Using Early Momentum Metrics to Drive Engineering Retention

From Dashboard to Strategy

A work in progress

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AI diligence statement for this presentation

This report was developed using an AI-augmented workflow (Claude AI (Anthropic) and NotebookLM (Gemni). No student-level PII data, as classified in WCU University Policy 97, was processed. Human verification was completed at data extraction and final report review. WCU OIPE retains full accountability for all findings and recommendations.

The Catalyst: Moving Beyond the Dashboard

With limited budgets, remediation measures must be data-driven… **The current dashboards are great for determining how many left and when, but not why**, which is required for the development of any strategic remediation plan.

Passive Reporting: Delivering descriptive data (who and when).

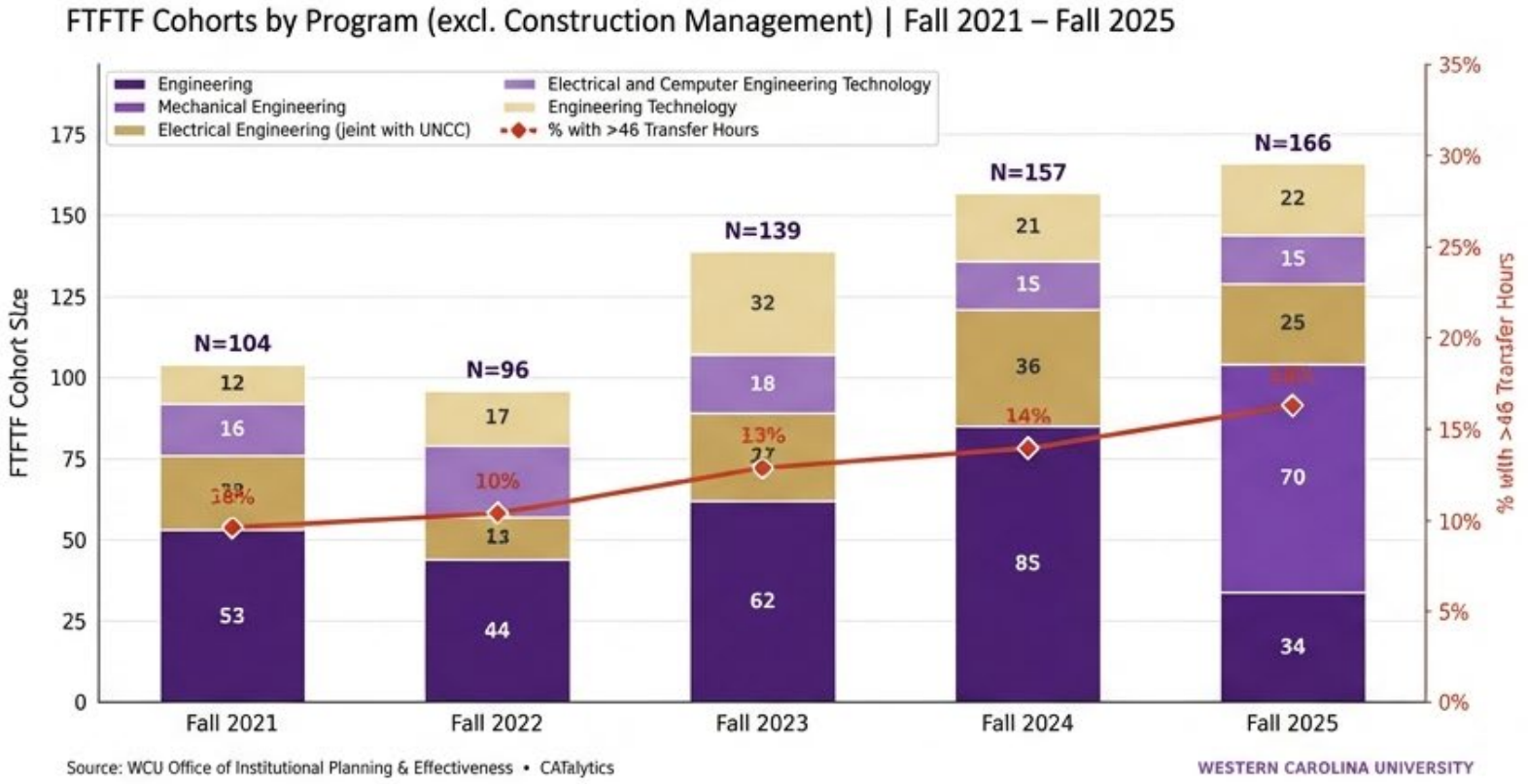
Active Partnership: Anchoring data in **frameworks** to uncover **predictive behavior** (why).

