model and discuss its various components to ensure that the model is relatively accurate and comprehensive. Improvements have been made to the model from the initial draft in areas around student identity and the interaction between students and faculty as it relates to the students sense of belonging.

With this step complete, our ongoing goal is to work with additional teams to model specific sectors at higher and lower levels of time abstraction, recognizing that there are micro and macro effects that impact the probability of Student Success.

We thank you all for your time and efforts in reviewing this model and look forward to working with all of you in the future as we strive to reach our goals.

Enrollment Dynamics Model

Statement of Purpose
Creating a shared mental model, or system diagram will provide a resource for the University to improve its Teaching Service Delivery by helping to identify common problems and points of leverage.

For the model to be effective for the University, it must be consistent for all students but allow for the variability that exists with each Individual Student.

Overview

1. Model Mechanics
    Fundamental Structure (Rework Cycle)
    Student Life Factors
    Academic Support
    Academic Operations
    Teaching Efficacy Feedback Loop

2. Intervention Opportunities

UC Merced Student Success Historical Outcomes

Graduation Rate Goals

FIRST-TIME FULL-TIME FRESHMAN RETENTION & GRADUATION RATES

Cohort	N	Retention %			Persistence %					Graduation %				
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	4-Year	5-Year	6-Year	7-Year	8-Year
Fall 2005	706	82.3%	68.3%	63.5%	25.1%	5.4%	2.0%	0.8%	0.3%	33.3%	52.3%	58.2%	60.2%	60.8%
Fall 2006	396	79.5%	68.7%	64.9%	28.5%	8.6%	3.8%	0.8%	0.0%	29.8%	50.8%	58.1%	61.1%	62.1%
Fall 2007	668	79.2%	66.9%	62.0%	30.5%	7.6%	2.1%	0.9%	0.3%	26.8%	49.1%	56.7%	58.7%	59.6%
Fall 2008	922	83.1%	74.2%	68.5%	30.7%	8.5%	1.5%	0.4%	0.3%	33.6%	55.3%	63.6%	65.4%	66.2%
Fall 2009	1,126	87.1%	75.3%	71.3%	31.9%	5.0%	0.8%	0.4%	0.0%	36.7%	61.7%	66.3%	67.6%	68.1%
Fall 2010	1,335	84.6%	73.9%	70.0%	31.5%	3.8%	0.7%	0.1%	0.1%	37.6%	62.6%	66.4%	67.4%	67.8%
Fall 2011	1,439	82.8%	72.8%	67.5%	33.5%	4.6%	1.3%	0.8%		32.5%	59.8%	64.4%	65.7%	
Fall 2012	1,492	84.5%	73.3%	69.0%	28.7%	4.3%	1.1%			37.9%	62.1%	66.0%		
Fall 2013	1,650	82.6%	75.0%	71.2%	25.6%	3.5%				44.7%	66.1%			
Fall 2014	1,546	84.0%	74.1%	69.5%	24.3%					44.6%				
Fall 2015	1,782	85.8%	77.7%	72.5%										
Fall 2016	2,040	80.5%	72.9%											
Fall 2017	2,285	81.6%												

Campus has never reached 70% for 8 year Rates.

University Goals

Freshman Graduation Rate Actual and Projected

		2008	2012	2016	2020	2030
4 year	All	36%	39%	45%	45%	50%
	Pell	34%	35%	46%		
	URG	38%	34%	44%		
6 year	All		63%	67%	70%	75%
	Pell		64%	65%		
	URG		62%	59%		

Source: Multiyear projection templates
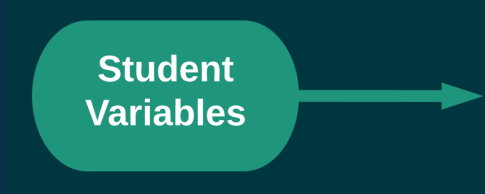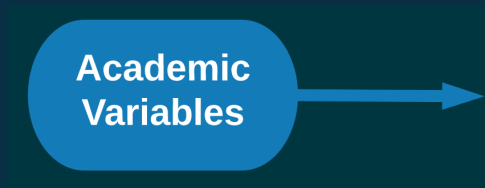
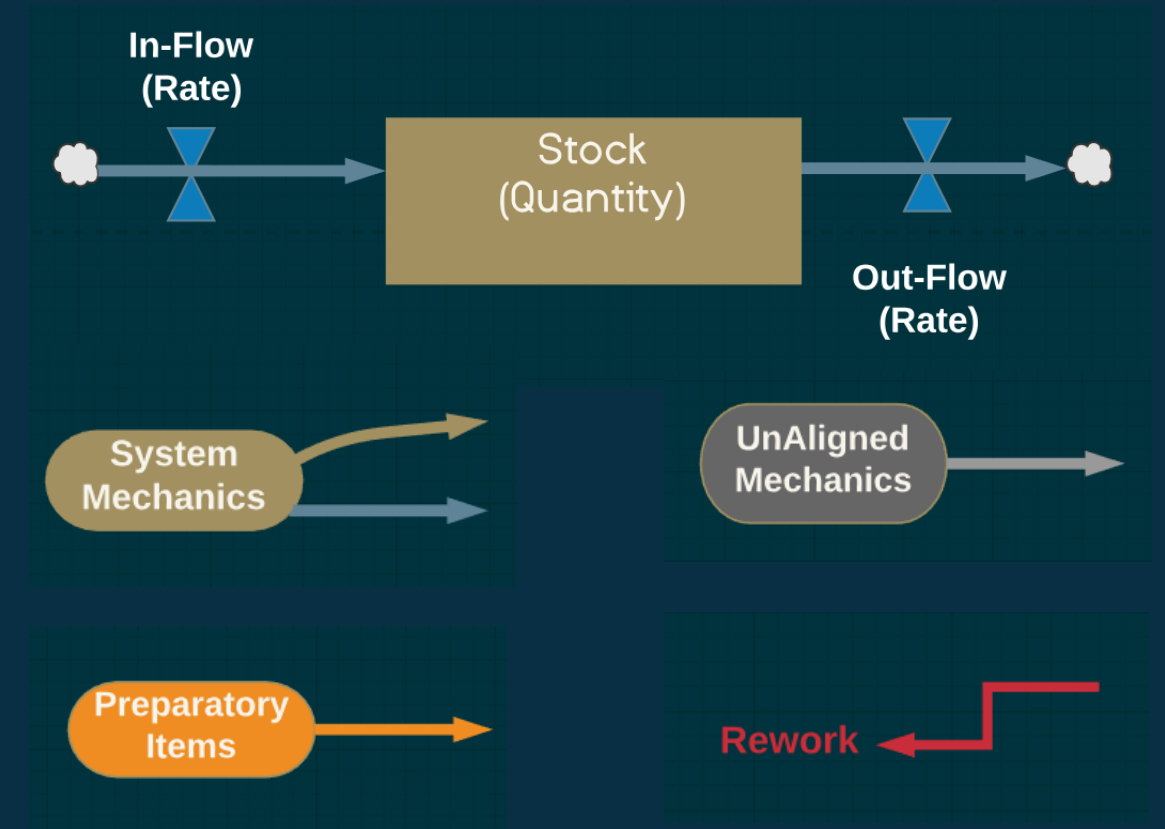**Increase 4-Year Graduation Rate by 5%**
Increase 6-Year Graduation Rate by 8%

