The Design, Development, and Implementation of a Beef Cattle Breeding Simulation

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The Challenge

Apply information beyond the classroom

Real-world experience or experiential learning

Constraints on experiential learning include:
- Time
- Money
- Safety

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A Solution

Educators must explore alternatives

Simulation-based learning is increasingly prevalent
- Students can make decisions and see effects quickly
- Controlled environment so no safety concerns
- More cost efficient

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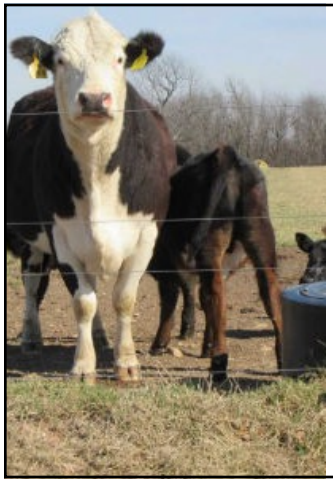

History

"Beef Genetic Simulation"
- Developed in 1966 by R.L. Willham, Iowa State University
- Written in Fortran

Adapted for AGNET and renamed "Cowgames"
- Dr. Merlyn Nielson & Dr. Jim Gosey, University of Nebraska

Adapted for microcomputer
- Dr. David Buchanan & Larry Burditt, Oklahoma State

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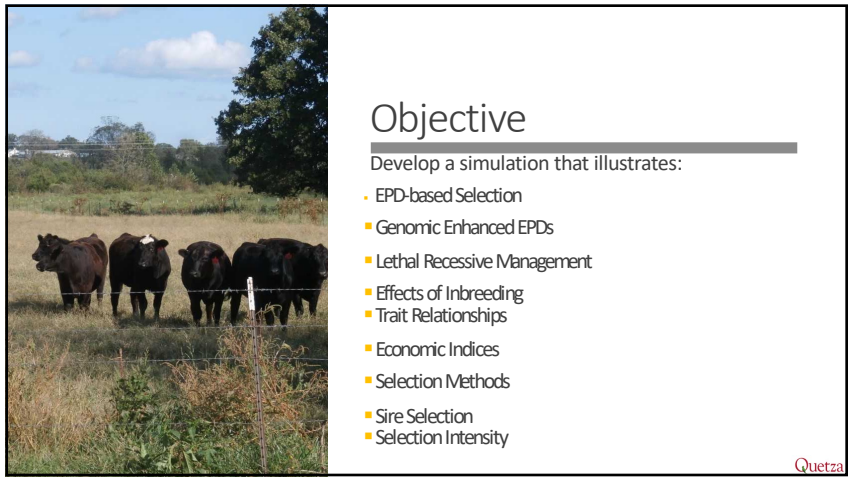

Objective

Develop a simulation that illustrates:

- EPD-based Selection
- Genomic Enhanced EPDs
- Lethal Recessive Management
- Effects of Inbreeding
- Trait Relationships
- Economic Indices
- Selection Methods
- Sire Selection
- Selection Intensity

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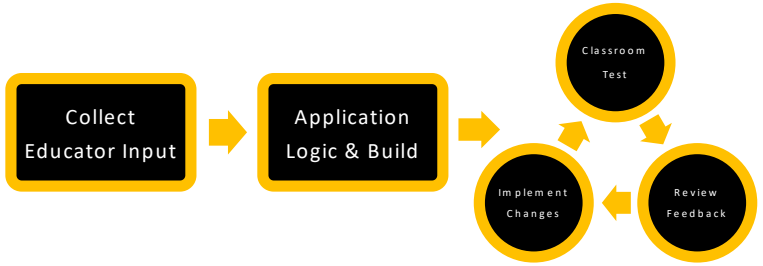
Methods