How many of you have released a dashboard and never heard from that office again?

What IR Does	What Gets Missed	What's Possible
Build the report	The conversation	**STRATEGY**
Design the dashboard	The interpretation	**INTERVENTION**
Release the data	The strategic question	**PARTNERSHIP**
Wait for questions	The follow-through	**IMPACT**

This is the story of what happens when IR stays at the table.

Rising Complexity Requires a Sharper Analytic Lens



60% cohort growth since 2021.

Mechanical Engineering is driving the 2025 surge.

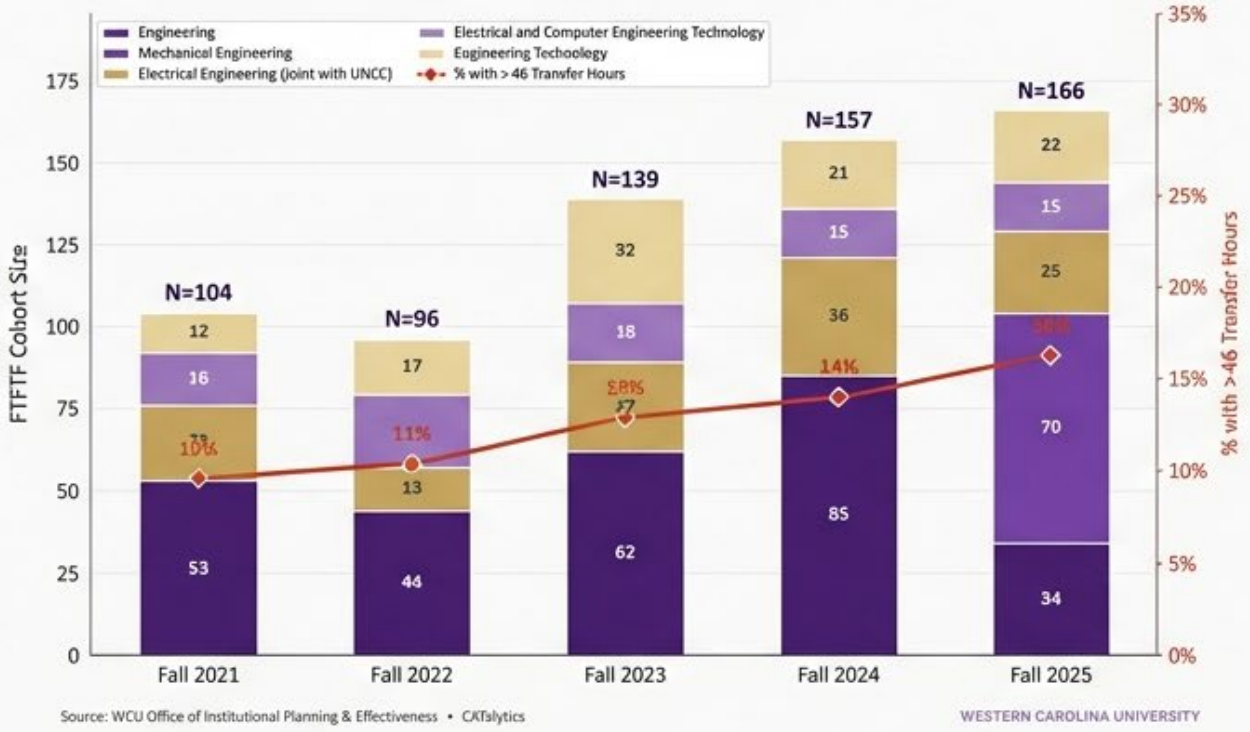
A rising percentage of students are entering with >46 transfer hours, severely adding to advising complexity.

The current dashboard showed how many students left and when, but not why. Growing cohorts mean growing stakes; we needed a predictive tool.