Mental Model
Key

Color is used in the diagram to highlight both different agents and structural elements.
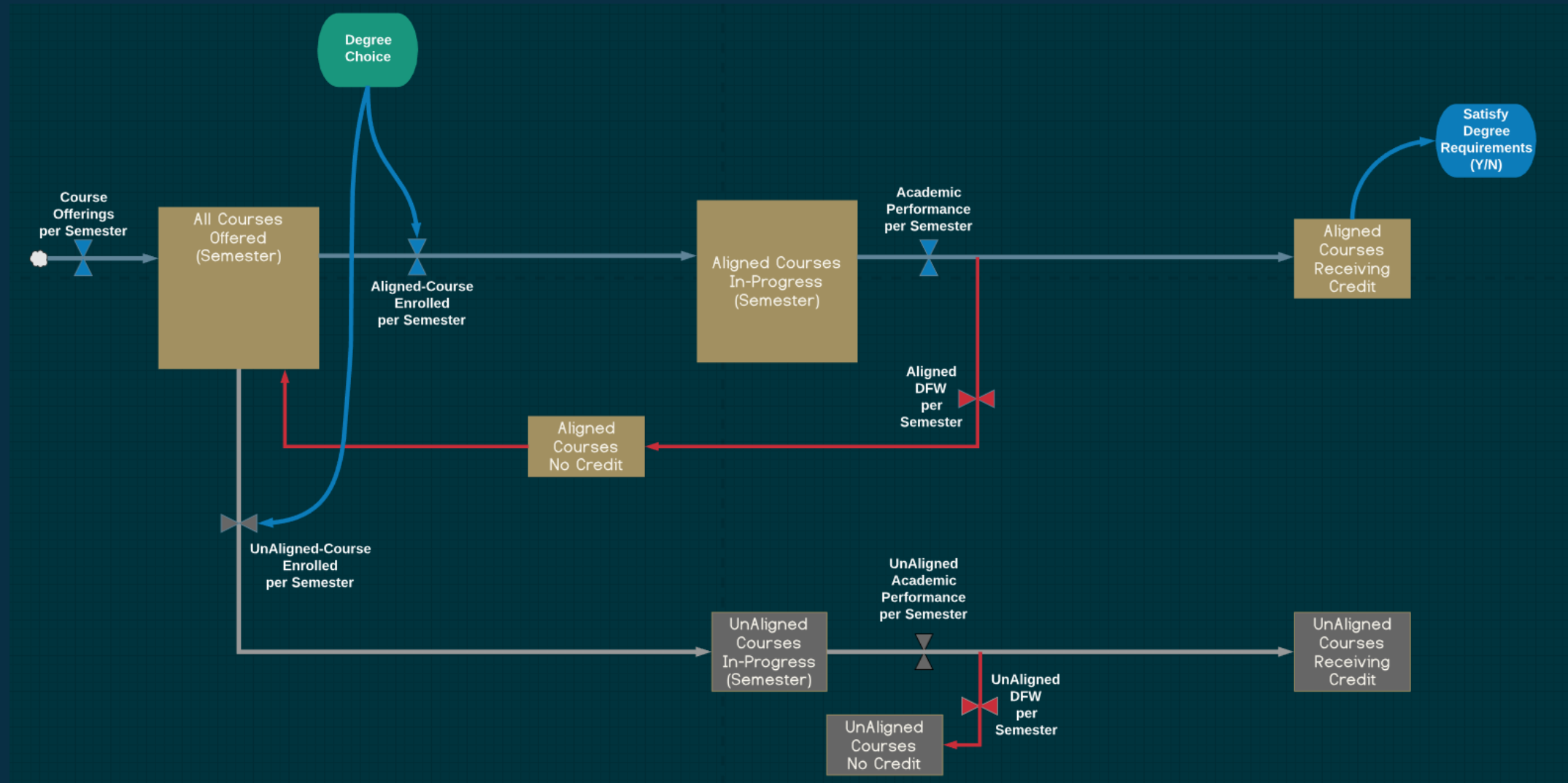
Agent Behavior

Academic Variables

Student Variables

System Structure

In-Flow (Rate)

Stock (Quantity)

Out-Flow (Rate)

