Using an Integrated Approach to Improve the Development and Scoring of Technology-based Speaking Tests

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Introduction

AZELLA

Arizona English Language Learner Assessment

- A standards-based English language proficiency assessment that meets both state and federal requirements
- Placement Test (year-round, July - June, appx. 25K)
  - Administered to students identified as L2 learners on Home Language Survey
- Reassessment Test (annual summative, February-March, appx. 75K)
  - Students who have been placed into an ELL program take the reassessment once a year until they achieve proficiency
  - Reassessment scores used for accountability measures

AZELLA

Arizona English Language Learner Assessment

- Four domains (Listening, Speaking, Reading, Writing)
  - Listening, Reading, Writing: paper-based
  - Speaking: delivered on 1-on-1 by an administrator on a speaker phone and scored automatically by AI scoring

- Five stages
  - Stage I (Kindergarten)
  - Stage II (grade 1-2)
  - Stage III (grade 3-5)
  - Stage IV (grade 6-8)
  - Stage V (grade 9-12)

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Project Partnership

Arizona
Department of Education

- Project Sponsor
- Owner of the Test
- Item development

WestEd

- Item production
- Booklet design

Pearson

- Human scoring service
- Automated scoring service
- Psychometric service
- Test Printing
- Test Administration

Motivation for the Project

Before 2012-2013

- Paper/Pencil Test
- Test administered inconsistently
- Hand scored by Test Administrator
- Test scored inconsistently
- Assessment of Speaking proficiency was not a priority

How could we achieve a speaking test that could be administered and scored **consistently** and **reliably** for accountability purposes with about 100K ELLs every year?

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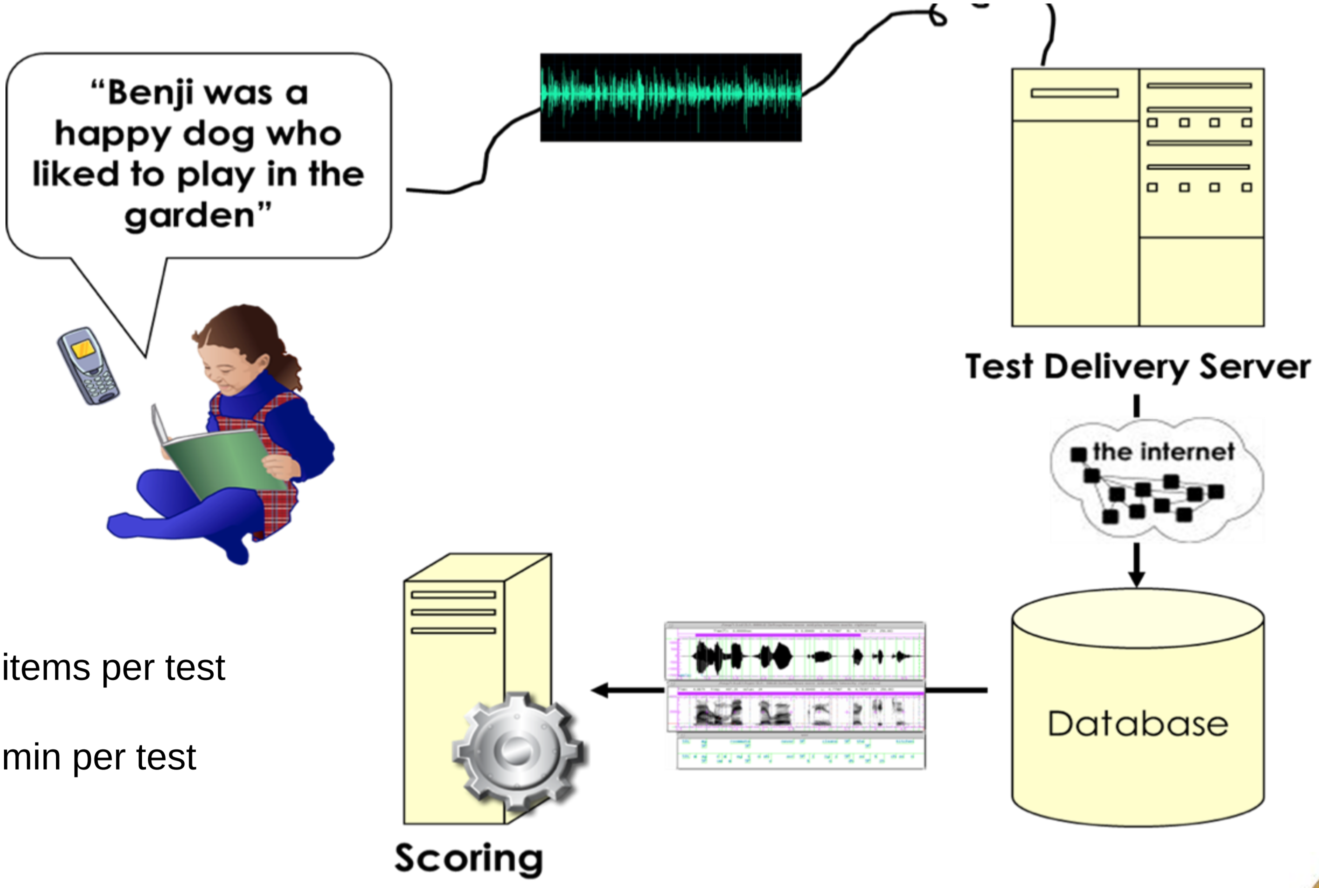
Solution