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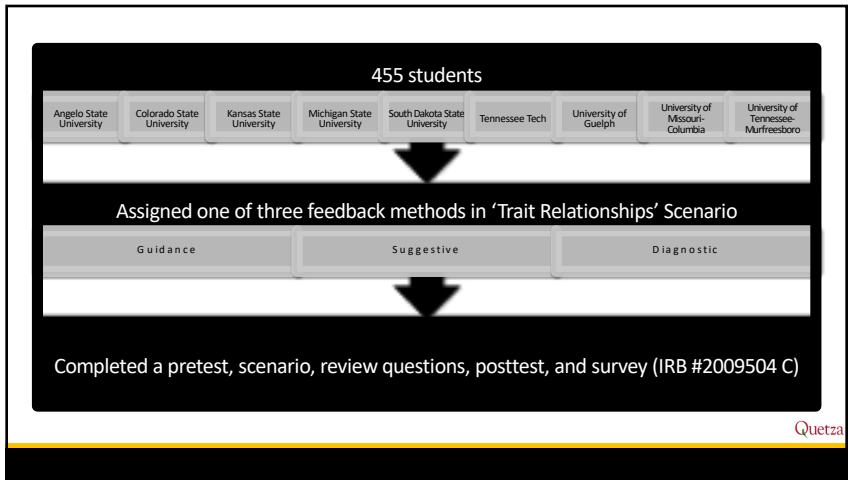

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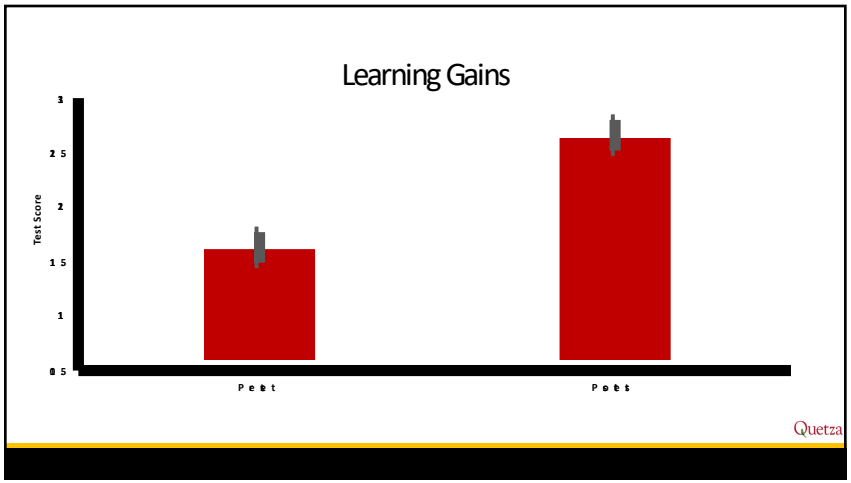