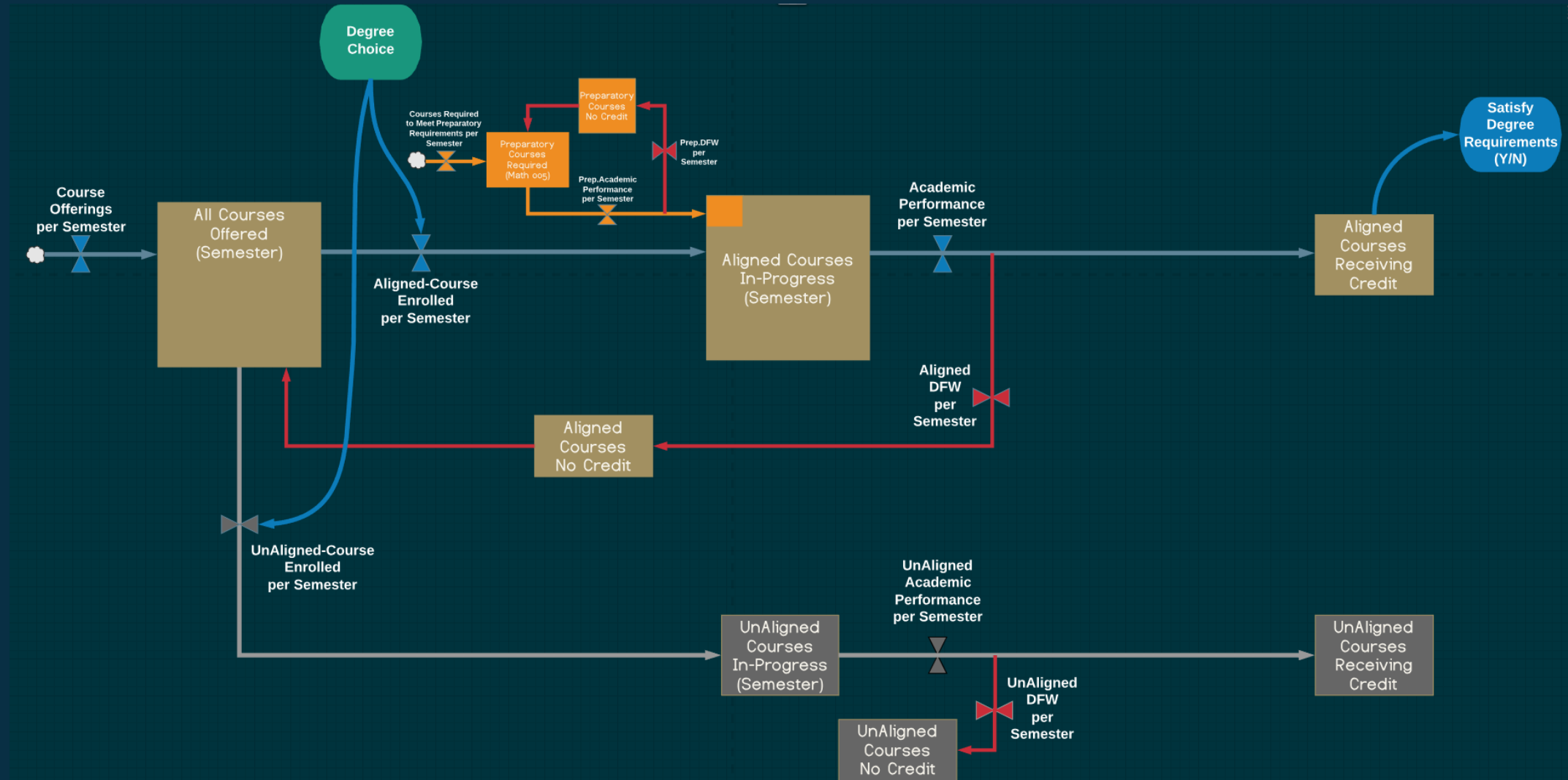System Mechanics

UnAligned Mechanics

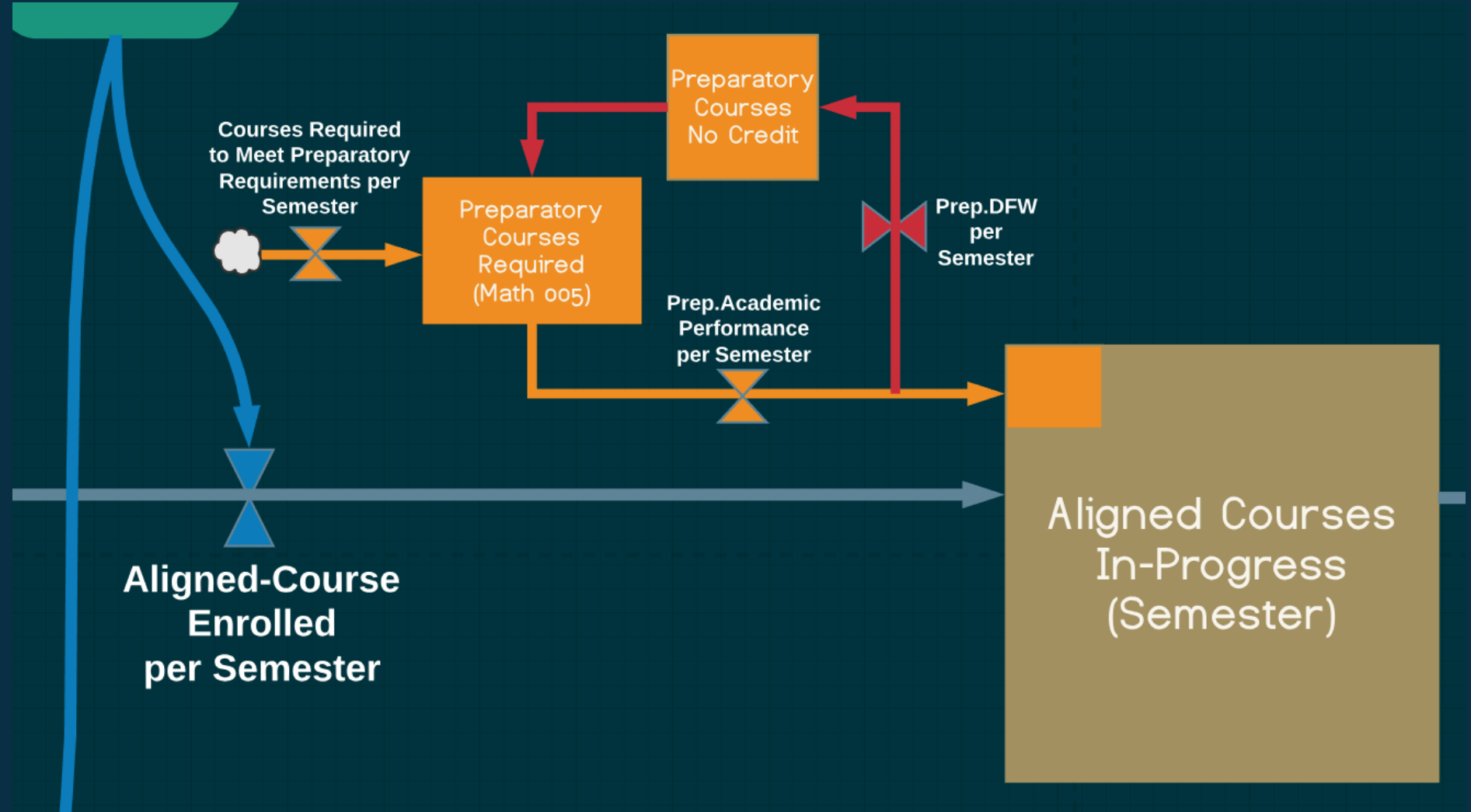Preparatory Items

Rework

Enrollment Mechanics
Primary Structure – Rework Loop

Preparatory Courses
Recursive Mechanics
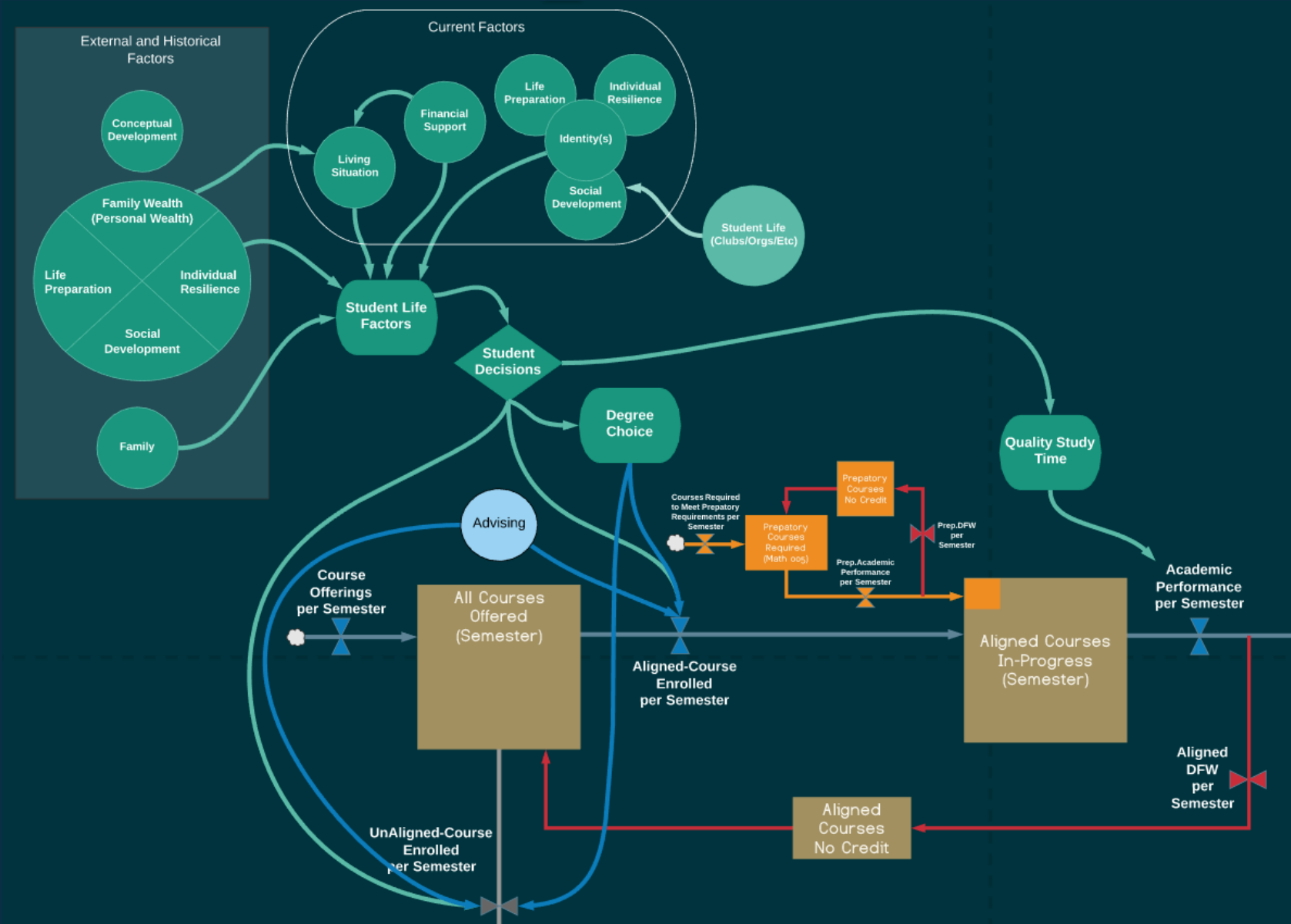
Preparatory Courses
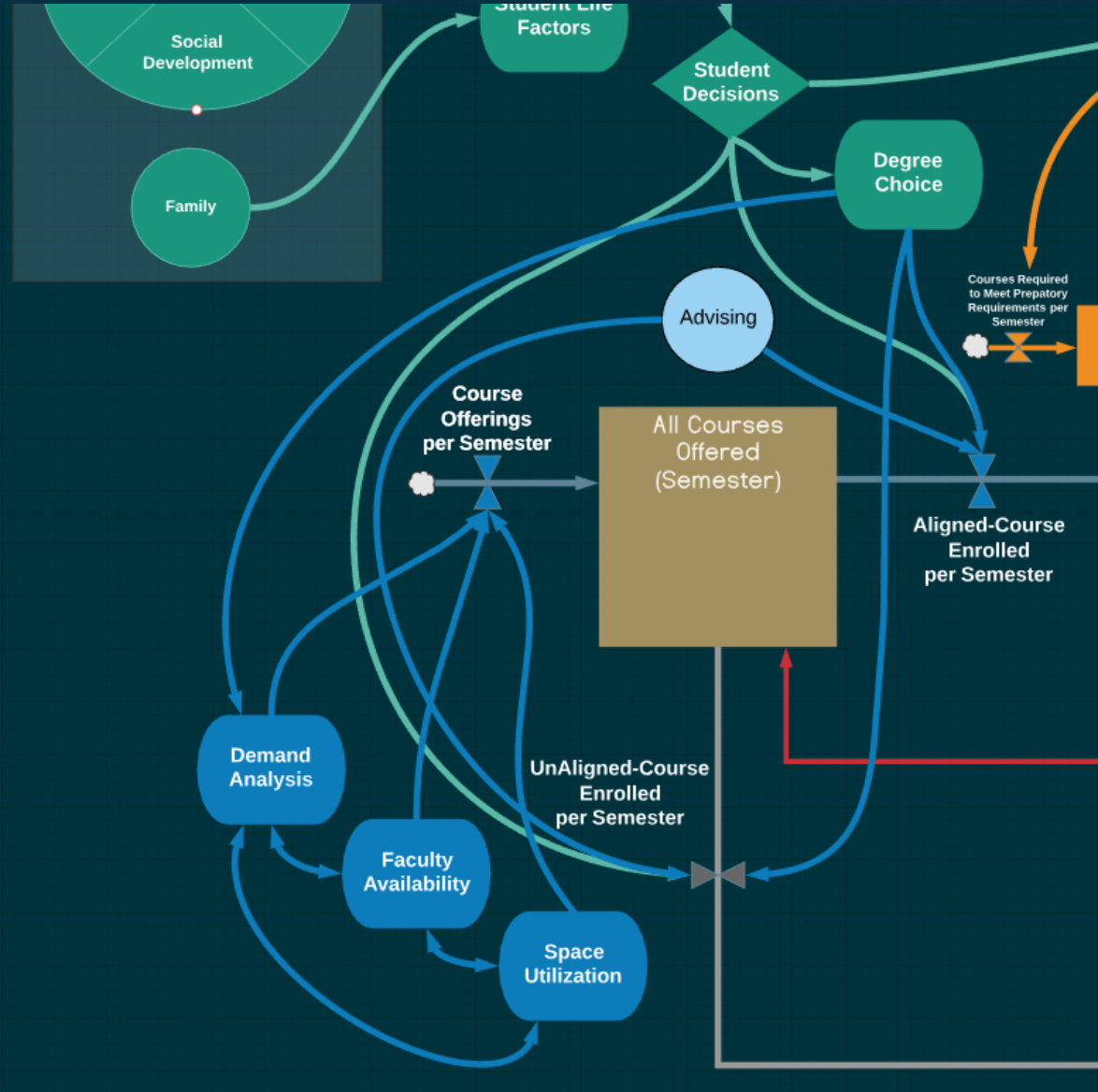*Recursive Mechanics*