ADE and Pearson agreed in 2011 to initiate the project to develop an **automatically scored speaking test**

- Development Work: 2011-2012
    - i. 1st Field Test (November, 2011)
      1st-12th grade, n= 31,685
    - i. 2nd Field Test (April, 2012):
      Kindergarten, n=13,141

- 1st Operational Test: January 2013   K-12, n=140k

AZELLA Speaking administration



10-12 items per test

12-15 min per test

Item Types

Item Types	Skill
Give short responses	Speaking
Questions about an image	Speaking
Questions about a statement	Speaking
Give directions from a map	Speaking
Give instructions to do something	Speaking
Detailed responses to a topic	Speaking
Open questions about a topic	Speaking
Repeat	Speaking
Similarities & Differences	Speaking
Naming	Reading/literacy
Word list	Reading/literacy

Sample Items

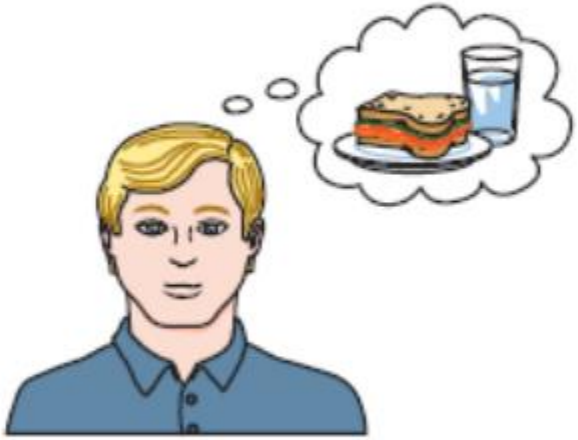
Naming (Syllabification)

Look at the picture. This is a strawberry. Say the three syllables of the word strawberry.

https://www.azed.gov/assessment/files/2014/05/azella_stage-ii-sample-test-teachers-edition.pdf

Short Response

Look at the picture. The boy is hungry. What does he say to his teacher?