Institutional Context: Surging Growth Meets Falling Retention

CET Cohort Grows 60% Since 2021 — Mechanical Engineering Drives 2025 Surge

FTFTF Cohorts by Program (excl. Construction Management) | Fall 2021 – Fall 2025

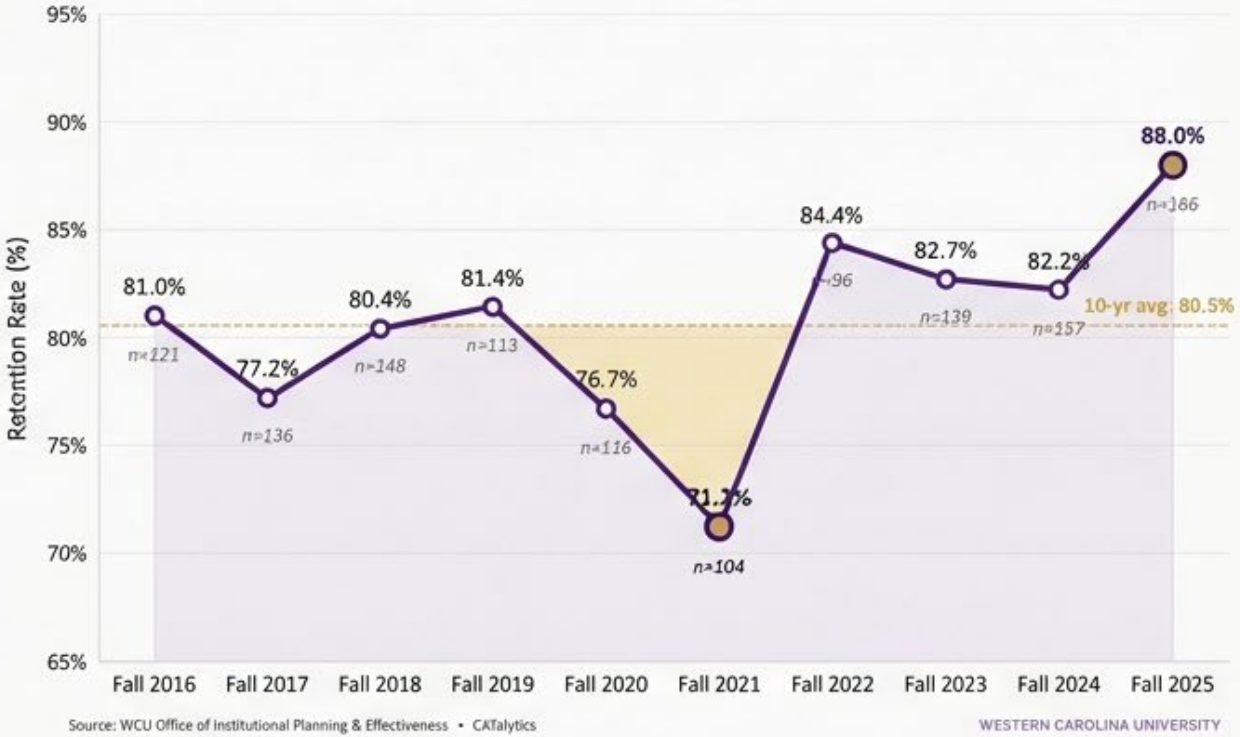


Source: WCU Office of Institutional Planning & Effectiveness • CATalytics

WESTERN CAROLINA UNIVERSITY

CET Fall-to-Spring Retention Trend

FTTTF Cohorts (excl. Construction Management) | Fall 2016 – Fall 2025



Source: WCU Office of Institutional Planning & Effectiveness • CATalytics

WESTERN CAROLINA UNIVERSITY

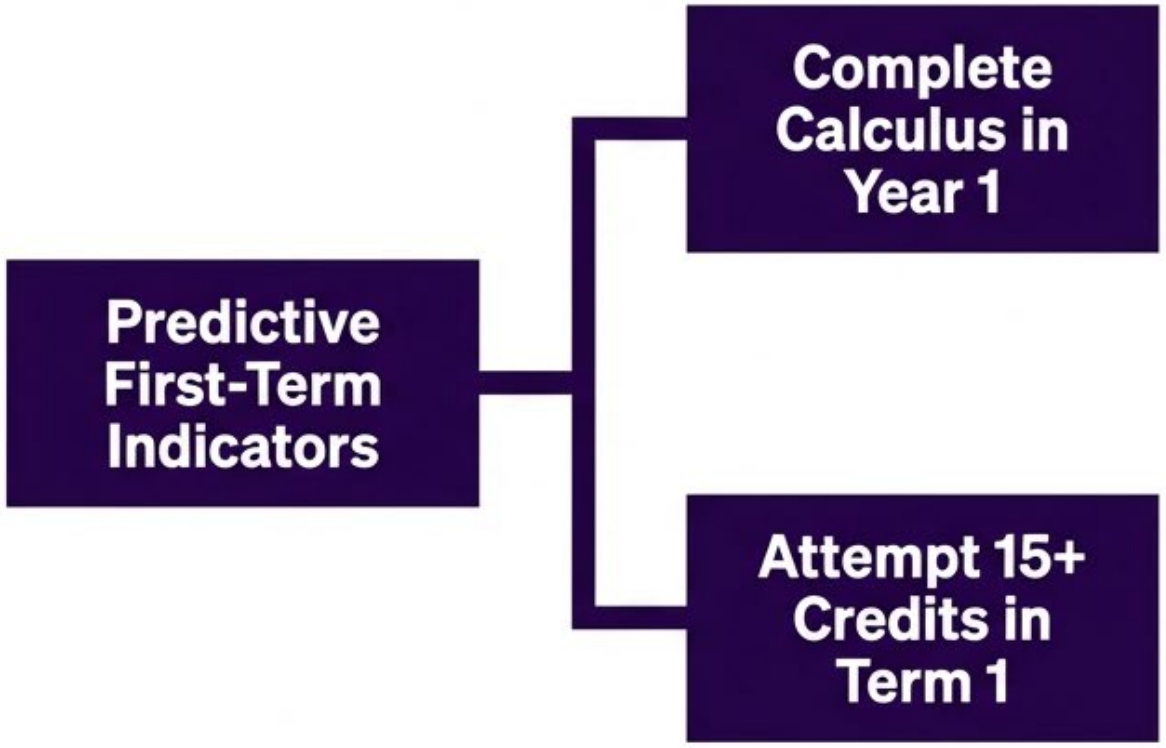
- 60% cohort growth since 2021.
- Driven heavily by the new Mechanical Engineering program.
- Increasing transfer-credit complexity (>46 transfer hours rising).

- CET retention dipped to an alarming 71.2% in Fall 2021.
- Well below the 10-year historical average of 80.5%.

Growing Cohorts = Growing Stakes.
Remediation requires precise, scalable interventions.

WHAT IS EMM?

Defining the Momentum Filters



27 More Credits Earned

Based on national EMM data

+19% Degree Likelihood (57% vs 38%)

Compared to non-momentum students

20% Less Paid Per Degree

In tuition and fees

$4,890 More Tuition Revenue Generated

Per student on average

Early Momentum Metrics predict completion. They tell us what to track.

LOCAL VALIDATION

Calculus as the Ultimate Predictor

Nearly half of entering **students in recent cohorts were not on track to complete** MATH 153 in Year 1.