Student Life Factors
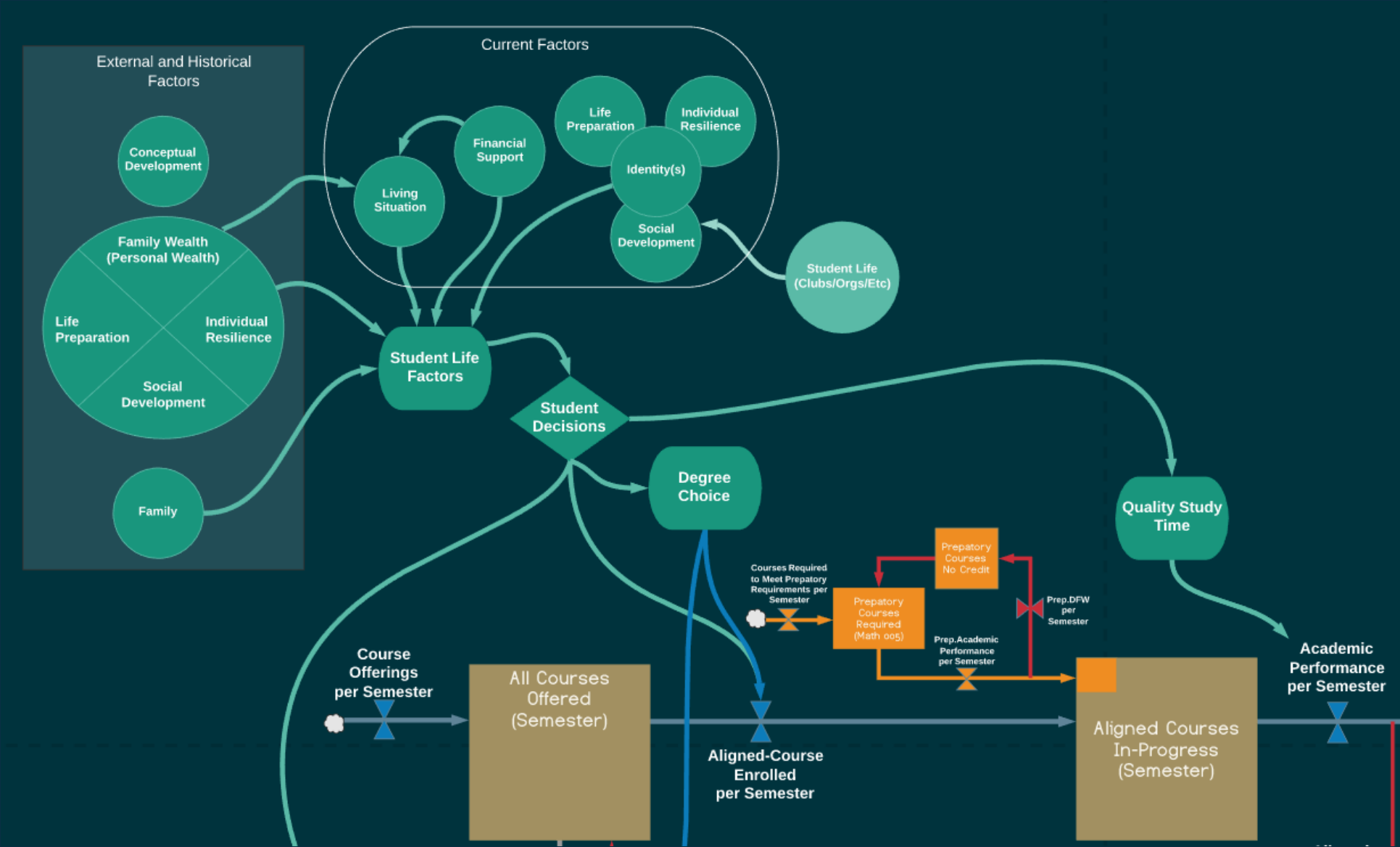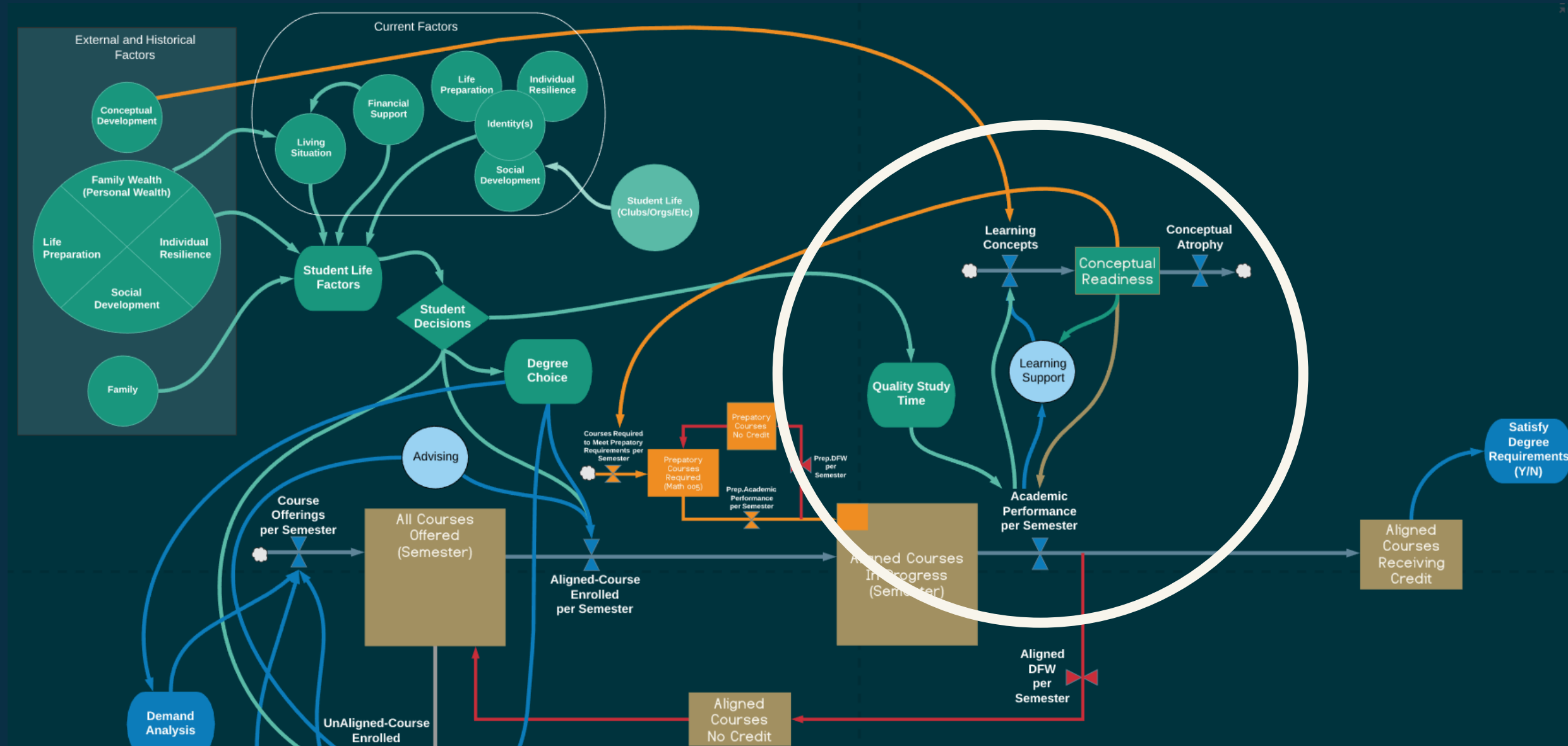
Academic Advising
Alignment to Degree
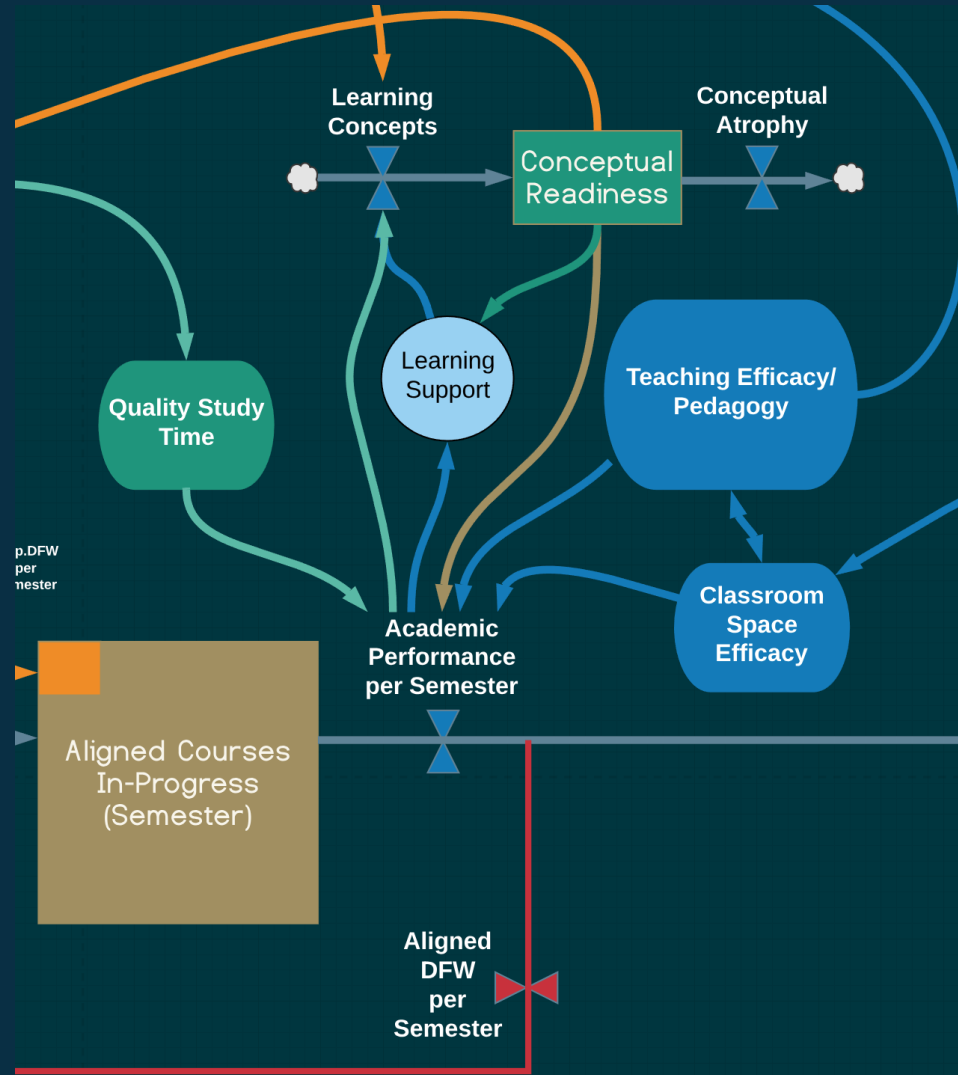
Academic Operations
Resource Optimization