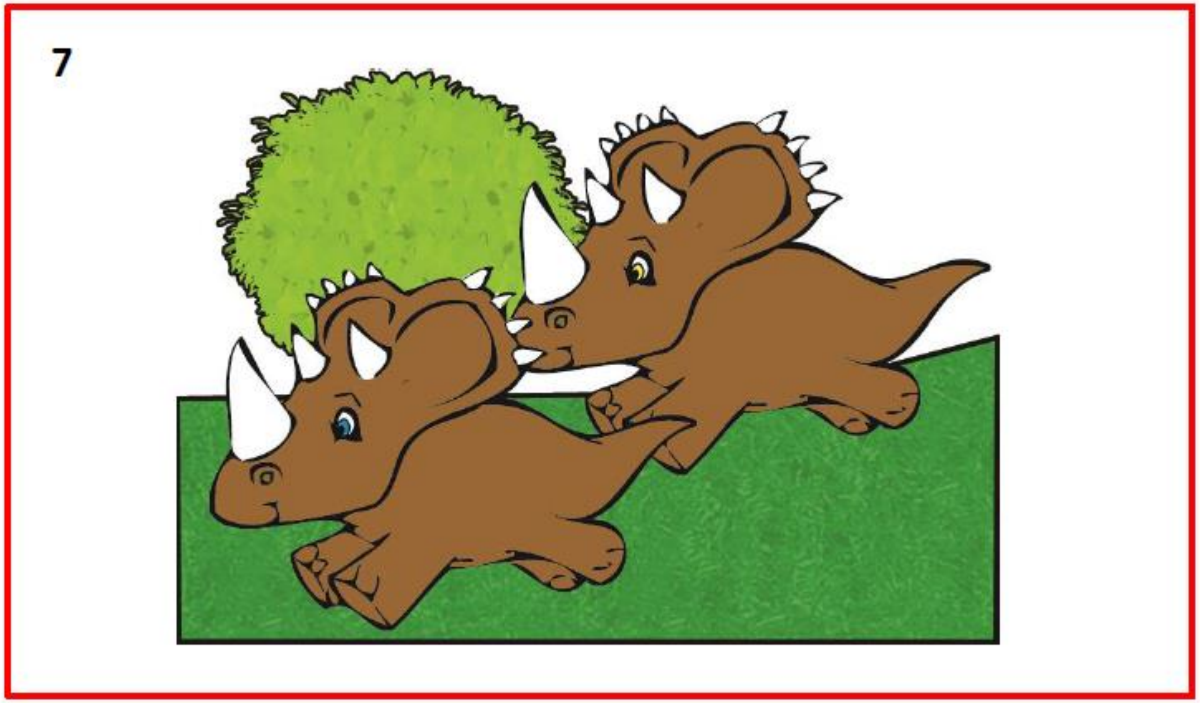


I’m hungry. Can I have a sandwich and a glass of water, please?

https://cms.azed.gov/home/GetDocumentFile?id=58595072aadebe0fe0261130

Question about Image

Look at the picture. What is happening in the picture? Remember to use a complete sentence.



http://www.azed.gov/assessment/files/2014/05/azella_stage-i-sample-test-book-v4-single-sided.pdf

Directions

Look at the map. Please answer in two or more complete sentences. Use the path marked on the map to tell how to get to from school to the park.

