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FaunaForest: A Novel Software Tool for Teaching Decision Trees to Middle School Students

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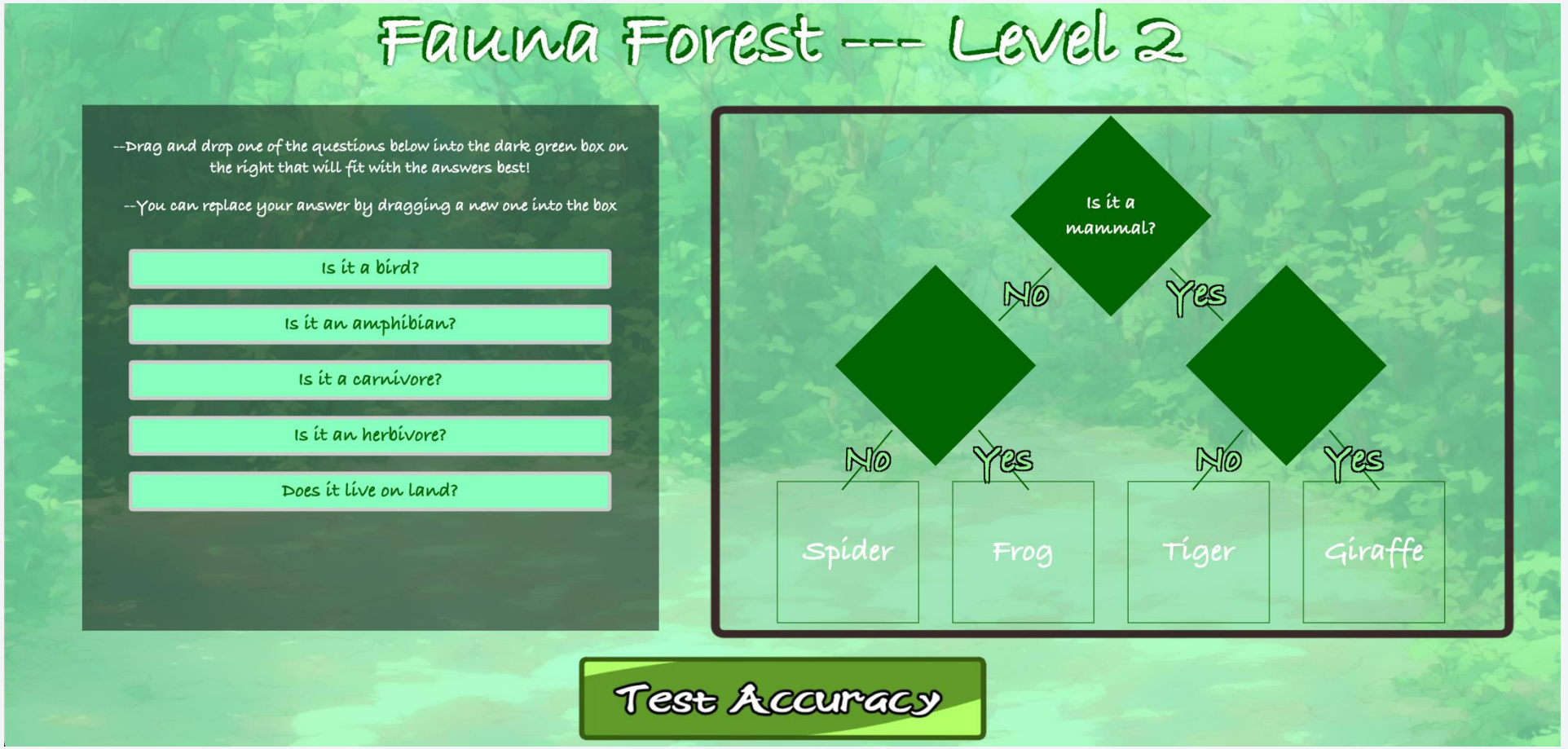
Background