Academic Performance
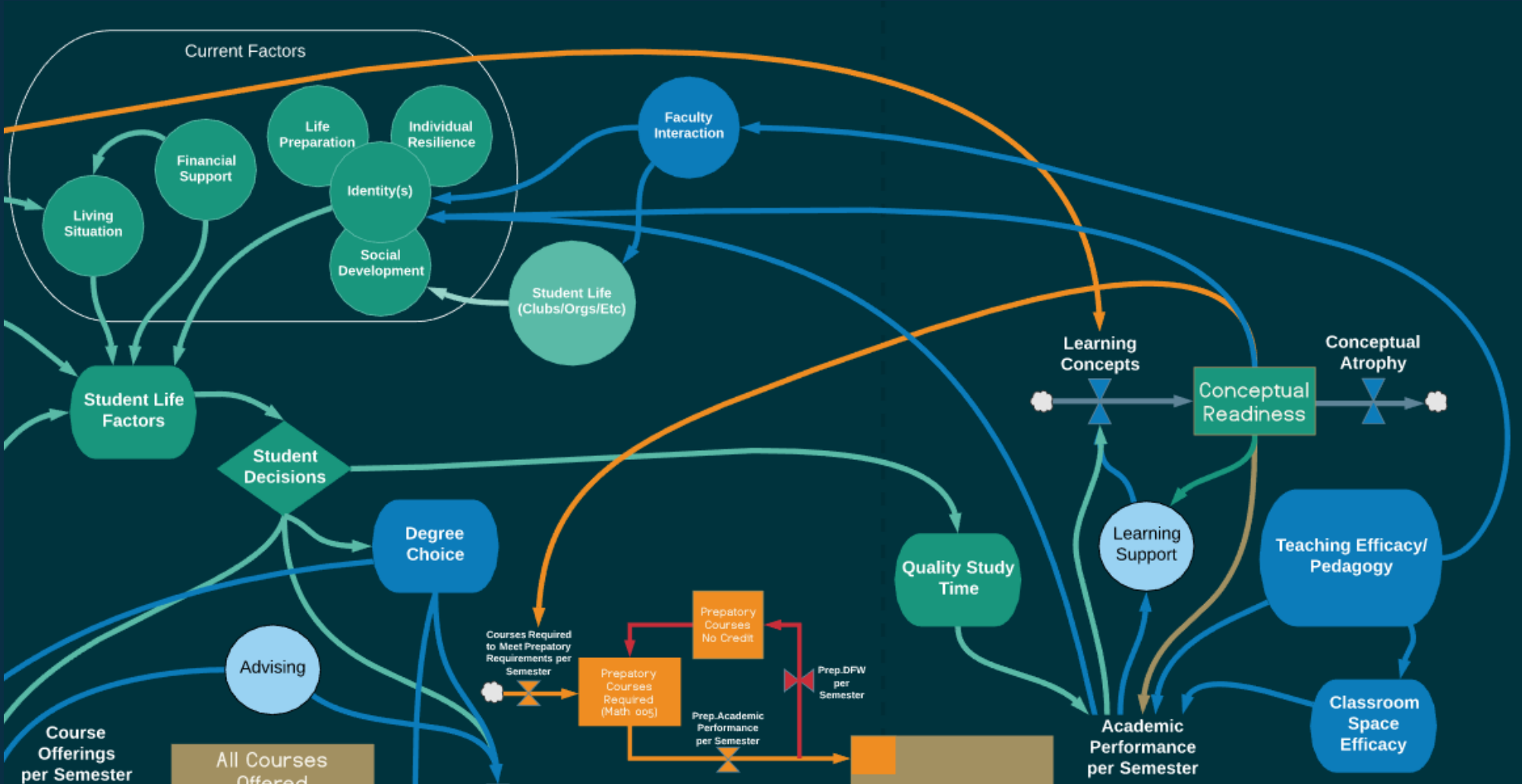*Learning, Support & Conceptual Readiness*