EMM gave us the filter. It told us what to put on the dashboard — and what to do about it.

Validating the framework locally: Math 153 is our ultimate gateway.

The Tool

Power BI Key Influencer (Uses machine learning to identify which variables most strongly predict an outcome).

The Question

What predicts CET retention at WCU?

The Local Insight

Completing MATH 153 (Calculus I) in Year 1 is the strongest single predictor of retention.

The data got us to the table. Then we had to build something.

Translating Dashboard Flags into Day-One Outreach

Before EMM Framework	After EMM Framework
- Dashboards showed broad historical rates. - Outreach was reactive (waiting for a student to stumble). - No shared language between IR, advising, and faculty.	- Day 1 flagging by math placement group. - Proactive outreach prioritizing the at-risk groups immediately. - Shared EMM vocabulary across the entire team.

We shifted from autopsying retention failures at the end of the year to intervening on Day 1 based on predictive math readiness.

Mapping EMM data directly to advising, belonging, and institutional outcomes.

Inputs

- EMM Data
- Math 153 Tracking
- First Year CET Program
- Senior Advisor

→

Activities

- Targeted Academic Advising
- Proactive Communication
- Discovery Program
- Peer Mentorship

→

Short-Term

- EMM: Increase 1st Term Momentum
- Increase 1st Year Momentum
- College Credit Pass Rate

→

Long-Term

- **UNC Perf. Metric:** Increase Degree Efficiency
- Increase 4-yr Graduation
- Reduce First-time Student Debt