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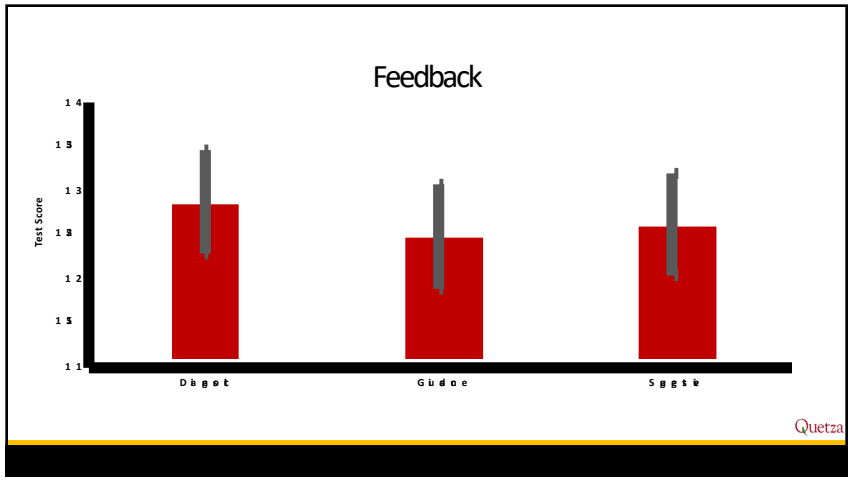
Feedback
Test Score
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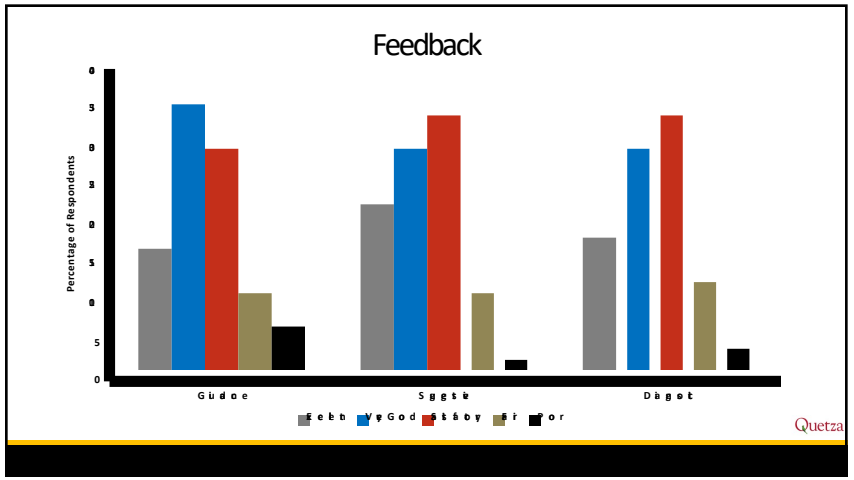
Feedback
Percentage of Respondents
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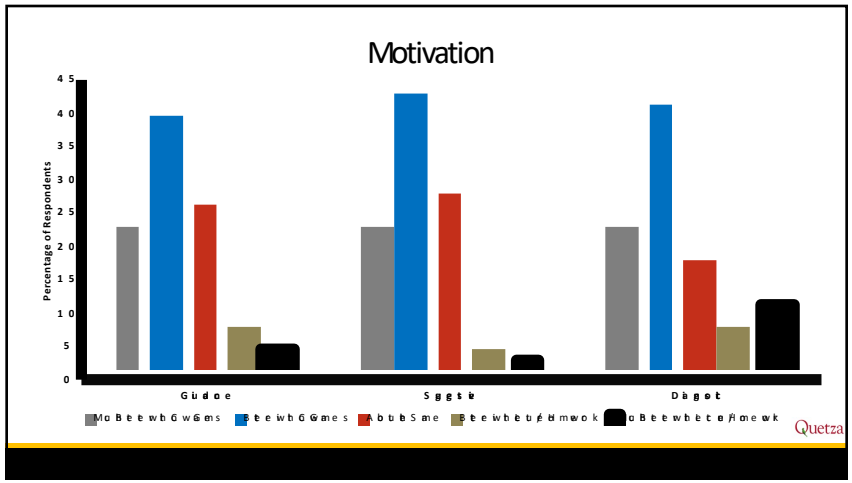
Motivation
Percentage of Respondents
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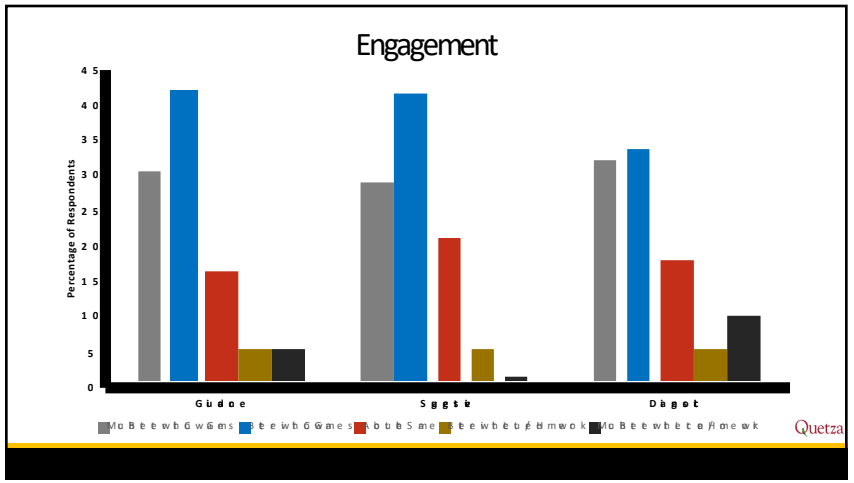
Engagement
Percentage of Respondents
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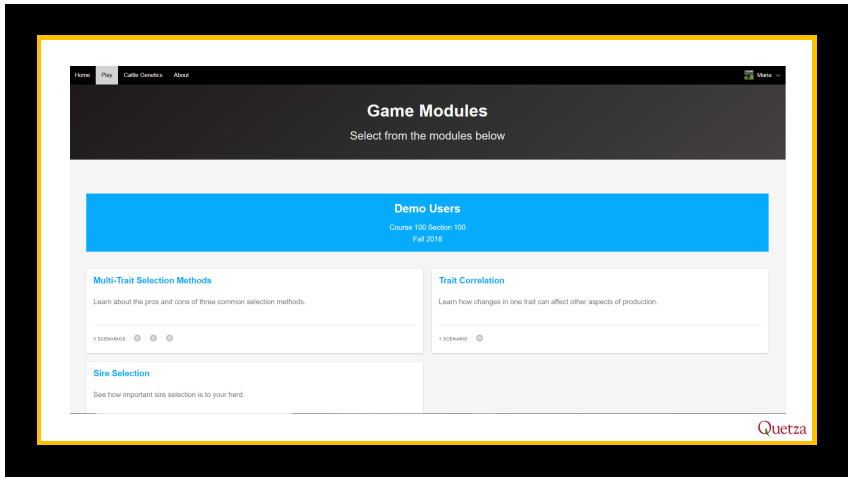
