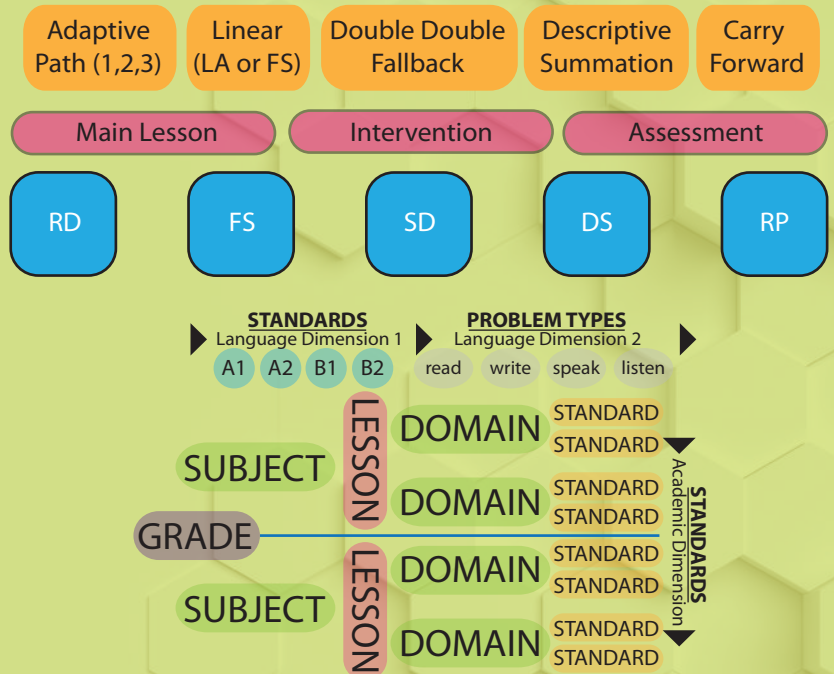# Advanced Pedagogic Algorithms
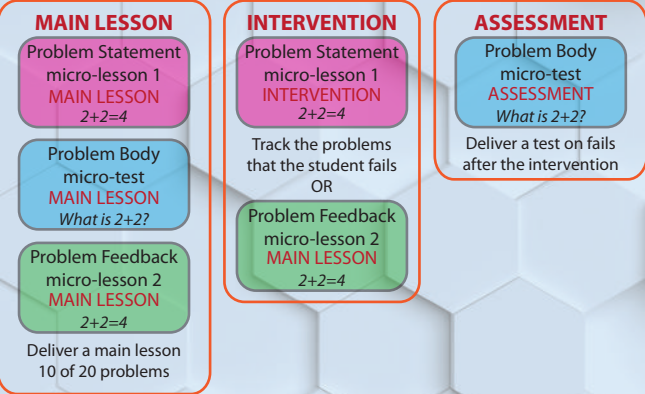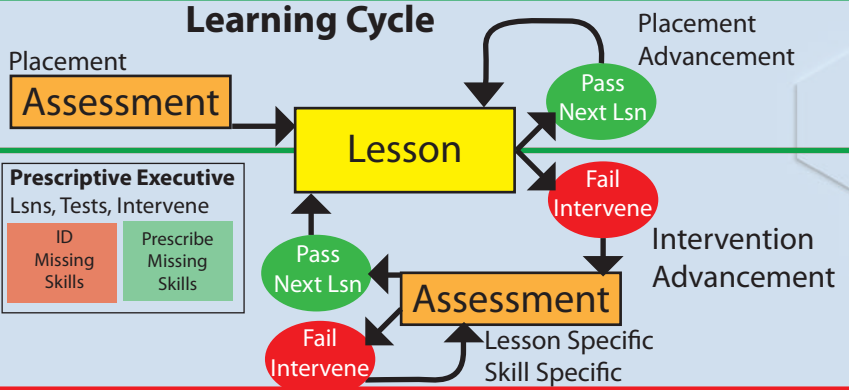
Lesson Creation:

(1) Assign Engines
- a. Which Engine for the main lesson?
- b. Which Engine for the intervention?
- c. Which Engine for the assessment?