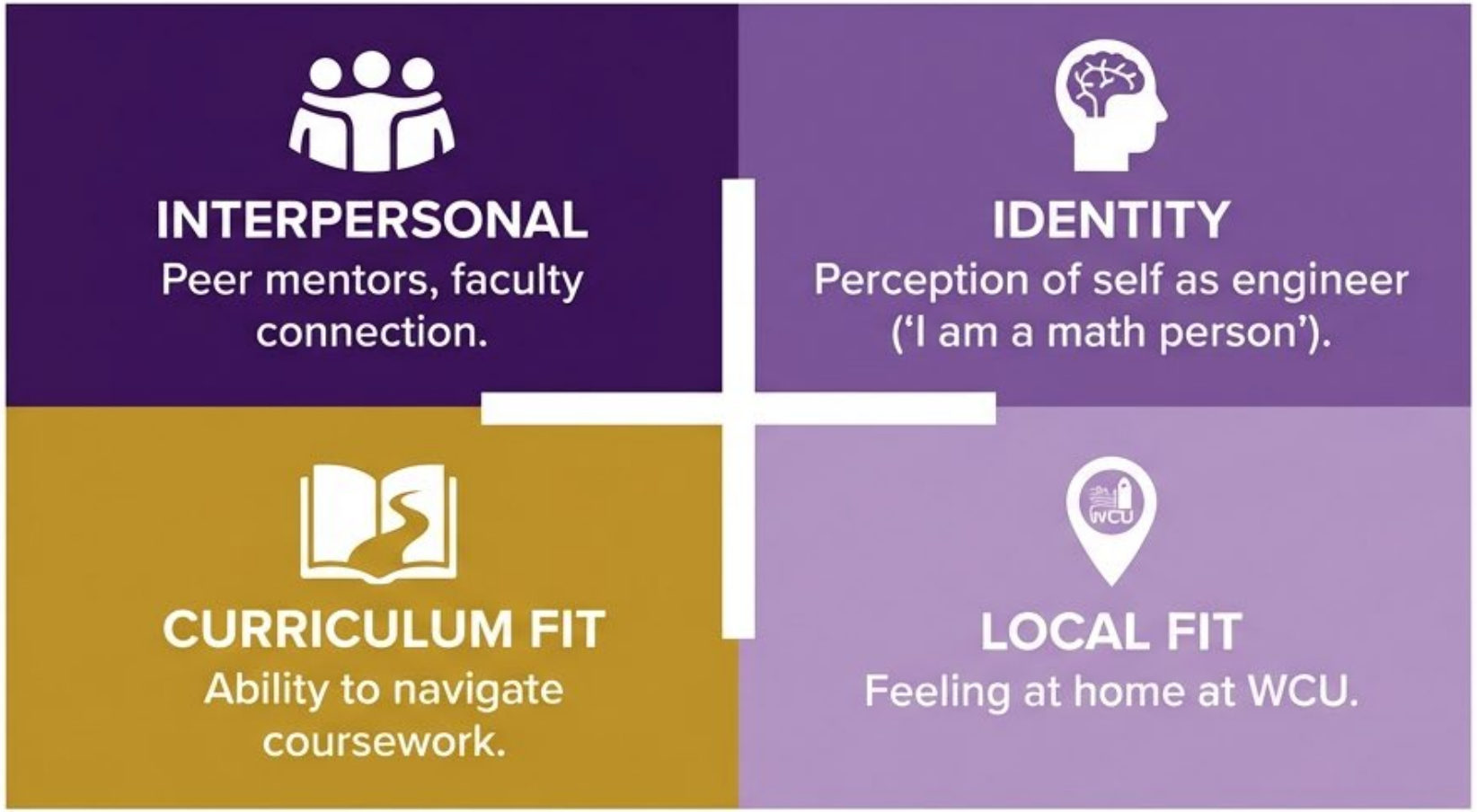
You need a framework to connect daily activities to long-term metrics.

Strategic Alignment: Daily Activities to UNC Performance Metrics

Every granular student interaction is designed to move the needle on UNC System funding targets:

