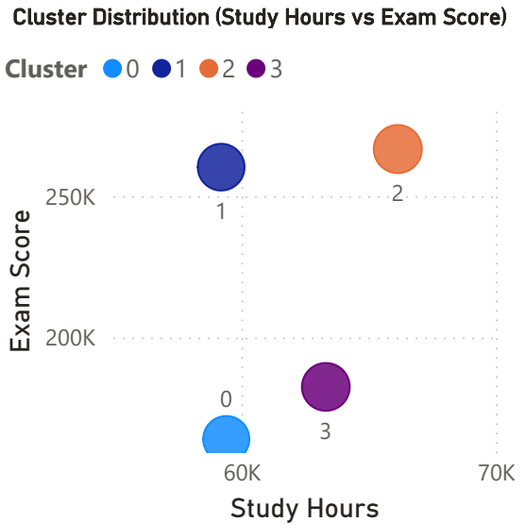
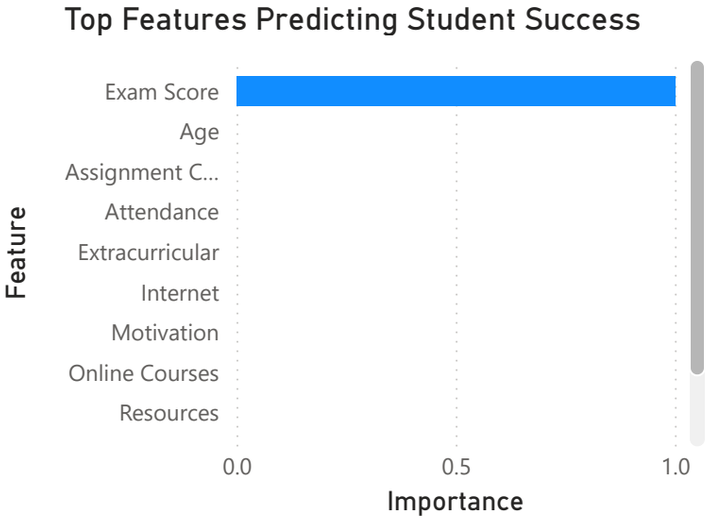
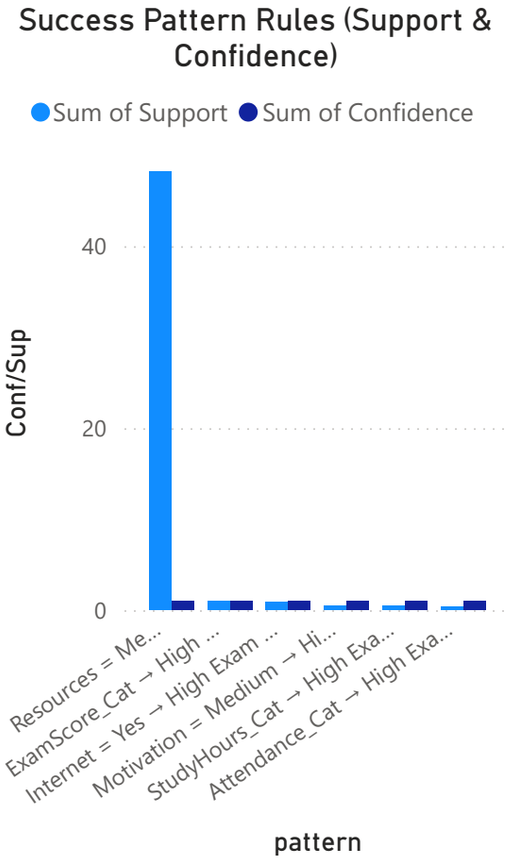
Success Pattern Rules (Support & Confidence)







Confusion Matrix - Classification Results

Actual	Sum of Predicted Pass	Sum of Predicted Fail
Fail	0	868
Pass	2860	0
Total	**2860**	**868**

KEY INSIGHTS & ACTIONABLE RECOMMENDATIONS

(Based on clustering, decision tree analysis, and association rule patterns)

INSIGHT 1: Exam Score Is the Sole Determinant of Passing

Finding:

The decision tree achieved 100% accuracy using *only* ExamScore as the predictor. All other features (study hours, attendance, motivation, resources, internet access) had zero importance in the pass/fail classification. This indicates that student success at the institution is determined entirely by exam performance, with no weighting from continuous assessments.

Recommendations:

- Introduce structured continuous assessment components to balance exam dependency.
- Redesign the grading system to incorporate assignments, participation, and weekly quizzes.
- Provide exam preparation workshops for at-risk students identified in clusters 0 and 3.
- Implement moderated exam review mechanisms to prevent score inflation or bias.

INSIGHT 2: Two Distinct High-Performing Learner Profiles Identified

Finding:

Clustering revealed two groups of strong performers. Cluster 1 achieved high exam scores with moderate assignment completion, while Cluster 2 combined high assignment completion and high online-course engagement. Both clusters averaged above 82% in exams despite different study behavior patterns.

Recommendations:

- Develop personalized learning pathways based on cluster profiles.
- Encourage high assignment engagement for all students, as it strongly aligns with high performance in Cluster 2.
- Promote blended learning strategies modeled after Cluster 1's success with digital coursework.
- Establish mentorship programs where high-performing students guide lower-performing peers.

INSIGHT 3: At-Risk Student Groups Show Inefficient Study Patterns

Finding:

Clusters 0 and 3 exhibited low exam performance (54–59%) despite having study hours comparable to the high-performing groups. This suggests that time spent studying does not directly translate into effective learning for these students.

Recommendations:

- Implement mandatory study strategy workshops focusing on active recall, spaced repetition, and exam techniques.
- Assign academic support tutors to students identified in low-performing clusters.
- Introduce diagnostic assessments early in the semester to identify learning gaps.
- Develop structured weekly study plans monitored by academic advisors.

Students Needing Intervention

3258

At-Risk Students

Current Pass Rate (%)

76.72

Pass Rate

Note:

These recommendations are based on data mining analysis of 1000 + students, using K-Means clustering, Decision Tree classification, and Association Rule mining. Implementation priority should be given to Insights 1, 2, and 3 for maximum impact.

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