(2) Name Lesson

(3) Assign Lesson Type
- a. Readability
- b. Focus Skill
- c. Sequence Dependency
- d. Descriptive Summary
- c. Rapid Progression

(4) Assign Academic Domain

(5) Assign Academic Standards

(6) Assign Language Standards

(7) Create Set of Problems (different types)
- a. reading
- b. listening
- c. writing
- d. speaking

Lesson Definition On Standards

| Adaptive Path (1,2,3) | Linear (LA or FS) | Double Double Fallback | Descriptive Summation | Carry Forward |

| Main Lesson | Intervention | Assessment |

| RD | FS | SD | DS | RP |

STANDARDS
Language Dimension 1
A1 A2 B1 B2

PROBLEM TYPES
Language Dimension 2
read write speak listen

LESSON

SUBJECT
DOMAIN — STANDARD / STANDARD
DOMAIN — STANDARD / STANDARD

GRADE

LESSON
SUBJECT
DOMAIN — STANDARD / STANDARD
DOMAIN — STANDARD / STANDARD

STANDARDS Academic Dimension

Learning Cycle

Placement
Assessment

Placement Advancement

Lesson

Pass Next Lsn

Fail Intervene

Intervention Advancement

Prescriptive Executive
Lsns, Tests, Intervene
- ID Missing Skills
- Prescribe Missing Skills

Pass Next Lsn

Assessment

Fail Intervene

Lesson Specific
Skill Specific

MAIN LESSON
Problem Statement
micro-lesson 1
MAIN LESSON
$2+2=4$

Problem Body
micro-test
MAIN LESSON
What is 2+2?

Problem Feedback
micro-lesson 2
MAIN LESSON
$2+2=4$

Deliver a main lesson
10 of 20 problems

INTERVENTION
Problem Statement
micro-lesson 1
INTERVENTION
$2+2=4$

Track the problems
that the student fails
OR

Problem Feedback
micro-lesson 2
MAIN LESSON
$2+2=4$

ASSESSMENT
Problem Body
micro-test
ASSESSMENT
What is 2+2?

Deliver a test on fails
after the intervention

Main Lessons

Adaptive Path Alone — For lessons that are not sumative and not sequence dependent, but that can have readability text levelling.

Adaptive Path Summary — For clustered (4) 'text intense' lessons associated with the essay builder so summation can be done by students.

Adaptive Path Sequ Dep — For sequence dependent lessons where AdP is used as a narrow spectrum placement test to ID the lessons that do not need to be delivered and find the ones that do.

Linear Stand Alone — For lessons that require no adaptive algorithms in the main delivery sequence, but that deliver problem after problem in a simple linear fashion.

Carry Forward — For focused skills like vocabulary lists and math problems, where not much teaching is required, but practice is needed.

Assessment

Double Double Fallback — Strong algorithm for Broad Spectrum assessments where rapid progression is required.

Adaptive Path Alone — Reading skill is always being assessed real-time because the sentence are levelled for readability while still addressing their primary learning goals.

Adaptive Path Summary — Readability is assessed here too, but the text blocks are conceptually interdepended, and they work with the essay builder as a problem type and test engine.

Adaptive Path Sequ Dep — This engine works with Sequence Dependent lessons, which require understanding foundational concepts, then build up to higher knowledge structures.

Carry Forward — For lesson intervention and assessment, where a student fails a lesson and we follow up immediately in the learning cycle.

Nested User Tiers

Inside GEC, we have a hierarchical user stack that is 7 layers deep. This allows us to have the following users with custom reporting aggregated for each specific level in the hierarchy.

Information flows up.
Oversight flows down.