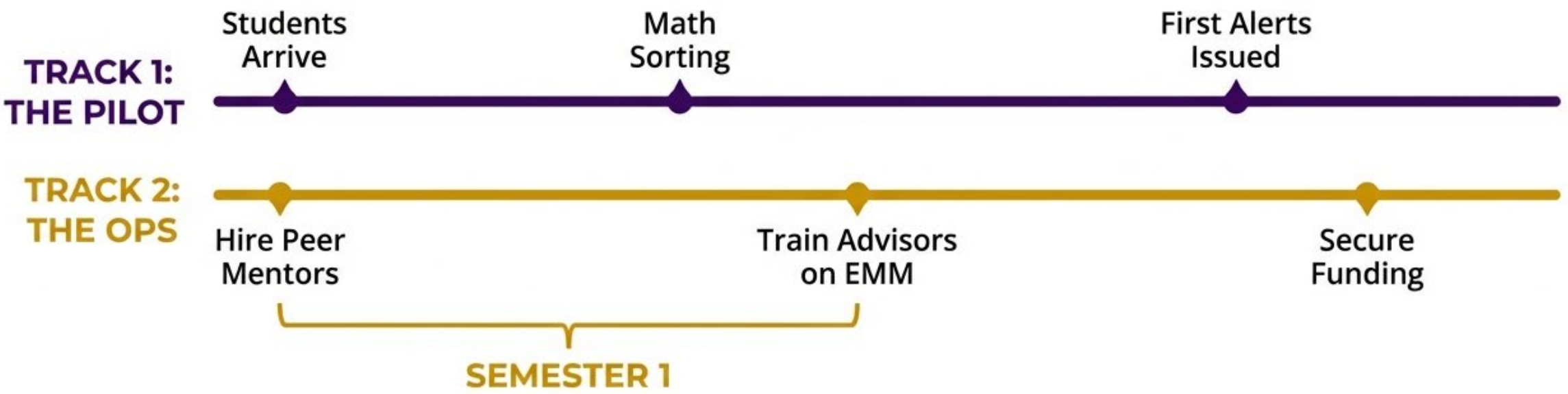
- **Math 153 Tracking & Targeted Advising** → **Degree Efficiency:** Reducing credit waste through early momentum.
- **Discovery Programs & Peer Mentorship** → **4-Year Graduation:** Building the structural support to persist.
- **Proactive Outreach** → **Reduced Student Debt:** Preventing "re-take" costs and unnecessary semesters.

BELONGING IS STRUCTURAL, NOT SOFT



Belonging interventions complement academic momentum; they don't replace it.