Home
Play
Cattle Genetics
About
Maria
Game Modules
Select from the modules below
Demo Users
Course 100 Section 100
Fall 2018
Multi-Trait Selection Methods
Learn about the pros and cons of three common selection methods.
Trait Correlation
Learn how changes in one trait can affect other aspects of production.
Sire Selection
See how important sire selection is to your herd.
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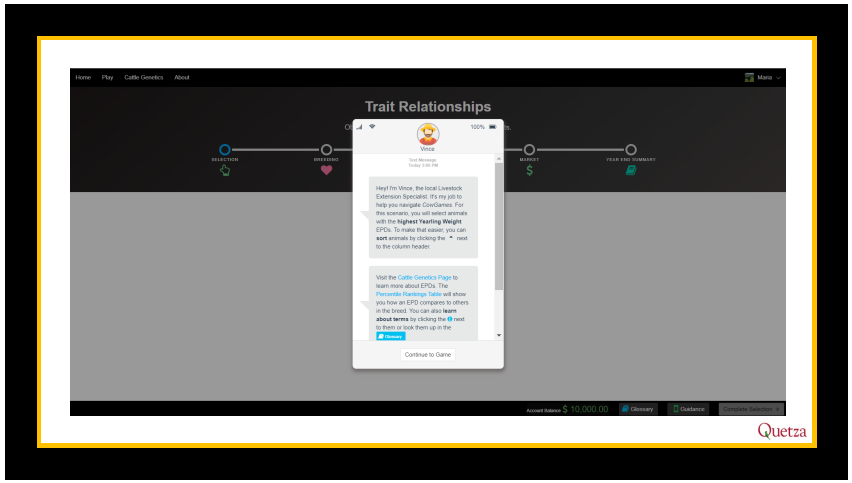
Home
Play
Cattle Genetics
About
Maria
Trait Relationships
Vince
Continue to Game
Account Balance $ 10,000.00
Glossary
Guidance
Quetza