- K-12 AI literacy is increasingly significant
- Decision trees (DTs) education
  - Fundamental AI model
  - Aligns with AI4K12's Big Ideas 2 and 3
  - Existing work relies on unplugged activities
- Need for accessible, engaging, and interactive software tools
- FaunaForest

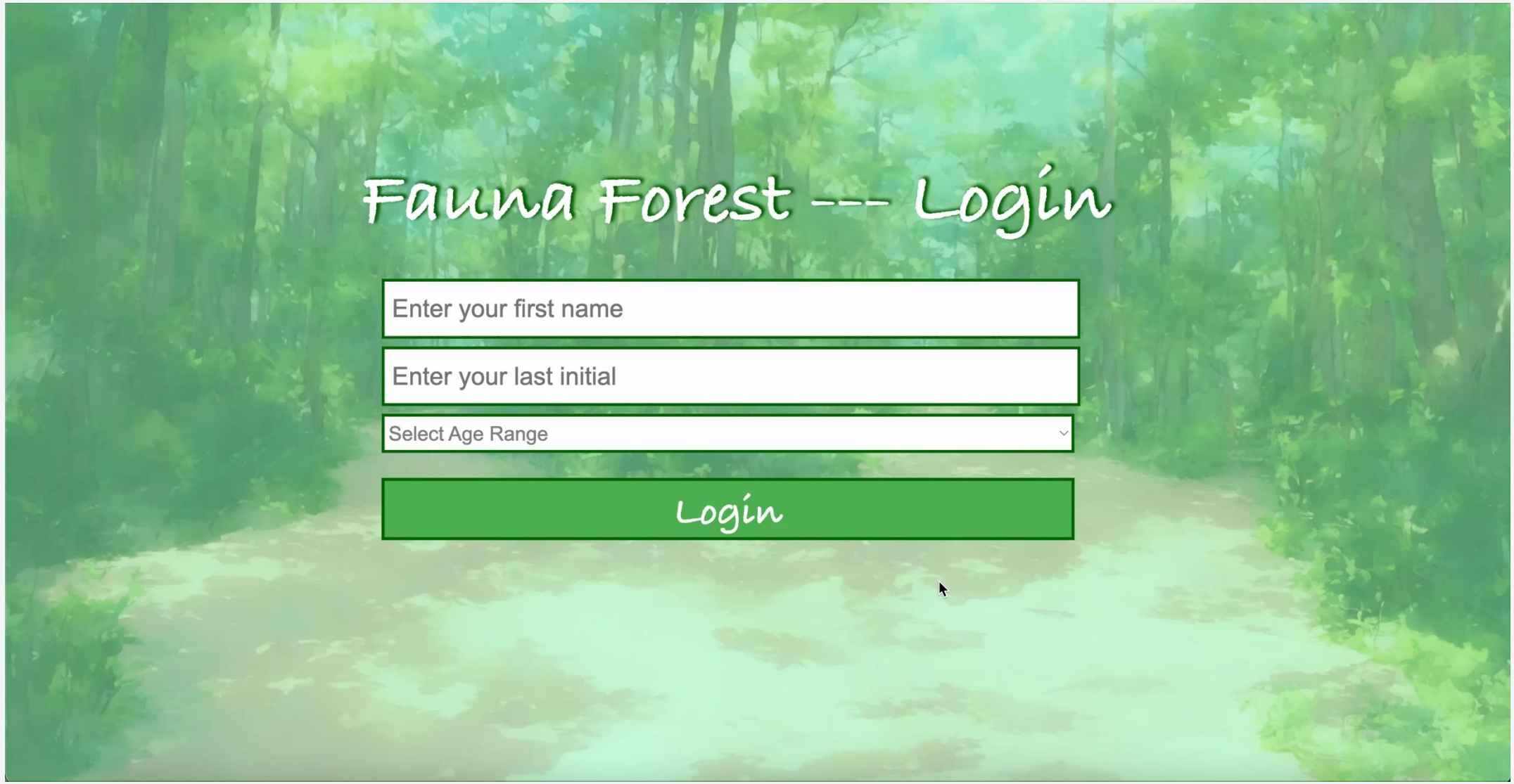
Research Questions

- (RQ1) What evidence is there of learning within FaunaForest?
- (RQ2) Are there any differences in learning outcomes between different grade levels?
- (RQ3) Is FaunaForest engaging?

