Analytic System Documentation

System / Project Name: General Education Learning Objectives Dashboard

Course / Semester: Spring 2026

Team Members: Samuel Tate, Tyler Parker, Aiden White

Date Completed: 5/5/2026

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1. System Description

1.1 Overview and Purpose

- We are creating a foundation for a dashboard that will provide users with visual representations for Learning Objectives (LO), as well as provide users with comparisons and analysis to support related decisions.

1.2 Intended Users and Stakeholders

- The dashboard is primarily designed to allow the General Education Department (Gen. Ed.) at Arkansas Tech University to visualize, compare, and analyze learning objective data to support educational and curriculum-related decisions.

1.3 Scope for This Semester

- Our scope was primarily developed around creating a simple dashboard that can provide a variety of analytics and visualizations using the provided data.
- The way our dashboard is meant to be designed this semester was not intended to be a definitive final product, but rather a foundation that future projects can use to improve analytics and input more data.
- The largest constraint we faced was data availability. While the data wasn't difficult to obtain, thanks to our sponsor Amanda Gardner, the data we had was very little, so our dashboard cannot currently provide sufficient analysis for any real decision making.

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2. Requirements

2.1 Functional Requirements

Req ID	Requirement Description	Priority (Must/Should/Nice)	Status (Done/Partial/Not Done)	Notes
V01–V36	Interactive scatter plots: LO1–LO5 pairwise comparisons (36 combinations) with selectable X/Y axes, regression overlay, and cluster coloring. Bar chart explorer grouping by Delivery, Goal, or Subject with aggregation options.	Must	Done	Tyler Parker (V01–V36 graph UI); Aiden White (regression logic); Samuel Tate (clustering)

2.2 Non-Functional Requirements

- Performance (e.g., response times, data volumes).
- Reliability / availability expectations.
- Security / privacy considerations (if any).
- Usability / accessibility goals.

Req ID	Requirement Description	Priority (Must/Should/Nice)	Status (Done/Partial/Not Done)	Notes
NF01	Dashboard loads and renders in under 5 seconds on app start; supports up to 1,000 records without performance degradation. Data is loaded once at startup from Supabase; no real-time refresh required.			

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3. Data Model

3.1 Data Sources and Destinations

Type (Source/Destination)	System / Platform	Location (DB/Schema/Table, Path, API, etc.)	What It's Used For
Source	Supabase (PostgreSQL)	Table: GEData_Raw_2021_2024 via REST API (https://hlaazlqgqymhbaimgtdy.supabase.co)	Raw GE assessment data (2021–2024) used to power all dashboard visualizations, regression analysis, and KMeans clustering.

3.2 Logical Data Model / ER Description

- No formal ER diagram was created. The data model consists of a single flat table with no joins.
- Main entity: GEData_Raw_2021_2024 each row represents one assessment record for a student in a Gen. Ed. course section.
    - Key fields: Subject (course discipline), Goal (Gen. Ed. goal), Delivery (course modality), LO1–LO5 (numeric learning objective scores), and additional assessment columns.
    - Relationship: One Subject can have many assessment records across multiple Goals and Delivery modes. All LO scores belong to a single assessment record (one-to-one).
- No ER diagram file. Data provided directly by Amanda Gardner (Gen. Ed. Department, Arkansas Tech University) as a CSV with 505 rows and 27 columns (shape: 505 x 27). Loaded into Supabase table GEData_Raw_2021_2024.

3.3 Data Quality and Limitations

- Currently, the dashboard is not suggested for supporting any real LO-related decisions. While the dashboard does provide the desired forms of analytics and visualization, there is not enough data for any significant analysis.

4. Analytic Processes (ETL, Models, Automated Tasks)

4.1 Automated or Non-User Interface Catalog

Included to Blackboard Submission

4.2 Known Gaps and Ideas for Enhancements

- No ETL gaps — data is loaded live from Supabase on app startup. No scheduled or batch automation processes were implemented; all analytics are computed in real time within the Dash application.
- Future teams could: (1) add a data upload interface so the Gen. Ed. department can update the Supabase table without developer help; (2) implement scheduled ETL to automatically ingest new annual CSV exports; (3) add additional years of data to enable meaningful longitudinal trend analysis; (4) create a preprocessing pipeline to standardize column names and validate incoming data quality.