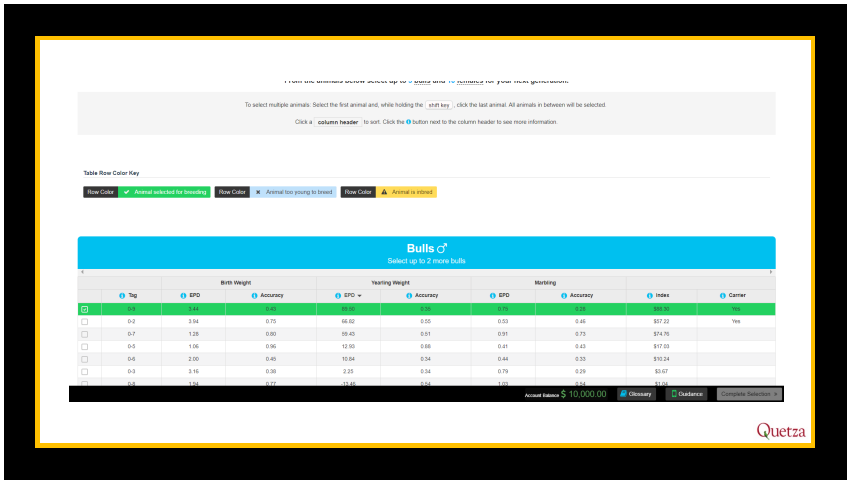
Table Row Color Key
Bulls♂
Select up to 2 more bulls
Birth Weight
Yearling Weight
Marbling
Account Balance $ 10,000.00
Glossary
Guidance
Quetza