1. International User
2. National User
3. Company User
4. Disctrict User
5. School User
6. Teacher User
7. Parent User
8. Student User

GEC
UPPER MANAGEMENT SYSTEM

INFORMATION FLOWS UP

OVERSIGHT FLOWS DOWN

Interntl Admin

National Admin

Company Admin

Partner 1 Data
Partner 2 Data

GEC Data

School Admin

School Admin

Teacher Admin

Teacher Admin

API
SINGLE SIGN ON
DATA INTEGRATION

Communication System

Inside GEC, we have text, audio and video chat between two individuals or for groups of any size.

The communication is very useful in classroom settings, but also for administration teams up and down their specific hierarchy.

The GEC notification system is both PC and mobile enabled, and can be as useful for admin as it is for teachers, students and parents.

The same is true for the GEC synchronous study environment, which is useful for admin team meetings and collaboration as well.
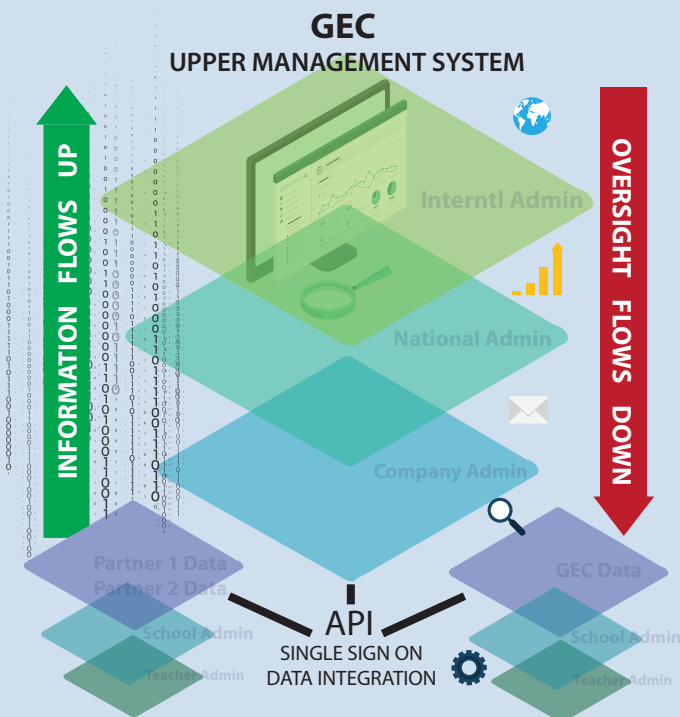
Tracking - Aggregating - Reporting - Notifying - Motivating - Intervening

Language Reporting
The CEFR language framework incorporates can-do statements for usage and grammar. GEC has build a standards map which associates multiple standards to lessons at the problem level. This means we can track mutiple standards in a single lesson on a problem by problem basis.

Academic Reporting
Using the same standareds engine, we apply academic standards to problems together with the CEFR standards in a way that allows us to track the skill levels concurrently as our students progress through the academic content. This gives GEC deep performance insights.

Study Skills
Students self regulate if their habits are shown to them in a positive, non-threatening way. But if students do not self-regulate, GEC can escalate notifications to teachers and parents as well.
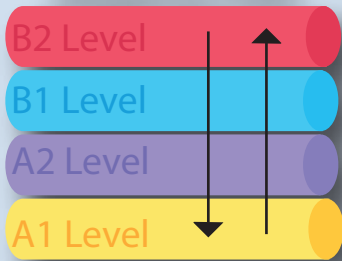
Motivation
Motivating students requires engagment, reporting, and notification to reveal where problems exist. But the true power to motivate lies in the social psychology from educators, parents and especially peers.

Pedagogy Engines in Action

Adaptive Path

B2 Level
B1 Level
A2 Level
A1 Level

Adaptive path allows us to deliver a series of difficulty levels in one single lesson environment. When the student consistently passes problems on one level, the system automatically levels them up on the next problem.

This engine is used for readability together with our essay builder, which is our summary engine that trains for comprehension and writing skills.

Linear Engine

Problem 1
Problem 2
Problem 3
Problem 4
Problem 5

The linear engine delivers problems in sequence like any classical digital curriculum would do. We use it for skills focus lessons, like vocabulary or math problems.

