

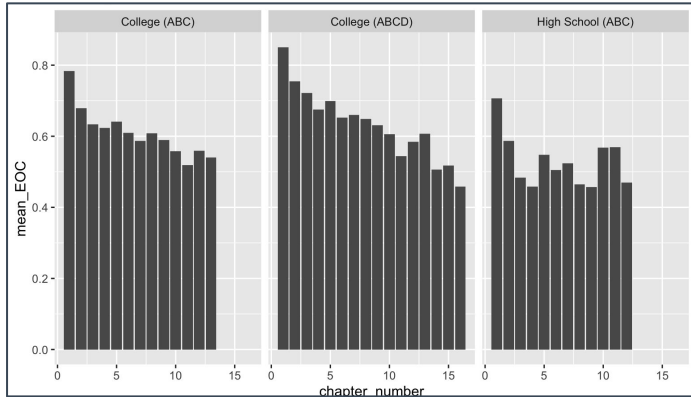

To Put It Into Perspective

Space, Learn, Repeat.

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Preliminary Findings

EOC by Book



Utility Value by Chapter

| Chapter Number | Utility Value Score (0-6) | End of Chapter Grade (%) | Learning Score |
|----------------|---------------------------|--------------------------|----------------|
| 1 | 4.739677 | 69.61203 | 12.455004 |
| 2 | 4.534259 | 64.50385 | 13.351467 |
| 3 | 4.517174 | 63.01265 | 13.566149 |
| 4 | 4.543756 | 65.09290 | 8.678192 |
| 5 | 4.514479 | 62.01255 | 12.424146 |
| 6 | 4.495318 | 60.13109 | 9.002898 |
| 7 | 4.482126 | 61.67968 | 10.135818 |
| 8 | 4.424876 | 59.61775 | 11.949166 |
| 9 | 4.536232 | 57.64162 | 8.551383 |
| 10 | 4.544654 | 52.63004 | 8.831631 |
| 11 | 4.559846 | 57.17447 | 9.902127 |
| 12 | 4.682203 | 54.79388 | 4.020663 |

EOC scores **decreased** over time for all books.

For chapters 1–8, EOC scores **decreased** as a student's perceived usefulness of the material **decreased**.

Hypothesis: Improving perceived usefulness and confidence of material while practicing spaced repetition will increase retention rates.

Approach

Student Outlook



Split the responses from student surveys vs learning scores into training/testing sets and created a decision tree.

```
data_split <- initial_split(pulse_eoc_total_pivot, prop = 0.8)
train_data <- training(data_split)
test_data <- testing(data_split)

tree_spec <- decision_tree() %>%
  set_engine("rpart") %>%
  set_mode("regression")

tree_fit <- tree_spec %>%
  fit(learning_score ~ Cost + Expectancy + `Intrinsic Value` + `Utility Value`, data = train_data)

predictions <- tree_fit %>%
  predict(test_data) %>%
  pull(.pred)

# Calculate RMSE and R-squared
metrics <- metric_set(rmse, rsq)
model_performance <- test_data %>%
  mutate(predictions = predictions) %>%
  metrics(truth = learning_score, estimate = predictions)
```

Spaced Repetition



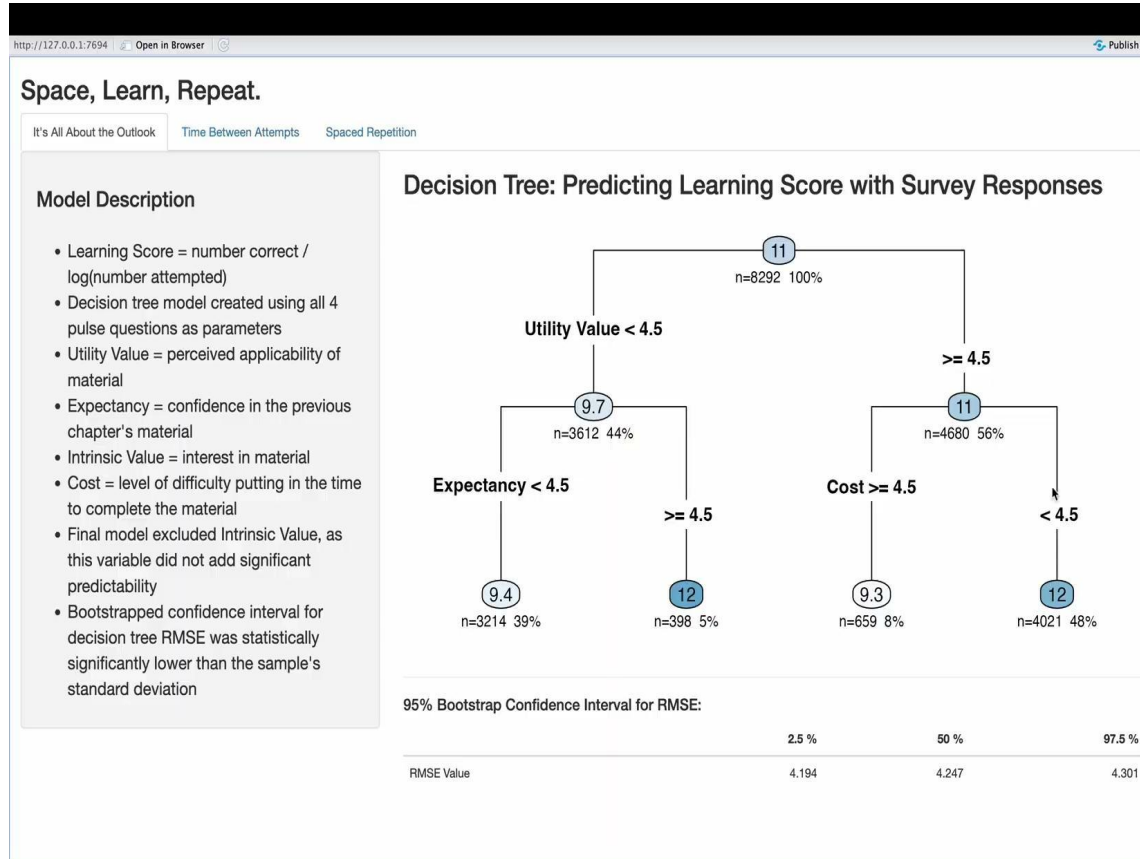
Created date first accessed, data tried again, and time difference variables.

```
page_views = filter(page_views, time_difference >= 0)

page_views_temp = page_views %>%
  group_by(dt_accessed, tried_again_dt, time_difference, student_id) %>%
  summarize(max_time_diff = max(time_difference))

page_views_temp
```

Shiny Demo



Next Steps

A close-up photograph of a hand holding a pen, writing mathematical equations on a lined notebook. The equations include $2x^2 - 5x = x(x+1) - 9$, $x(x+1)^2 - 1 - 5$, and $(x+1)^2 - 1 - 5$.

Outlook:

“Using real-world applications increases student engagement and improves how well students can remember and recall key concepts.”

A photograph of an open book with its pages slightly curved, set against a blurred background of warm, golden lights, creating a bokeh effect.

Spaced Repetition:

“German psychologist Ebbinghaus conducted a series of experiments on learning retention, discovering that our brain naturally forgets things if we don't go back and review.”

We **recommend** the textbook to:

- Contextualize material with **real-world examples** at the beginning and end of each chapter to improve perceived usefulness.
- Incentivize **spaced repetition** by integrating concepts from previous chapters into current topics.
- Develop a “Quizlet-style” application that generates practice questions.