Bulls ♂
Heifers ♀
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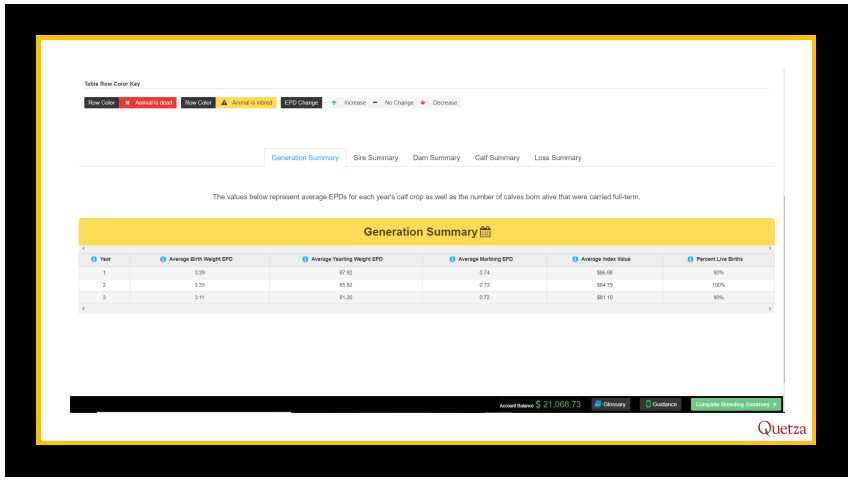
Table Row Color Key
Generation Summary
Sire Summary
Dam Summary
Calf Summary
Loss Summary
The values below represent average EPDs for each year's calf crop as well as the number of calves born alive that were carried full-term.
Generation Summary
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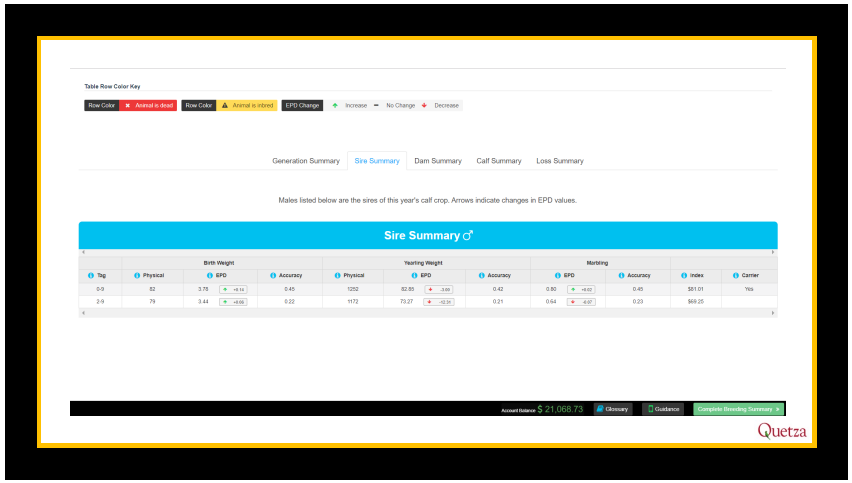
Table Row Color Key
Generation Summary
Sire Summary
Dam Summary
Calf Summary
Loss Summary
Males listed below are the sires of this year's calf crop. Arrows indicate changes in EPD values.
Sire Summary ♂
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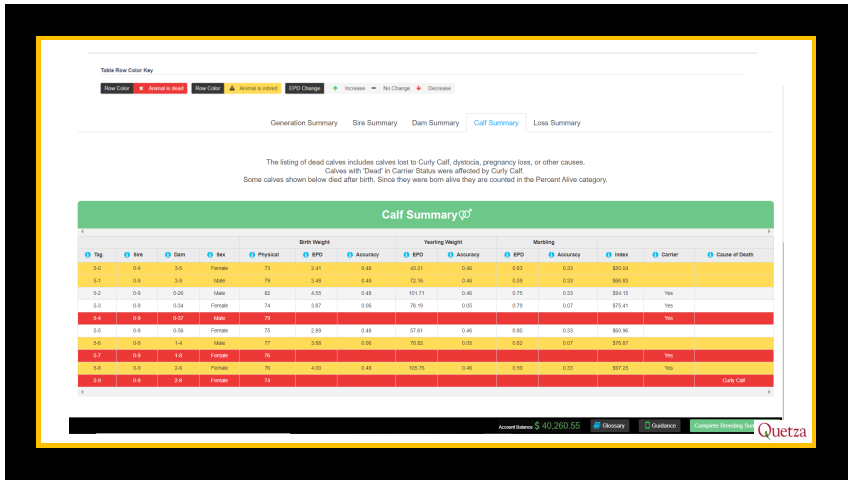
Table Row Color Key
Generation Summary
Sire Summary
Dam Summary
Calf Summary
Loss Summary
The listing of dead calves includes calves lost to Curly Calf, dystocia, pregnancy loss, or other causes.
Calves with "Dead" in Carrier Status were affected by Curly Calf.
Some calves shown below died after birth. Since they were born alive they are counted in the Percent Alive category.
Calf Summary ♂♀
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Livestock Bill of Sale
CowGames National Packing House
Invoice No: 1951913
Date of Sale: 6/17/2018
Account Sales of 12 Bulls, Cows and Heifers in the Amount of $ 11,294 .00
Seller Account:
Maria Haag
Buyer Account:
CowGames Inc
Pricing Guide
Value Grid Base Price
Grades Premium (per cwt)
Carcass Weight Discounts (per cwt)
Prime $6.00
Choice $0.00
Select -$5.00
Standard -$18.00
Small (< 550 lbs) -$10.00
Large (> 900 lbs) -$10.00
Cattle Purchased
Account Balance $ 9,880.00
Glossary
Guidance
Complete Market