When coupled with the Carry Forward Engine, or the Double Fallback Engine for assessment components, the Linear lesson approach is enhanced and becomes a much more powerful teaching tool.

Carry Forward Engine

01
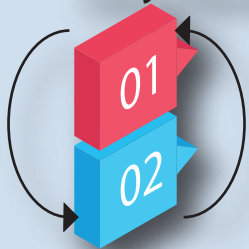
Micro Assessments
Check for skills gaps.

02

Micro Lessons
Fills skills gaps.

Carry Forward is the main intervention engine that runs our learning cycle behind every other lesson type. If students fail a lesson, the failed problems are delivered in a cycle of micro-lessons and micro-tests until all weak skills have been eliminated.

Carry forward can also be used as a primary lesson type, rather than just an intervention tool alone.

Double Fallback Engine

4/4 Attempt
Broad Spectrum Assessment.

6/8 Fallback
4/4 failed, so add another 4 problems.

Failure Intervention
Deliver the full lesson or alternatively intervene.

Double Fallback is a broad spectrum assessment engine that rapidly checks for student skills deficits very quicly across many lessons. 4 Key problems are delivered, and if the student answers all correct, they pass the lesson. Since 4 is a very small data set, students are given an additional 6/8 opportunity if they fail the first 4 questions.

Failing a DF assessment initiates delivery of the full lesson version.

GEC Problem Anatomy

MICRO LESSON 1
Statement
MICRO TEST
Body
MICRO LESSON 2
Feedback

Every GEC problem consist of a lesson component and a test component. This architecture gives us the ability to deliver assessment and intervention with very sensitive specificity, and is a key strategy that helps GEC to better automate the student learning process.

Student Reports and Interventions

46%

Academic Skills
Other Courses
Language Arts
Social Studies
Science
Math

38%

Langauge Skills
Grammar
Vocabulary
Writing
Speaking
Listening
Readability

33%

Study Habits
Attendance
Activity
Attention
Regularity
Scheduling

21%

Social Skills
Other
Participation
Peer Support
Peer Interaction
Authority Response

A Tracking Academic Skills

ENGLISH OF ACADEMICS

GEC uses a CLIL (Content & Language Integrated Learning) strategy that teaches English through K-8 Science, Social Studies, Math and other K-8 academic topics.

B Tracking Language Skills

ADAPTS AUTOMATICALLY TO STUDENT PROFICIENCY

Each problem in the GEC text curriculum has four 'skill versions' (speaking - listening - reading - writing). GEC's AI tracks and targets weak skills and delivers the appropriate 'skill version' to strengthen them.

Additionally, each lesson (paragraphs and problems) exists in four difficulty levels (CEFR / A1 - A2 - B1 - B2), and automatically adapts to student comprehension ability.

C Tracking Study Skills

CRITICAL AUXILIARY SKILLS TRAINING

Poor scheduling, irregularity and other detrimental study habits do much to handicap students in their academic and 2nd language performance. The GEC systems gives students, parents and teachers gentle feedback with the goal of helping them to improve these critical study and life skills.

D Attitudes and Motivation

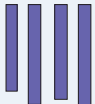**THE MOST IMPORTANT ISSUE TO ADDRESS**

Demotivated and dis-interested student behaviors used to be a disciplinarian issue for parents to address. GEC can now programatically help with this most thorny problem. The GEC platform has tools that provide opportunities for students to interact socially in ways that increase their motivation to do excel.

Langauge Skills

Readability	Listening	Speaking	Writing	Vocabulary	Grammar
Reception Production Interaction	Reception Production Interaction	Reception Production Interaction	Reception Production Interaction	General Lesson Specific	Analytic Performance

Academic Skills

Math	Science	Social Studies	Language Arts	DDP Program
Scores Language Levels	Scores Language Levels	Scores Language Levels	Scores Language Levels	Scores Language Levels

Data generated by student activity in the system is organized to give insight across a multi- dimension of different skills, including (1) **Language Skills**, (2) **Academic Skills**, (3) **Study Skills**, and (4) **Social Skills**, which underpin student motivation.