FaunaForest Tool Design



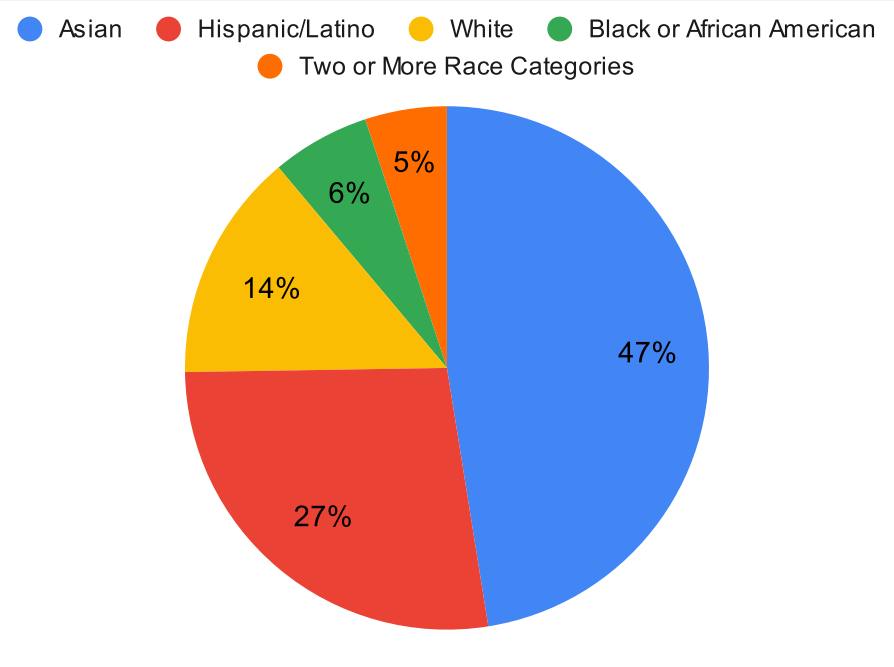
User interface - FaunaForest level 2



FaunaForest gameplay

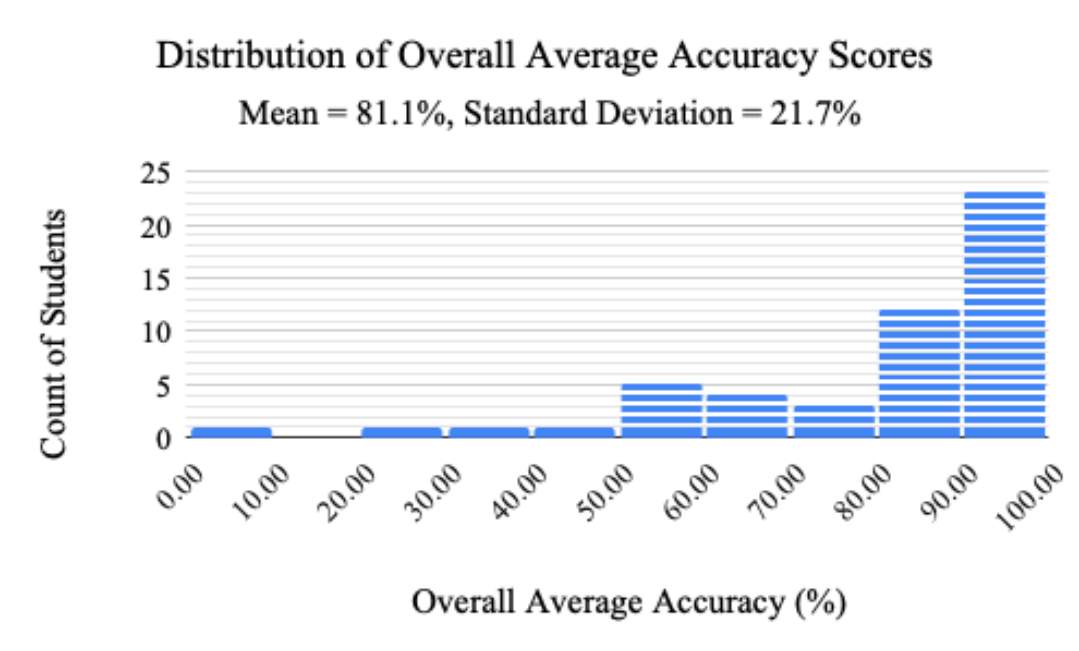
Study Design

- 7 AI educational software tools were tested
- Participants - middle school children
- Location - STEM Public Charter School