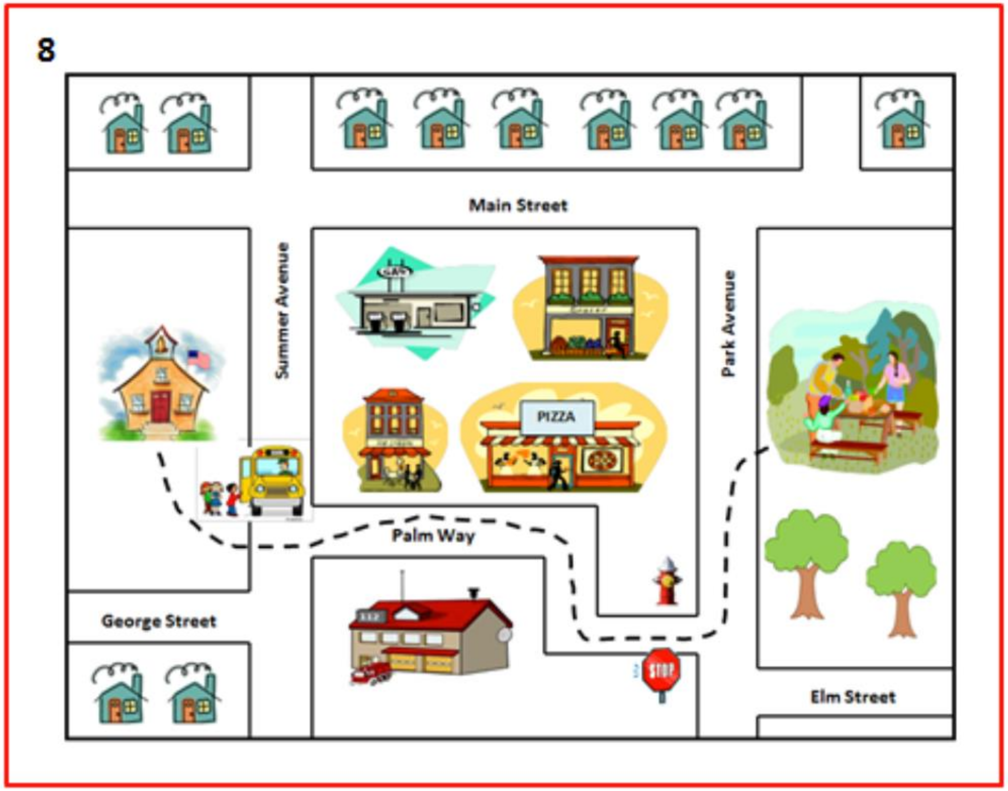


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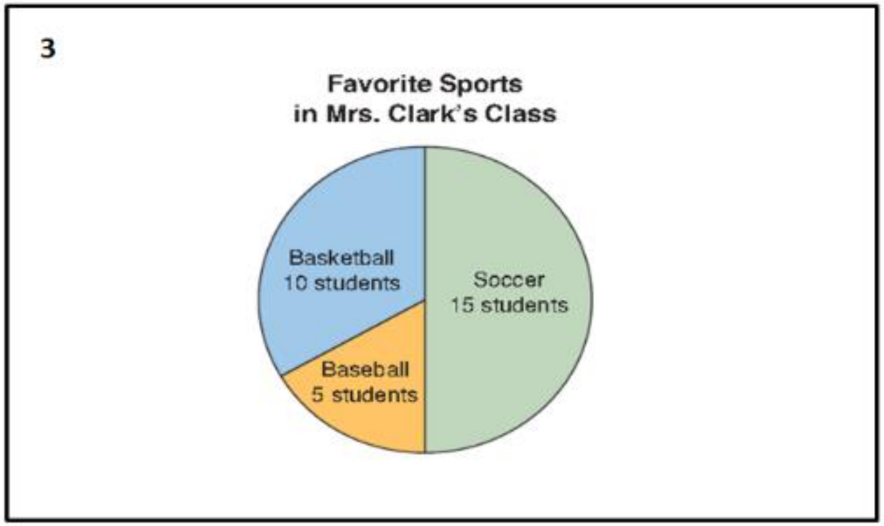
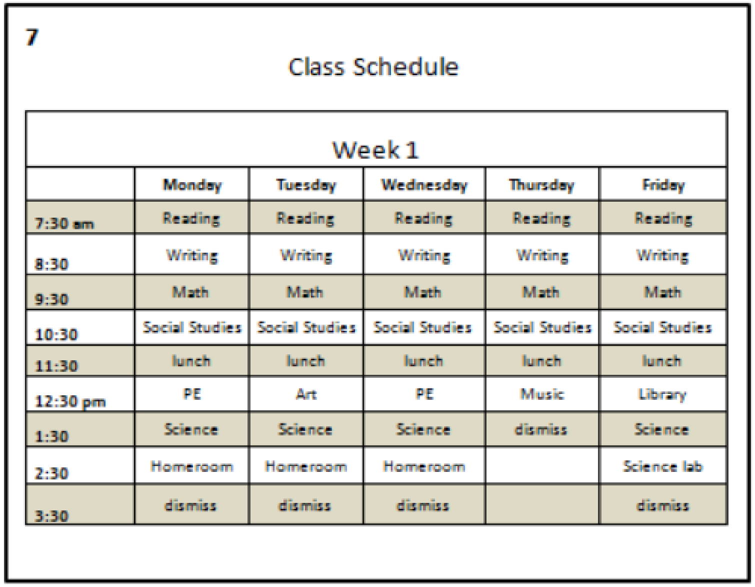
Chart Description



What can you tell us about the chart?



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Class Schedule

Week 1					
	Monday	Tuesday	Wednesday	Thursday	Friday
7:30 am	Reading	Reading	Reading	Reading	Reading
8:30	Writing	Writing	Writing	Writing	Writing
9:30	Math	Math	Math	Math	Math
10:30	Social Studies	Social Studies	Social Studies	Social Studies	Social Studies
11:30	lunch	lunch	lunch	lunch	lunch
12:30 pm	PE	Art	PE	Music	Library
1:30	Science	Science	Science	dismiss	Science
2:30	Homeroom	Homeroom	Homeroom		Science lab
3:30	dismiss	dismiss	dismiss		dismiss

https://www.azed.gov/assessment/files/2014/12/sample-tests-12-16-14-for-posting.pdf

Question about Statement

Follow along as I read the statement. "Walking is the best exercise." Please answer in complete sentences. Do you agree or disagree with the statement?

Explain why you agree or disagree that walking is the best exercise.