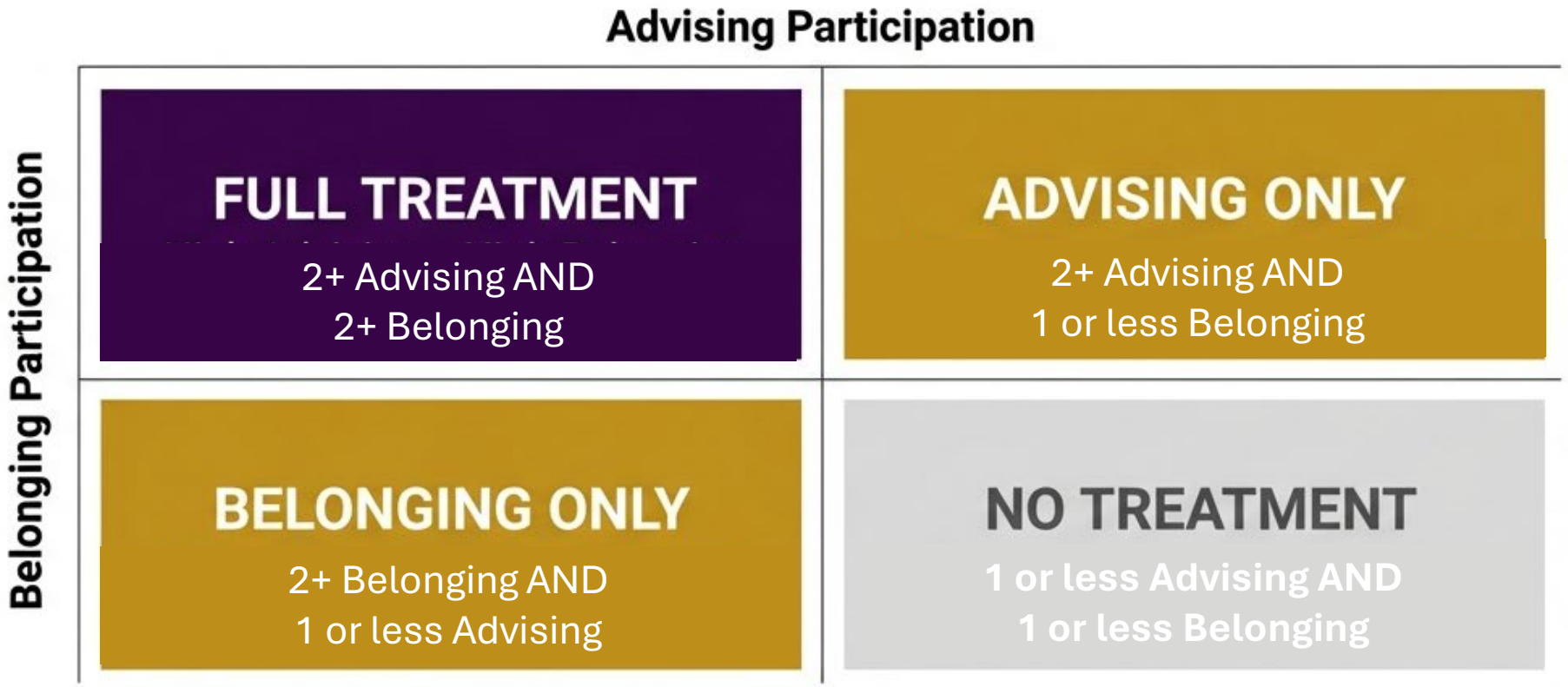
BUILDING WHILE FLYING



Operational infrastructure was built in **real-time** alongside the intervention.

You don't need everything in place to start. You need a framework and willing partners.

THE PILOT EXPERIMENT: TREATMENT GROUPS



Interactions tracked via Navigate (Advising) and ENGAGE (Belonging).

Honest evaluation is part of the strategy. We need to know which lever pulls the most weight.

This helped us define our Targeted Advising Group.

What were students who were not taking Calc I doing?

Student Group
Developing *Enrolled below gateway (MATH 130)*
Some Momentum *Approaching gateway (MATH 146)*
Not Enrolled *No math in Term 1*
Calc I or Higher / Prior Credit* *Enrolled in MATH 153+ or met requirement before entry*
Pilot Targeted Advising *Sum of first three groups*

Nearly Half of CET FTFT Fall 2025 Freshmen Need Gateway Math Support

46% of incoming CET freshmen remain below gateway math readiness — less than recent years and within pilot advising reach

Student Group	Baseline FTFT Freshmen	Baseline % of Cohort	Fall 2025 FTFT Freshmen	Fall 2025 % of Cohort	Change (pp)
Developing *Enrolled below gateway (MATH 130)*	118	30.1%	52	31.3%	1.2 pp
Some Momentum *Approaching gateway (MATH 146)*	73	18.6%	23	13.9%	-4.7 pp
Not Enrolled *No math in Term 1*	25	6.4%	2	1.2%	-5.2 pp
Calc I or Higher / Prior Credit* *Enrolled in MATH 153+ or met requirement before entry*	176	44.9%	89	53.6%	8.7 pp
Pilot Targeted Advising *Sum of first three groups*	**216**	**55.1%**	**77**	**46.4%**	**-8.7 pp**
Total Cohort	**392**	100%	**166**	100%	

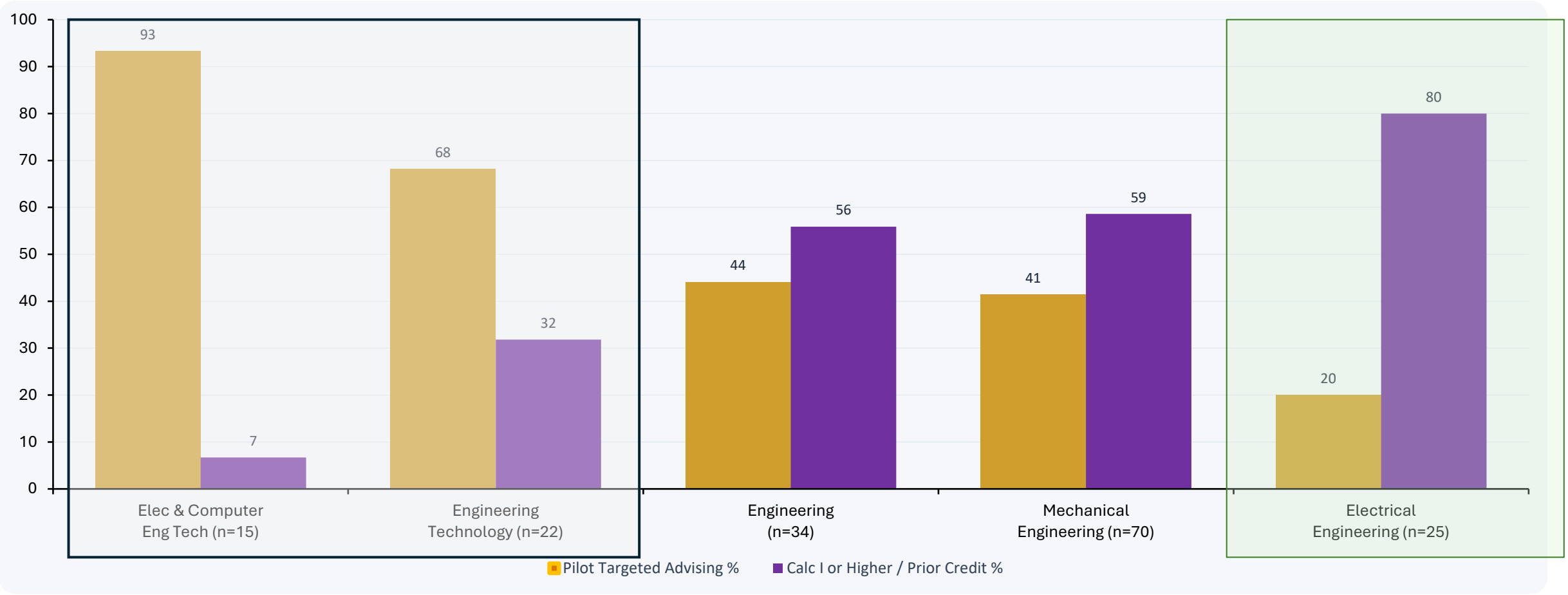
Key Finding: The share of CET freshmen needing targeted advising fell to 46.4% (-8.7 pp from baseline) — genuine progress, but against a backdrop of enrollment growth that is expanding the absolute caseload. The Developing group (MATH 130) showed virtually no decline, remaining the largest single advising segment at 31.3%. As staff capacity becomes the binding constraint heading into Fall 2026, tiered and efficient outreach strategies for the Developing group will be critical to sustaining this positive trend.