- Students rotated between the software tools every 8-10 minutes
- Data collection
  - Collective pre-survey
  - FaunaForest Website Interaction Data
  - Audio/Screen Activity
  - Post-survey



Demographic information of participants

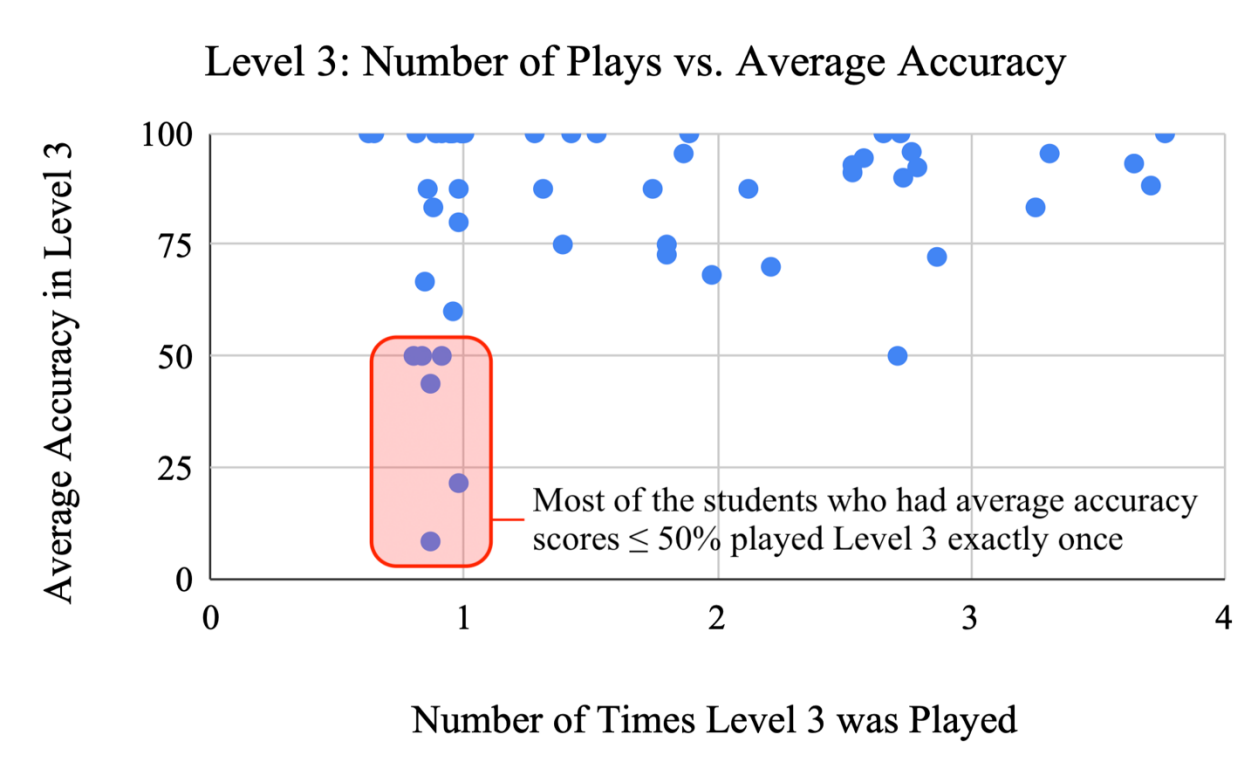
Results – (RQ1) What evidence is there of learning within FaunaForest?