Structural Reliability

Stage	Human Cronbach α	Machine Cronbach α
I	0.98	0.99
II	0.99	0.99
III	0.96	0.94
IV	0.95	0.94
V	0.96	0.95
Average	0.97	0.96

Machine scores to Human scores: Test-Level

Stage	Human-Human Correlation r	Machine-Human Correlation r
I	0.91	0.88
II	0.96	0.90
III	0.97	0.94
IV	0.98	0.95
V	0.98	0.93
Average	0.96	0.92

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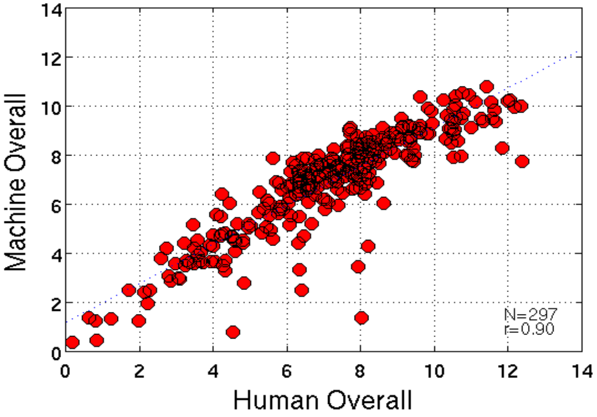
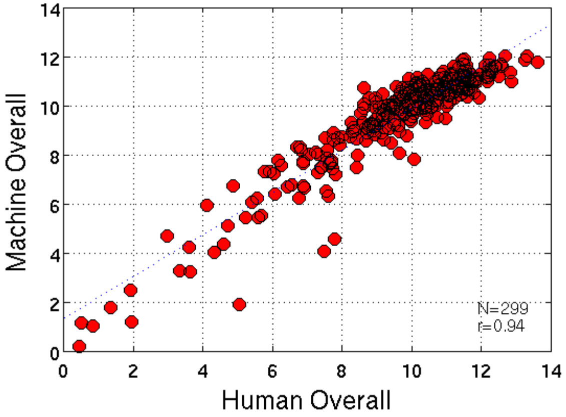
Scatterplot by stage

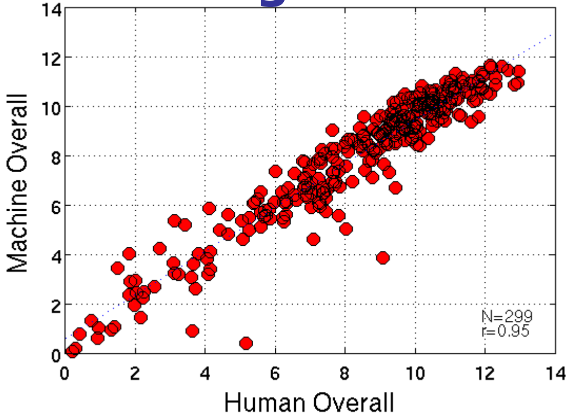
Stage II



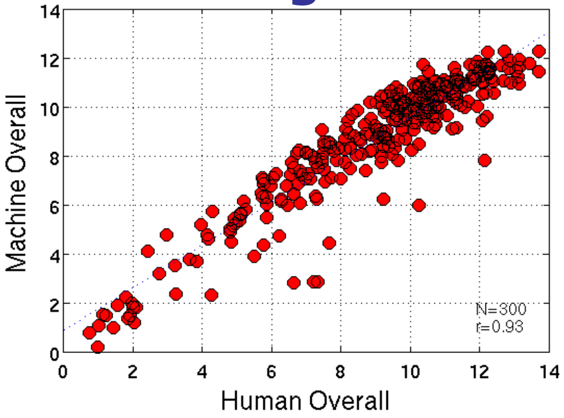
Stage III



Stage IV



Stage V



Accomplishments before 2016-2017

- Successfully delivered **2 field tests** and **3 operational tests**:
  - Nov. 2011 - 1st-12th grade n = 31K (Field Test)
  - Apr. 2012 - Kindergarten n = 13K (Field Test)
  - Jan. 2013 - K-12 n = 140k
  - Feb. 2014 - K-12 n = 90k
  - Feb. 2015 - K-12 n = 85k

- Trained and optimized automated scoring engines

- Built strong validation evidence for scoring young population

- Received positive feedback from the field

Not all stories are good…..