Academic Performance
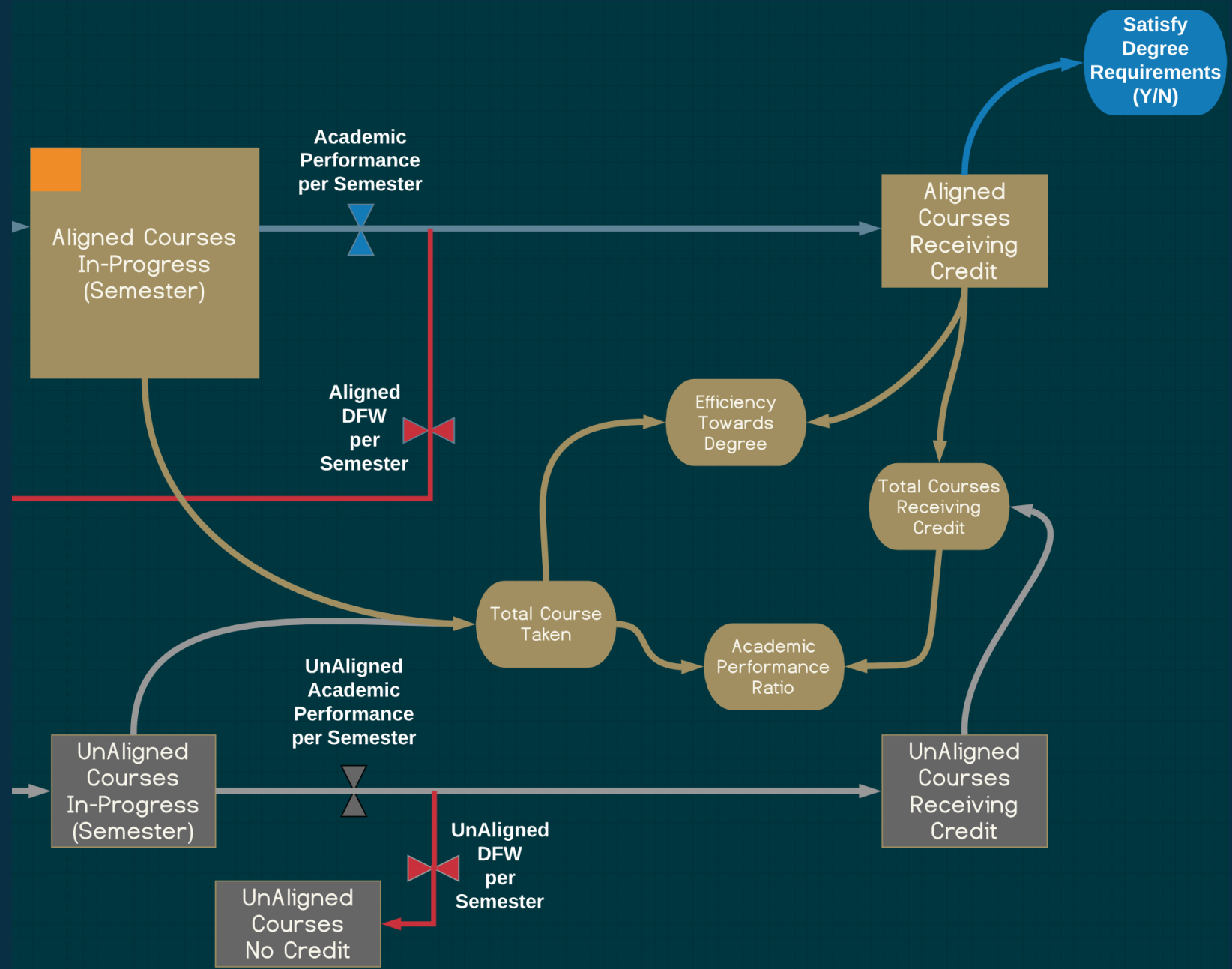*Teaching Efficacy / Pedagogy & Classroom Space Alignment*
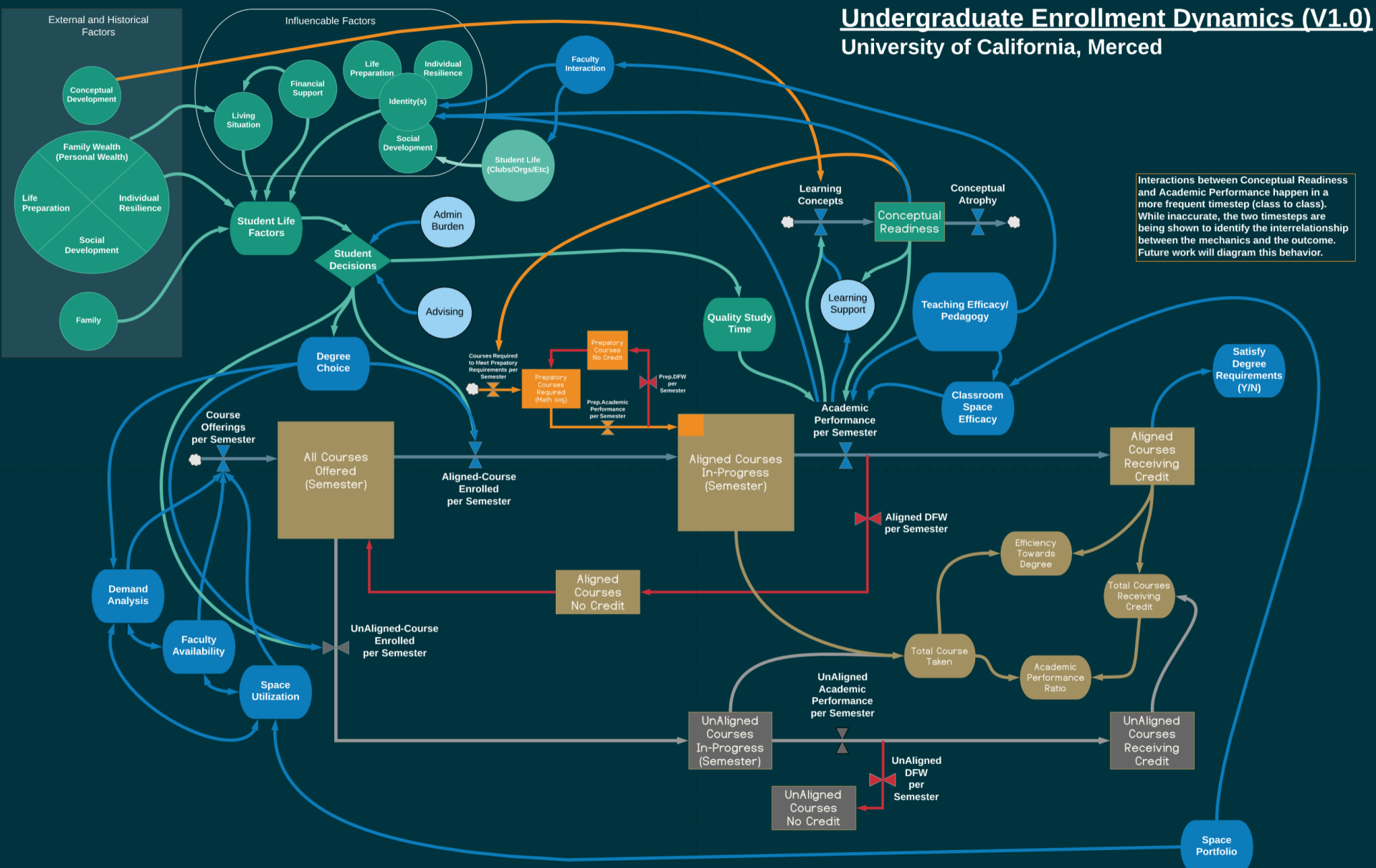
Academic Interaction
Academic Sense of Belonging

Efficiency Metrics
Tracking Student Success

Enrollment Dynamics
Individual Undergraduate Student

Undergraduate Enrollment Dynamics (V1.0)
University of California, Merced

Interactions between Conceptual Readiness and Academic Performance happen in a more frequent timestep (class to class). While inaccurate, the two timesteps are being shown to identify the interrelationship between the mechanics and the outcome. Future work will diagram this behavior.

Intervention Opportunities

The objective of the Enrollment Dynamics Model is to identify where there are opportunities for our teams to improve or intervene, enabling our campus to reach our established goals of increasing Graduation Rates.

The following slides highlight the focus areas that are leverage points to improve our outcomes.

These focus areas should be studied in greater depth, with more detailed models to identify their true behavior.

- **Academic Performance**
- **Student Life Factors**
- **Course Selection – Student Behavior**
- **Course Scheduling – Academic Administration**
- **Preparatory Requirements, Requisite Course Sequencing and Time to Degree**
- **Potential Indicators – Efficiency Metrics**
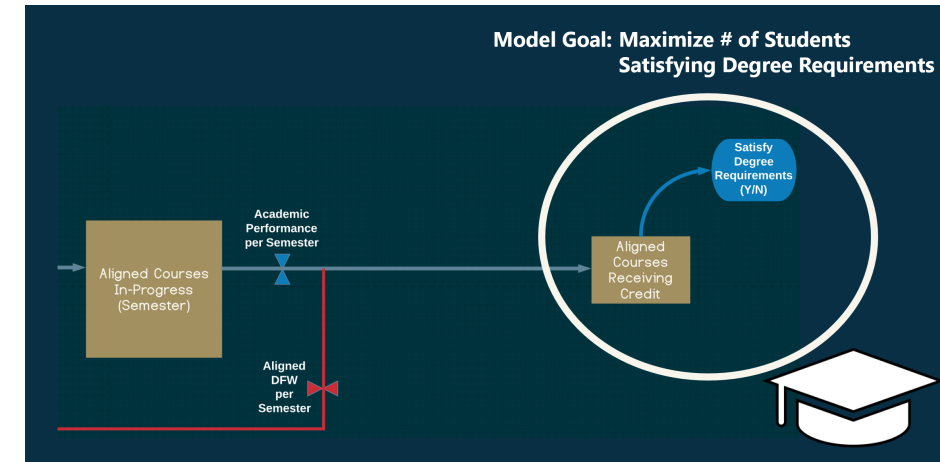
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Source: Multiyear projection templates

Student Success
Academic Performance

The current model uses a simplified overview based on the "semester" time-step.

Academic Performance occurs on a Class by Class basis.

A more defined model will be created to show how the course syllabi sets the "course-level" mechanics as it relates to the transference of knowledge, synthesis and application by the student.

Contains the Primary Feedback Loop within the Model that drives Student Success.
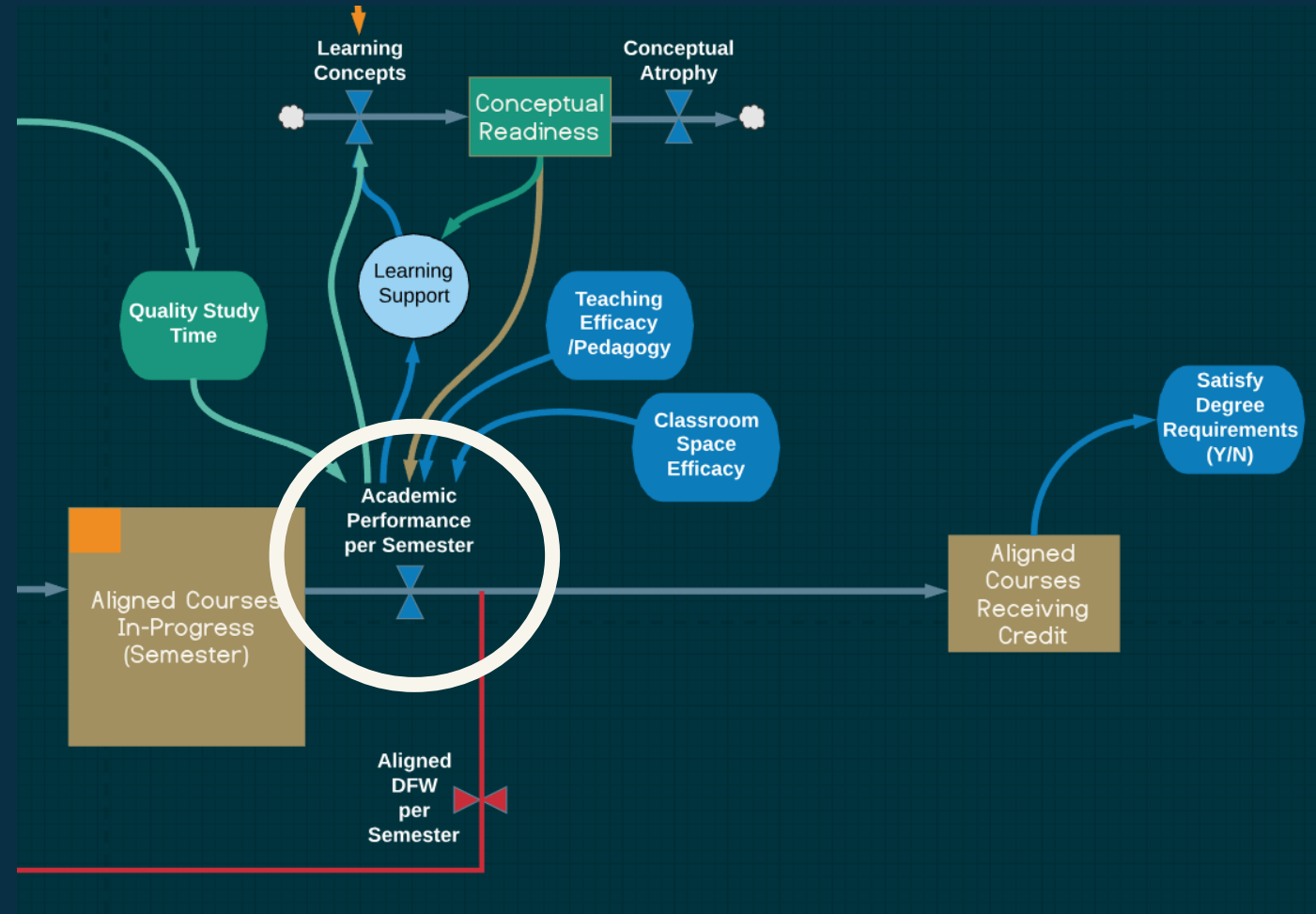
Student Life Factors