	Level 1	Level 2	Level 3
Mean (%)	75.5	79.2	83.3
Standard Deviation (%)	37.9	30.7	21.5

Mean (and standard deviation) of students' average accuracy scores across FaunaForest's 3 levels show an upward trend.

Results – (RQ1) What evidence is there of learning within FaunaForest?

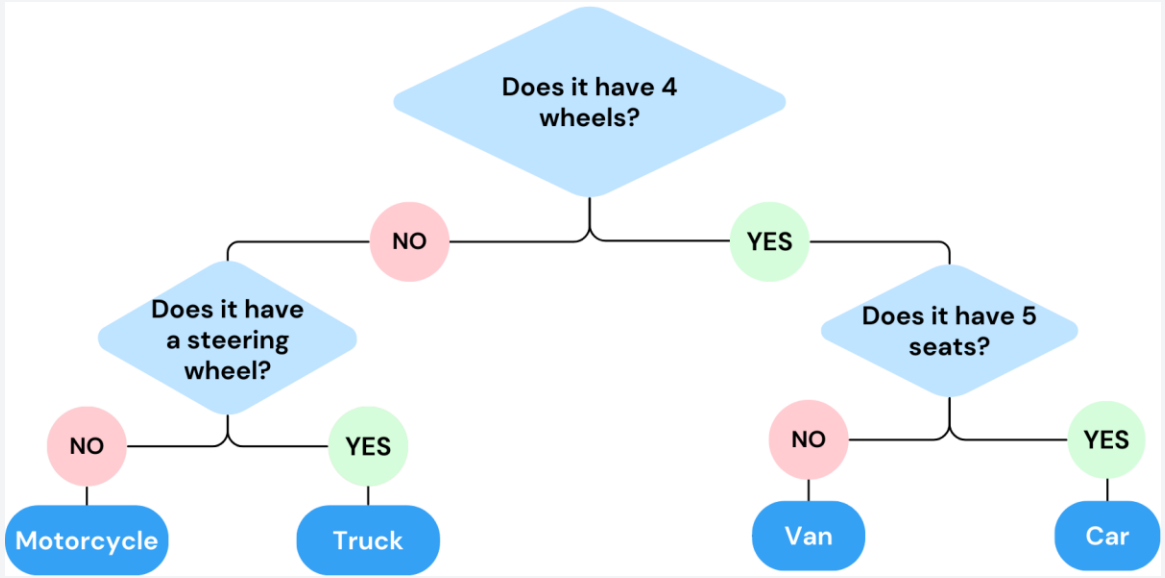


Students who played Level 3 multiple times performed better on it.

Two-sample t-test

- *p-value = 0.044*
- *Statistically significant difference in Level 3 average accuracy between students who played it once versus more than once*

Results – (RQ1) What evidence is there of learning within FaunaForest?



Response	Percentage of Students (%)
Motorcycle	72.3
Bicycle	8.5
Van	6.4
Car	6.4
Truck	6.4

Distribution of responses to the post-survey multiple choice DT traversal item asking students to determine how a bicycle would be classified. The correct answer is motorcycle.

Results – (RQ2) Are there any differences in learning outcomes between different grade levels?