Baseline: Fall 2022–2024 combined cohorts (n=392) | *Students with prior credit may not be enrolled in a math course in the first term. | Source: UNC Insight SDM, OIPE Analysis

Table: OIPE | Gateway Math Momentum = MATH 153 (Calc I) | Excludes Construction Management majors

Gateway Math Readiness Varies Significantly by Program — Fall 2025

Cohort-level improvement is broadly distributed; ECET and Engineering Technology carry the highest pilot advising load



ECET: 93% need targeted advising support — highest in CET

Elec. Engineering: 80% arrive at or above gateway — strongest in CET

Fall 2025 (n=166) | Source: UNC Insight SDM, OIPE Analysis | Gateway Math Momentum = MATH 153 (Calc I) | Excludes Construction Management

Advising Impact by Math Readiness Group

Fall 2025 CET FTFTF Cohort · CET Retention % · Developing students show the greatest advising benefit

Math Group	Advised (n)	CET Ret %	Not Adv (n)	CET Ret %	Δ pp
Developing ★	**27**	**77.8%**	25	72.0%	**+5.8**
Some Momentum	10	100.0%	13	100.0%	0.0
Calc I or Higher / Prior Credit	22	95.5%	66	93.9%	+1.6
Not Enrolled in Math *	2	100.0%	1	100.0%	0.0

** Not Enrolled in Math: n = 3 total; interpret with caution.*

★ Developing Group

+5.8 pp

CET retention advantage with 2+ sessions

77.8% advised vs 72.0% not advised

Additional Findings

Higher-readiness students:
Some Momentum and Calc I+ retained at 100% (or near) regardless of advising — minimal marginal effect.

Leaving CET ≠ Leaving WCU:
2 non-advised Developing students left CET but stayed enrolled at WCU in other colleges.

Advising investment yields the greatest retention returns in the Developing math group — where risk is highest.

Early retention signals and operational realities from the field.

What's Working

- Early advising outreach; Math-readiness tailwind; Cross-functional team cohesion.

What's Harder Than Expected

- Belonging tracking quality (Engage app); Peer mentor infrastructure.

What's Next

- Full vs. Advising-only outcome comparison; Refining belonging data points.

Honest evaluation builds better programs than polished success stories.

The IR Call to Action

- Be curious. Design datasets not just to answer today's questions, but to support future, iterative use.
- Be invitational. Use your skills in organizing information to help form teams, not just products.
- Resist assumptions. Practice servant leadership. Start from humility—assume you don't yet have the "right" data or the "best" practice.
- Gift your expertise. Your "outsideness" embodies a perspective others may not have.

Thank you for listening. Safe travels.
Anne Oxenreider, Senior Data Analyst, WCU
Let's keep the conversation going—connect with me on LinkedIn.