There are a number of factors that can impact each individual student.

Not all factors impact Academic Performance, but all have an impact on the well being of the student.

This model is not to be considered expansive in defining these variables, rather speaks to the outcome of these factors that can be measured through the students choices:

1. Degree and Course Enrollment
2. Educational Ecosystem Choices

(Living, work, support environments)

Educational Ecosystem Choices are meant to reflect that students are in a supportive environment that enables academic performance.
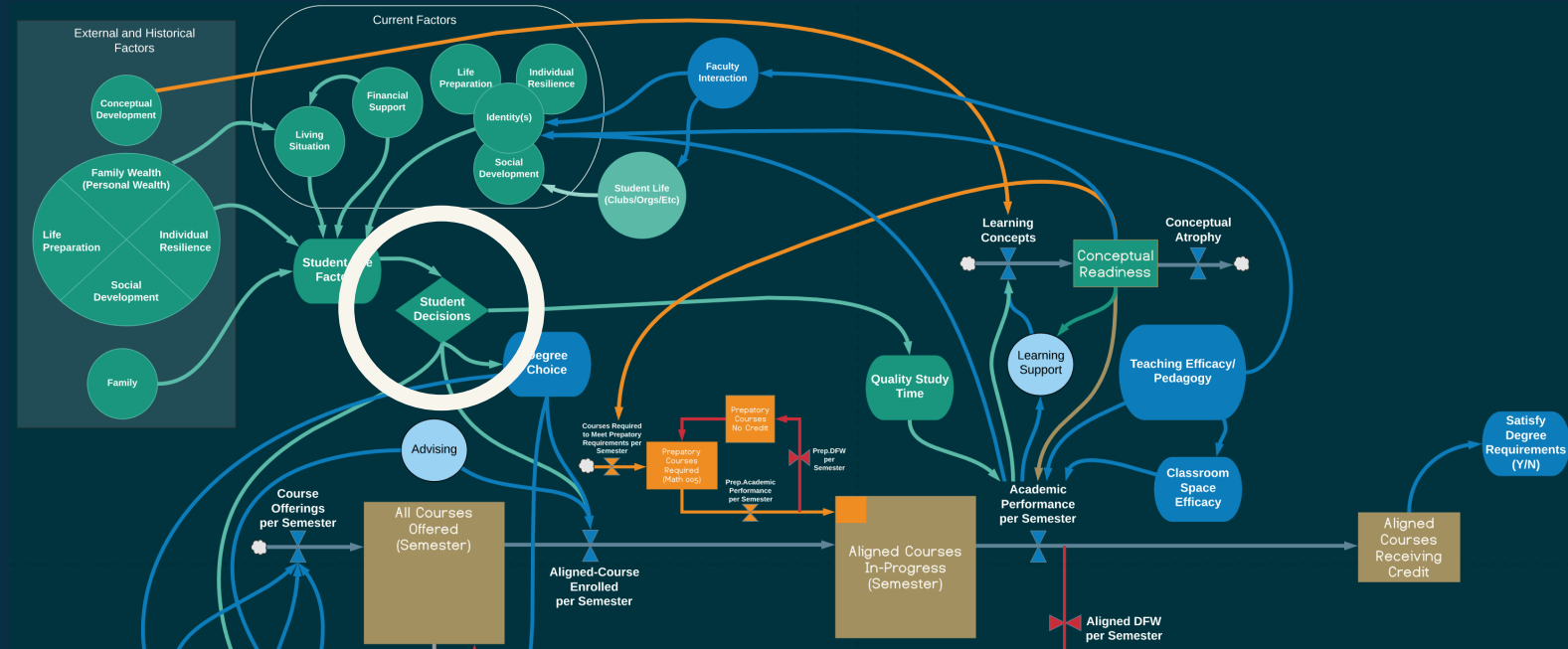
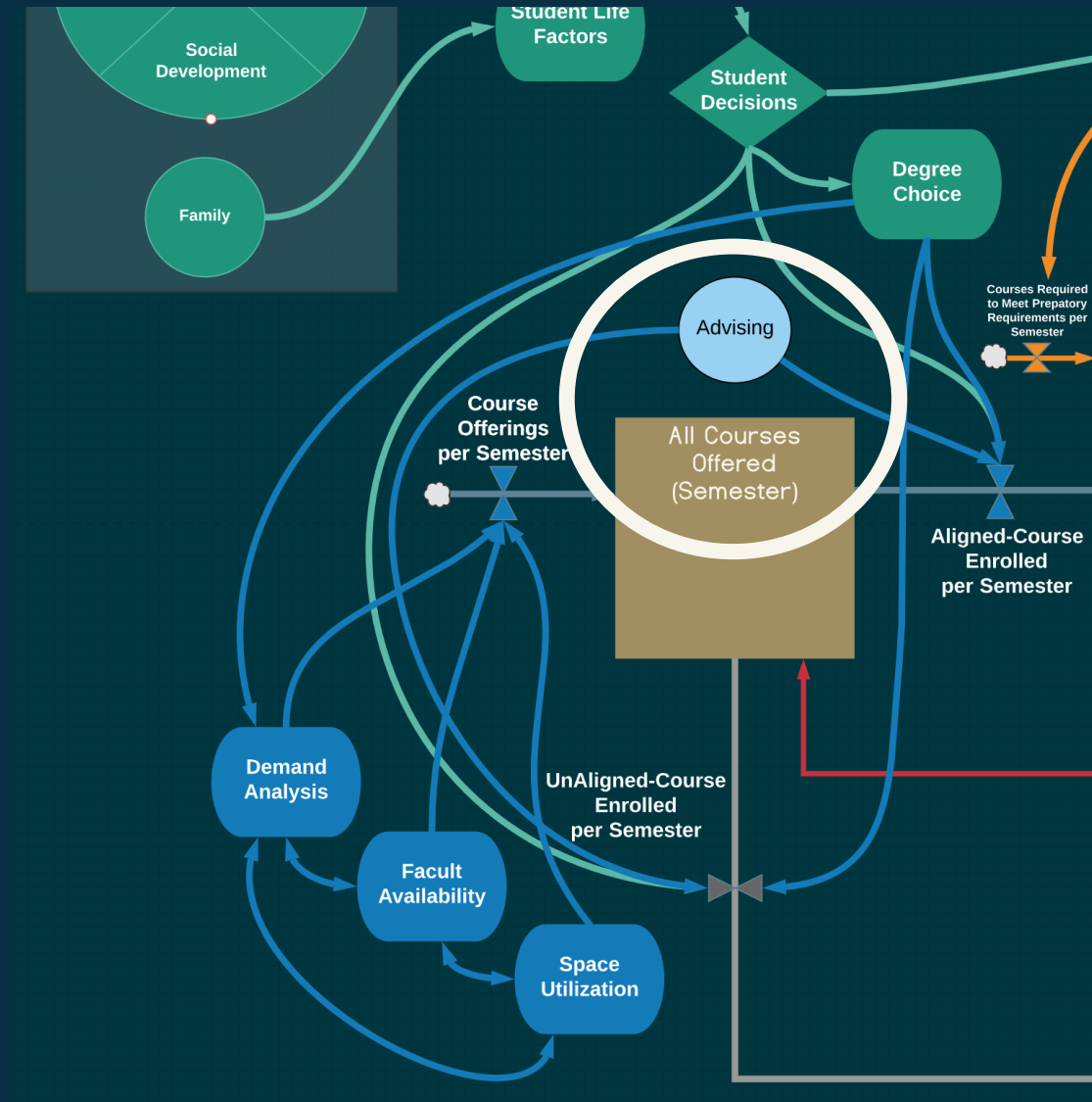# Student Success
Efficiency Towards Degree – Course Selection

Progress Towards Degree Starts at the Course Enrollment Choice. There are numerous factors that impact the choice of the student.