Grade	Correct Responses	Incorrect Responses
6	9 (50%)	9 (50%)
7	20 (76.9%)	6 (23.1%)
8	6 (85.7%)	1 (14.3%)

Performance on post-survey DT traversal item by grade level.

Grade	Count of Students	Mean (%)	Standard Deviation (%)
6	18	77.0	21.7
7	26	82.5	23.3
8	7	86.3	15.6

Mean and standard deviation of overall average accuracy scores by grade level.

Results – (RQ3) Is FaunaForest engaging?

- Observations
  - One student stayed at our table for the entire session, enjoying the challenge level
  - A student was initially confused but assisted by the researchers. At the next session, she played FaunaForest with a friend.
  - Students actively competed for high accuracy scores in the challenge level

Response	Count of Students
Interactive Activities	36
Explanatory Text	29
Visualizations	23

Features of FaunaForest that students indicated were useful in a post-survey item.

Discussion

- Successful aspects of FaunaForest
  - Interactivity
  - Challenge level
  - Structured guidance
- Web-based application → accessible and easy to use
- FaunaForest is an effective, quick introduction to DTs

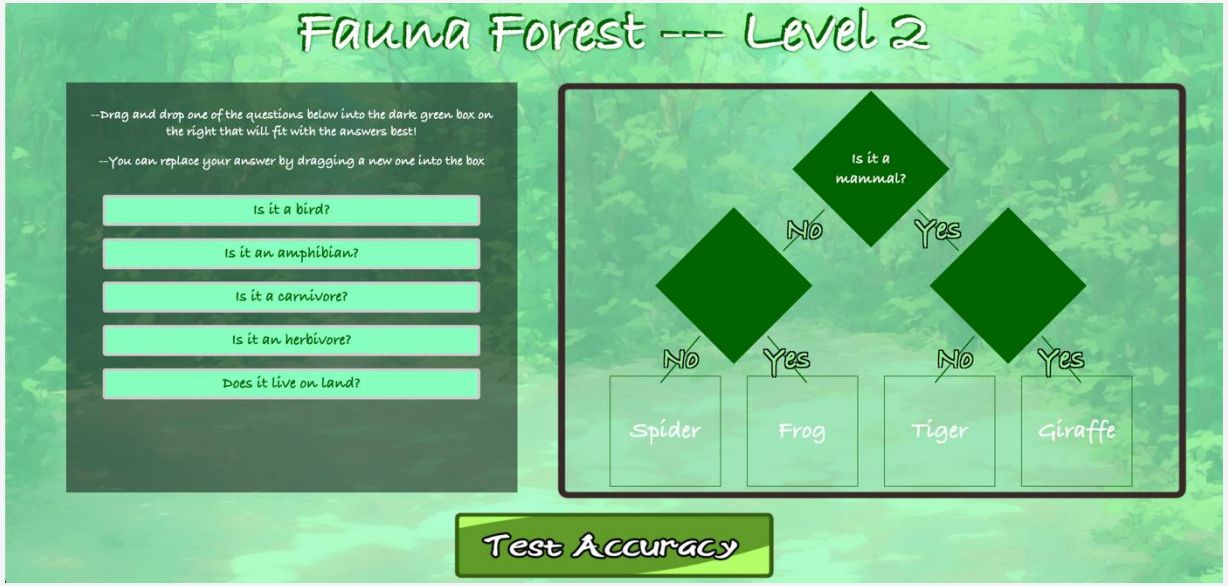
Limitations and Future Work

- Pre-survey versus post-survey analysis
- Limited sample size

- Introduce more complex concepts
- Expand FaunaForest
  - Additional levels
  - Dynamic DT building
  - Cater to multiple age groups

Conclusion

- FaunaForest - interactive web application for teaching DTs
- Evaluated with middle school students
- FaunaForest was effective
- Demonstrated the potential of software tools for AI education



Questions?

Access a repository containing the links to the FaunaForest live deployed version, GitHub repository, and this presentation here.

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