Study Habits

Scheduling	Regularity	Attention	Activity	Attendance
Complete Asgnmts Being on time	Study Steadiness Steady performance	Self Study metric In-class evaluation	Self Study Metric Group Metric	Presence History

By arranging our reporting structure in this way, we can track the weakest skills in the matrix and target them in a priority over the stronger skills. In this way, the system knows the weak skill and deliveres more focus on them until they improve and become stronger than another.

Social Skills

Authority Response	Peer Interaction	Peer Support	Participation	Other
As an Authority Under and Authority	Initiative Responsive	Giving Receiving	Passive Active	Metric 1 Metric 2

GEC Context Supported Essay Builder
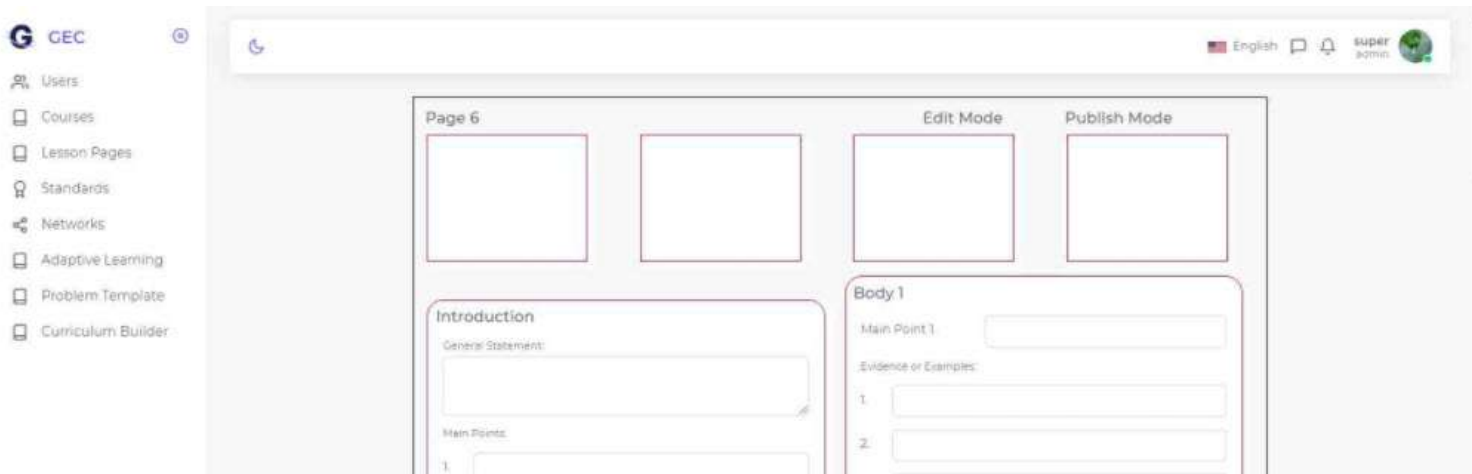
Content Informed - Intellegent Essay Fields

GEC's Essay Builder is tied to our academic source material in important ways. Each lesson has Self Study problems and a Live Class Page. The structure of each supported lesson maps to fields in GEC's Essay Builder environment.

After completing the Self Study problems and the Live Class, students are required to produce an essay from the material they have recently completed.

Every problem and every paragraph the students have covered directly ties into the structure of the essay. In this way, the structural nature of our curriculum's conceptual schema supports curriculum developers, teachers and students in a nest of related context that all together results in quality student output in written form.

Alternative Essay Forms

Main Point & Supporting Details, Cause & Effect, Compare & Contrast... GEC supports numerous essay formats and trains students to write well.

Removing the Training Wheels

GEC provides support, but gradually removes that support in a controlled, methodical way. The result is high level academic performance in dense sets of academic content for progressive GEC students.

4 'Skills Representative' Questions

Auto-generated questions derive from the eBook presentation, and these problems are created in four 'skills representative' versions. -LISTENING - READING - SPEAKING - WRITING.