From an operations perspective, providing clarity to the Student is of utmost importance, as we want to highlight the "aligned" Decisions that lead toward the degree of their choice.

There are opportunities to leverage technology to create standard "Roadmaps" and "Degree-Paths" for every student. Additionally, these tools provide a wealth of information for the academic operation.

When students CHOOSE to take a course that is "Unaligned" with their Degree program, it can be a strong indicator of a few issues:

1. Supply of Courses doesn't meet Demand
2. Student is considering a change of major
3. Student is trying to increase their GPA
**4. Student is trying to satisfy Financial Aid Requirements**

Student Success
Course Scheduling

Curriculum Planning and the respective Teaching Plan is more complicated than what is shown here, with an iterative process occurring between Demand, Space and Faculty Availability.

A more detailed model is warranted to look at the specific mechanics of the Curriculum Planning cycles and the factors that influence the outcome of the semesterly course offerings.

From a Computer Science perspective, the analysis may be optimized with a "Scheduling Algorithm", albeit one of high complexity. The problem is most likely classified as NP-Complete or NP-Hard with additional variables, which requires an iterative approach, not necessarily a deterministic "solution".
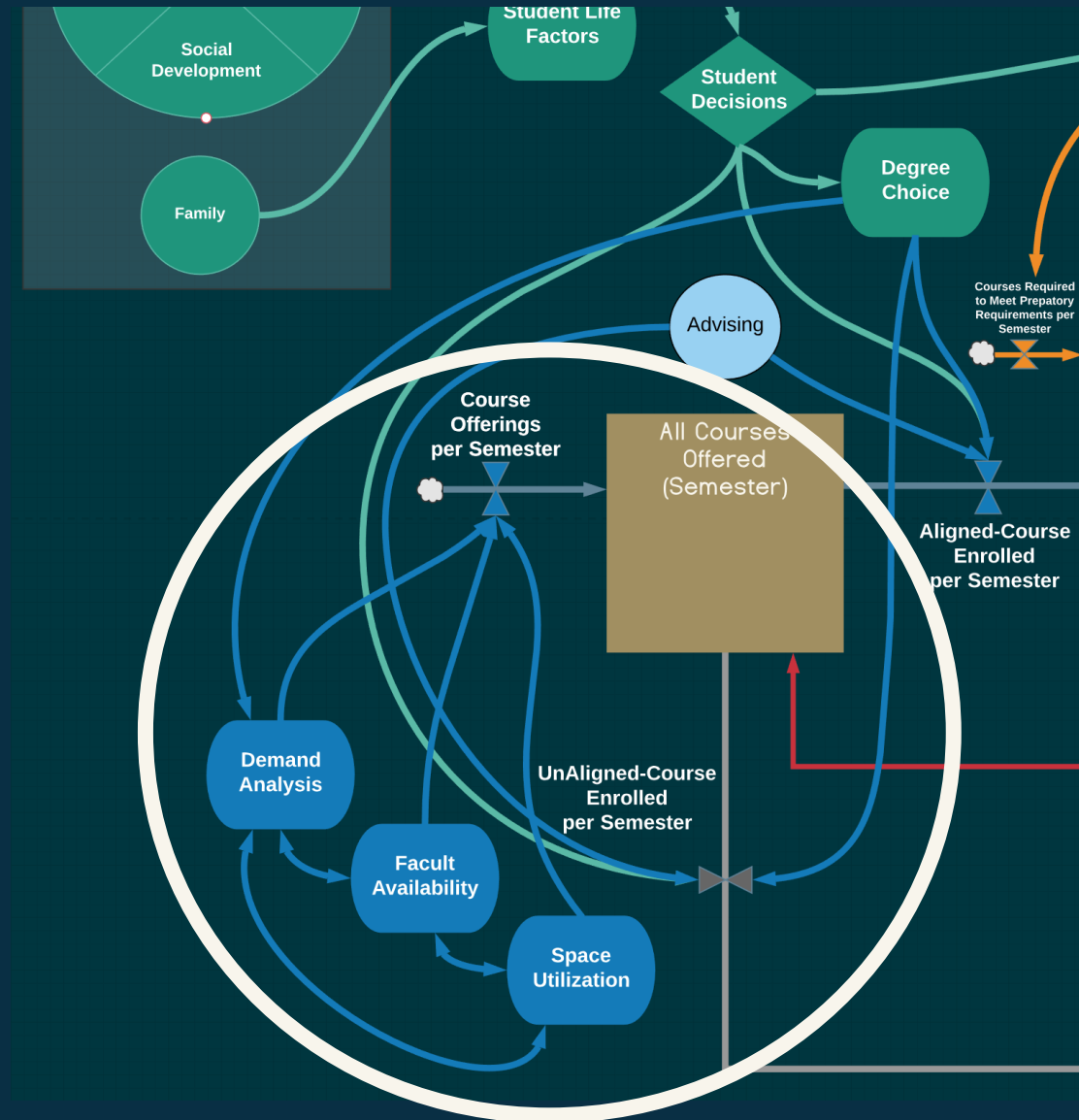
Preparatory Courses

Preparatory Courses are those that are deemed beneficial to prepare the student for more rigorous coursework within their degree program such as Math 005 or Writing 001.

While these courses may help prepare students for more sophisticated concepts, they also have the potential for putting the course schedule out of sequence with the course offerings.

Opportunities may exist to offer both preparatory courses and large gateway courses in multiple modes (online, community college, summer session, etc) to minimize any disruption that can be caused by prerequisite requirements and course scheduling.
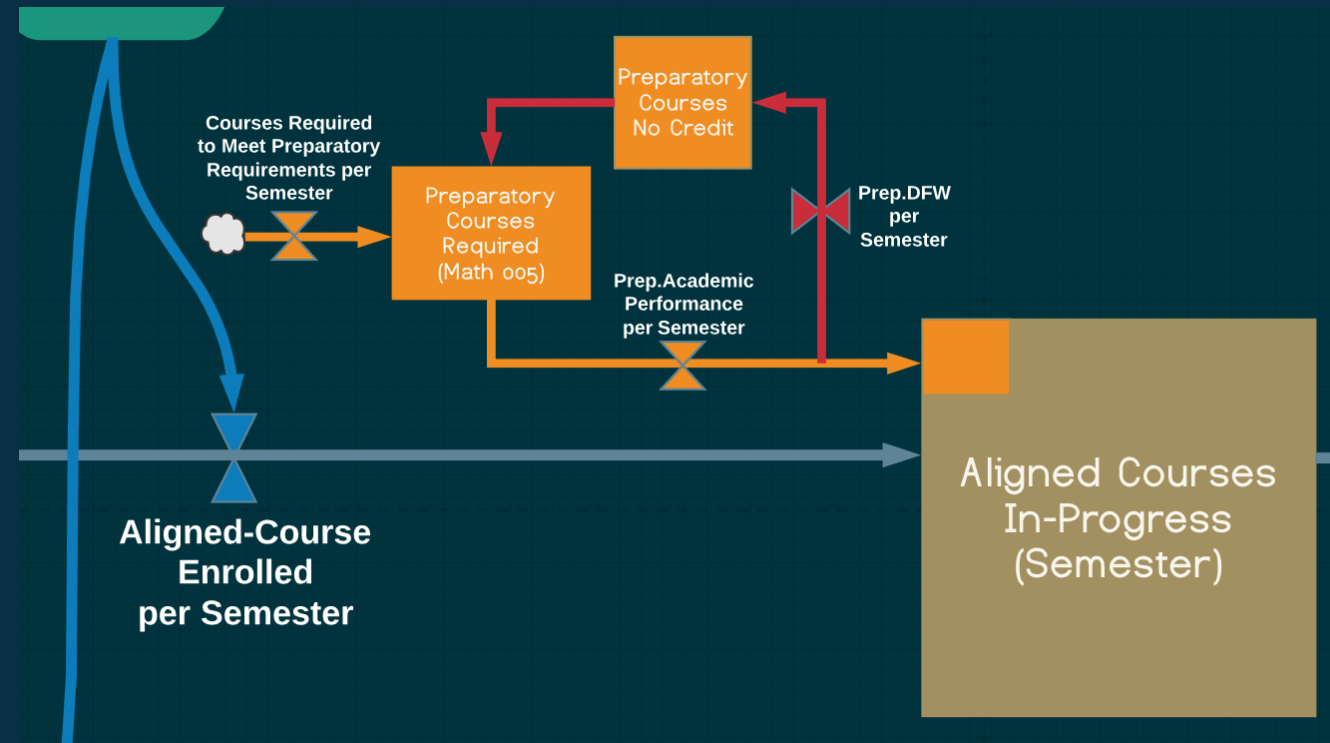
Efficiency Metrics
Potential Indicators - Efficiency Towards Degree

My Degree Path provides this analysis at an individual student basis.

We recommend creating these <u>types</u> of metrics at a macro level, as it will allow us to validate program efficacy and understand underlying mechanics more clearly.

<u>Metric Hierarchy</u>
Student
> **Degree Program**
>> **School**
>>> **University**