Lessons Learned from 2011-2015

- Test design and item types
- Development schedule
- Modification of rating rubrics after the system training
  - Lack of understanding on the impact of scoring criteria in the context of automated scoring
- Initial scoring process was atypical and caused difficulty
  - Draft rubrics
  - Lack of familiarity with items
  - No clear idea of how a student might respond
  - Items were difficult to evaluate

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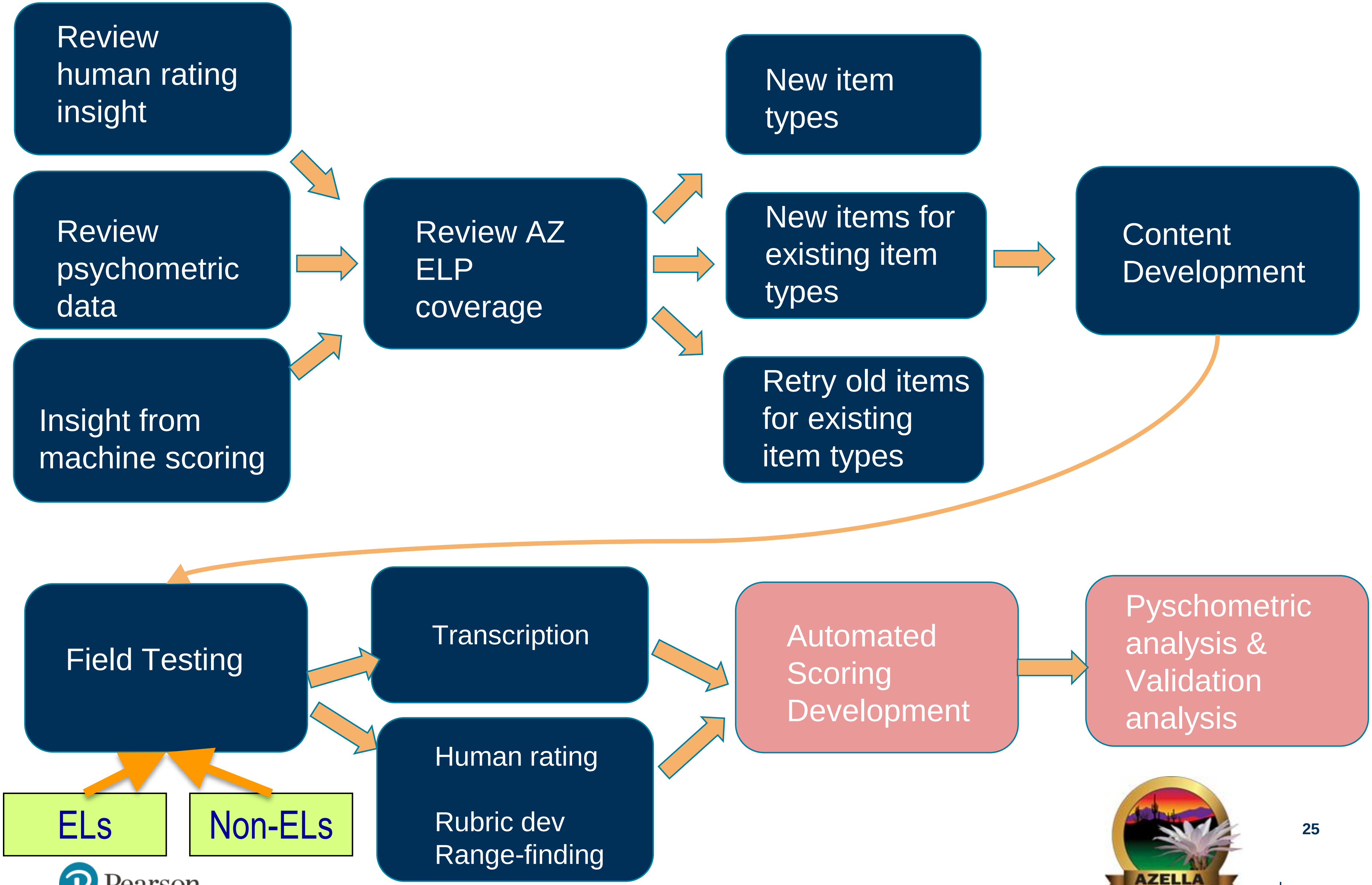
Development Project 2016-2017

2016-2017 Project Objectives

Goals:

- Keep the core test structure and items, but partially refresh - current tests in use for 4 years
- Review item statistics from past years and replace mediocre items for better reliability and discrimination
- Include new and more engaging item types
- Enhance the coverage of AZ’s ELP standards
- Prepare for the move to online testing

Development Process



Review human rating insight

Review psychometric data

Insight from machine scoring

Review AZ ELP coverage

New item types

New items for existing item types

Retry old items for existing item types

Content Development

Field Testing

ELs

Non-ELs

Transcription

Human rating

Rubric dev

Range-finding

Automated Scoring Development

Pyschometric analysis & Validation analysis

Psychometric Data Review

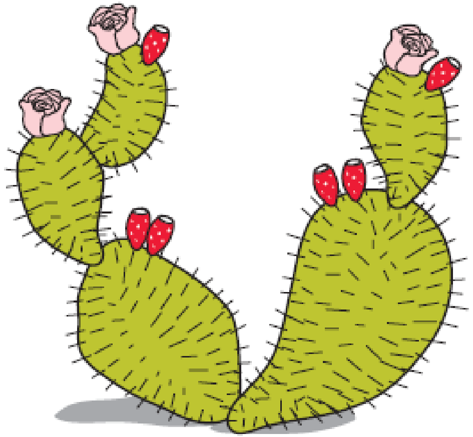
Quantitative Analysis: Review Psychometric Data

- Classical/IRT statistics
  - P-value
  - Point-biserial correlation
  - Score distribution
  - Item fit
- Percentage of exact and adjacent agreement
  - between human ratings
  - between automated score engine scores and human rating
- Interrater reliability coefficients

Identifying candidates for replacements

Qualitative Analysis: Review Student Performance

- Students don’t know what to say
- Students don’t speak in complete sentences
- Students don’t use academic language



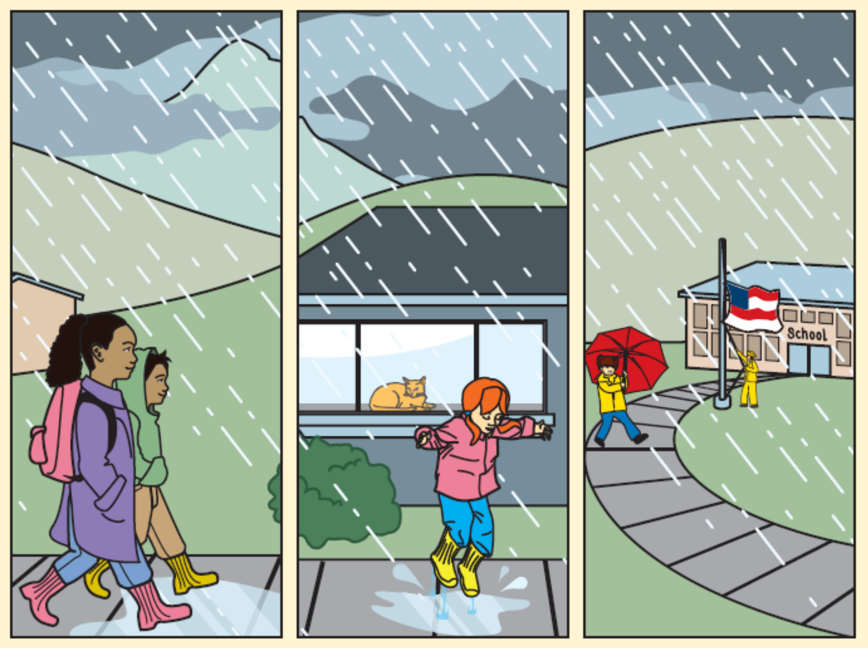
New Item Types

New Item Types

- Further develop item types with demonstrated performance strengths
- Add Listen and Retell - successfully used with other tests and performing well
- Add Oral Reading Fluency - an important reading component that could now be included in a standardized, summative assessment

Listen and Retell

- Retelling is an important academic language function
- Covers an AZ ELP standard
- Provides substantial contextual info for richer language production
- Allow a wider proficiency range
- Present the passage twice; about language production, not listening comprehension
- Decision to score descriptions of the pictures as valid responses
- Allows broader range of topics from social to academic domains



Oral Reading Fluency (ORF)

- ORF is included in the English Language Proficiency Standards but previously not tested
- Arizona EL and ELA practitioners consider ORF an important skill
- Scoring data confirms ORF is a good item type
- ORF rubric development was a collaboration with K-12 Standards and OELAS
- Previous ORF studies were helpful for setting criteria and ranges

Performance Scoring

Performance Scoring

How do we ensure scoring accuracy?