5. Visualizations and User-Facing Outputs

5.1 Visualization Catalog

Included in Blackboard Submission

5.2 Known Gaps and Ideas for Enhancements

- Missing/desired visualizations: (1) Time-series trend line showing LO score changes year-over-year (2021–2024); (2) Heatmap of average LO scores by Subject × Goal; (3) Box-and-whisker plots showing score distributions per LO; (4) Side-by-side department comparison dashboard.
- Next team improvements: (1) Add date/year filter to all tabs to enable time-based slicing; (2) Implement drill-down from Subject to individual course sections; (3) Add export-to-CSV/PDF button for stakeholder reporting; (4) Incorporate a KPI summary card row at the top of the dashboard showing overall LO pass rates; (5) Allow the Gen. Ed. department to upload new data directly through the UI.

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6. Project Plan and Status

6.1 Milestones Completed

Milestone / Deliverable	Target Date	Status (Done / Partial / Not Done)	Notes
Project Kickoff & Requirements Definition	Jan 2026 – Feb 2026	Done	Met with Amanda Gardner; received data (505 rows, 27 columns); defined scope, WBS, and project plan. All team members: T, A, S.

6.2 Open Items and Next-Semester Priorities

- Too little data to make actionable analysis. (Will be fixed as more data is added in future years)
- Possibility for an initiative to encourage the creation/collection of data. Relies more of the General Education department, but future projects could assist.

7. Training and Onboarding for End Users

7.1 Skills and Tools Needed

- Basic Python knowledge to initialize and run the dashboard, which can be handled by OIS.
- Knowledge of Arkansas Tech General Education Learning Objectives and courses.
- General computer skills to navigate the dashboard
- Basic/intermediate data analytics knowledge and skills to properly read and interpret data.

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8. Code, Artifacts, and Project Files

8.1 Repositories and Storage Locations

Type (Code / Data / Docs / Other)	Location (URL / Path / System)	Contents Summary	Access / Permissions	Notes
Code	GitHub repository (project code and scripts)	GitHub — BDA4003 Gen Ed Dashboard repo (uploaded to GitHub by team)	Accessible to team members; to be transferred to Amanda Gardner or OIS upon handover	Includes dashboard.py, requirements, and documentation files

8.2 Key Files and Entry Points

File / Artifact Name	Location / Repository	Purpose / When to Use	Notes for Future Teams
dashboard.py	GitHub repository root	Main entry point — run to start the Dash web application. Execute with: python dashboard.py	Install dependencies first: pip install dash pandas scikit-learn statsmodels plotly supabase. Runs on http://127.0.0.1:8053/

8.3 Environment and Configuration

- Required Tools: Python 3.9+ (primary runtime); Supabase account with REST API access; web browser to view dashboard. No Power BI or Tableau required — dashboard is built entirely in Python Dash.
- Required Python libraries (install via pip): dash, pandas, scikit-learn, statsmodels, plotly, supabase. Run: pip install dash pandas scikit-learn statsmodels plotly supabase
- Setup steps: (1) Clone or download the GitHub repository; (2) Install Python 3.9+; (3) Install required libraries using pip (see above); (4) Run python dashboard.py; (5) Open http://127.0.0.1:8053/ in a browser.

- Supabase URL and publishable API key are hardcoded in dashboard.py (lines 14–15). The key used is a public/publishable key. For production, move credentials to environment variables or a .env file using python-dotenv.
- The dashboard and database will be moderated by the university's OIS department to ensure that data is properly cleaned, and only authorized users are accessing the information

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9. Reflection

- The data we had to work with was very little, but our project was more focused on developing a foundation that can be built upon. With that in mind, we believe our model fulfills that purpose.
- Working with the Gen. Ed. Department, especially Amanda Gardner, was fortunately a smooth process. Despite not being able to provide as much data as we desired, we were still able to make a sufficient dashboard thanks to the department.
- Looking forward, we recommend that future teams focus on data collection initiatives and expanding the dataset. The current 505-record dataset spanning 2021–2024 is insufficient for statistically significant analysis. With more data, the regression and clustering features of this dashboard will become genuinely useful to the Gen. Ed. department for curriculum decisions.