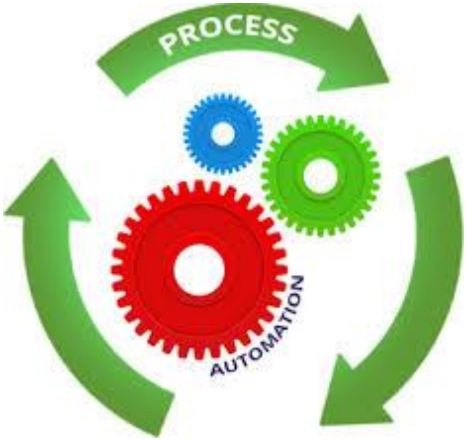
Resources

- **Staffing**
  - 1 Senior Content Specialist
  - 6 Scoring Directors
  - ~ 200 Expert scorers
- **Items and number of responses**
  - 81 unique items
  - ~ 95,000 scores to assign
- **Time and Schedule**
  - ~ 25,000 hours
  - 12 week schedule

Performance Scoring

Processes

- **Item Review**
  - Familiarize yourself with the tasks and/or prompts
- **Rubric Review**
  - Understand standards for scoring and expectations of students
- **Pre-Rangefinding/Rangefinding**
  - Review responses to understand how students respond
  - Meeting(s) to address scoring criteria and how to score responses accurately
- **Training Development**
  - The process by which scorers/raters are introduced to the content and expectations
  - Construct training materials based on approved responses and criteria
- **Training and Scoring**
  - Qualifying scorers/raters to apply standards
  - Applying scores to student work



Performance Scoring

Quality Monitoring

- **Reporting**
  - IRR/Agreement
  - Validity
  - Frequency Distribution
- **Backreading**
  - Content support staff reading behind scorers/raters to check quality
- **Review**
  - A repository for those responses that need clarification to be scored accurately
- **Item Evaluations**
  - Written feedback about the overall success of a unique item

Some thoughts on future

Some thoughts on future directions

1. **Adaptive Testing with Automated Scoring**
   - for more efficient and student-friendly test-taking experience

   Multi-stage adaptive:
   An initial set of MC items, then present an easy form or a difficult form of MC items (without an immediate feedback by automated scoring, OE items are not a part of adaptation)
   An interactive assessment where each module (testlet) is composed of Listening, Writing, Reading, Speaking (with an immediate feedback by automated scoring)
   Fully adaptive: Each response will get scored, and the next item will be determined based on the ability estimate at the point

1. **Multi-dimensionality**
   - e.g, Listen and Retell contributing both listening and speaking scores

Summary

Considerations in Test Development with technology

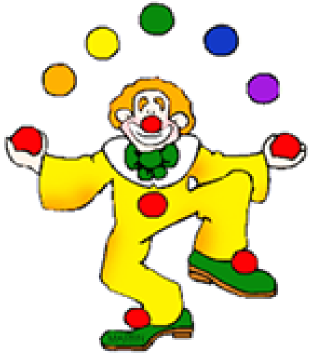
- Technology integration is most successful when both human processes and technological capabilities (and limitations) are integrated throughout all stages of development
  - Balancing construct definition, standards coverage and machine's capability
  - Item development should involve automated scoring experts to increase the likelihood of scoreability

Considerations in Test Development with technology

- Ensure reliable human rating with rigorous training. Quality human rating is a foundation for quality scoring system
  - Formalized process for scoring/rating
  - Lead time for item, prompt, and rubric review

- Ensure field testing yields good data
  - Usability testing / Cog labs
  - Quality hardware
  - Testing rooms / seating arrangement
  - ‘How to take the test” prep material

Stakeholder Priorities
A Balancing Act and an Opportunity



- Technology Experts – Better ways and means to test
- Psychometricians – Optimize item and test statistics
- Content Experts – Adhere to the construct – broad, relevant sampling
- Test Developers – Apply *Standards* and deliver intended functionality
- Test Administrators – Testing logistics
- Students – Fair opportunity to demonstrate their skills
- Federal and State regulations – Meet testing requirements
- Scorers- Unambiguous items that score reliably
- Users – Useful and meaningful score reporting
- Clients – Managing cost, time, and other resource limitations

The End - Questions?