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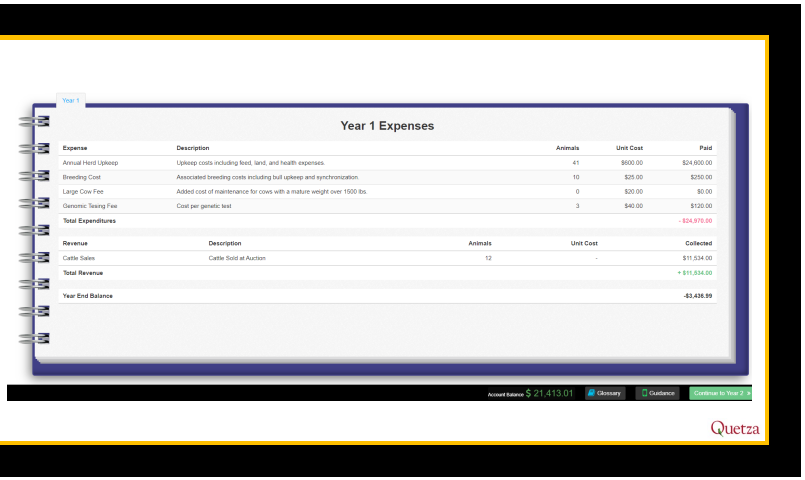
Year 1
Year 1 Expenses
Expense
Description
Animals
Unit Cost
Paid
Annual Herd Upkeep
Upkeep costs including feed, land, and health expenses.
41
$600.00
$24,600.00
Breeding Cost
Associated breeding costs including bull upkeep and synchronization.
10
$25.00
$250.00
Large Cow Fee
Added cost of maintenance for cows with a mature weight over 1500 lbs.
0
$20.00
$0.00
Genomic Tesing Fee
Cost per genetic test
3
$40.00
$120.00
Total Expenditures
- $24,970.00
Revenue
Description
Animals
Unit Cost
Collected
Cattle Sales
Cattle Sold at Auction
12
-
$11,534.00
Total Revenue
+ $11,534.00
Year End Balance
-$3,436.99
Account Balance $ 21,413.01
Glossary
Guidance
Continue to Year 2
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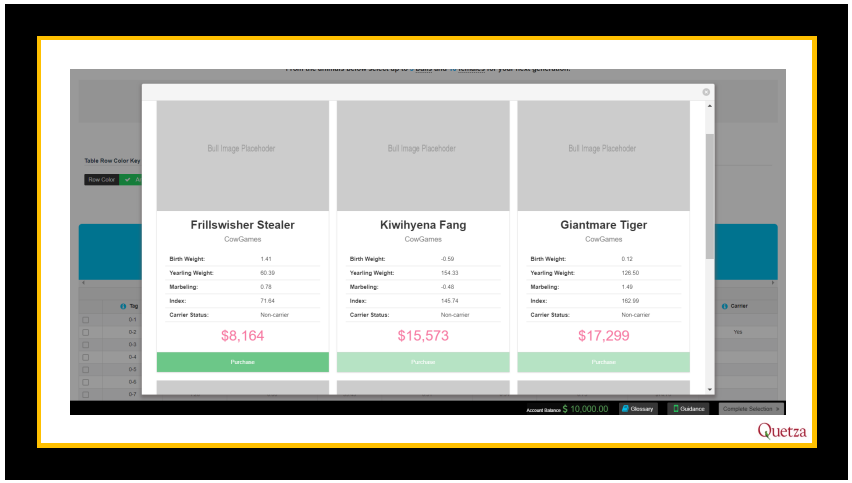
Bull Image Placeholder
Frillswisher Stealer
CowGames
Birth Weight: 1.41
Yearling Weight: 60.39
Marbeling: 0.78
Index: 71.64
Carrier Status: Non-carrier
$8,164
Purchase
Bull Image Placeholder
Kiwihyena Fang
CowGames
Birth Weight: -0.59
Yearling Weight: 154.33
Marbeling: -0.48
Index: 145.74
Carrier Status: Non-carrier
$15,573
Purchase
Bull Image Placeholder
Giantmare Tiger
CowGames
Birth Weight: 0.12
Yearling Weight: 126.50
Marbeling: 1.49
Index: 162.99
Carrier Status: Non-carrier
$17,299
Purchase
Account Balance $ 10,000.00
Glossary
Guidance
Complete Selection
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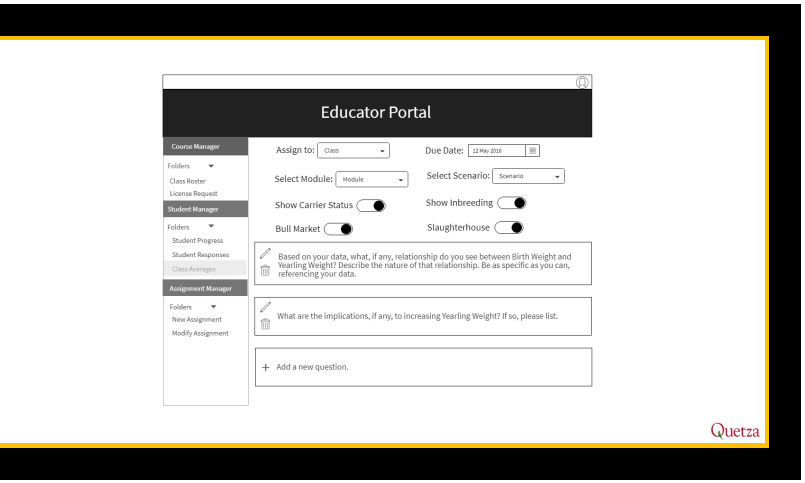
Educator Portal
Course Manager
Folders
Class Roster
License Request
Student Manager
Folders
Student Progress
Student Responses
Class Averages
Assignment Manager
Folders
New Assignment
Modify Assignment
Assign to: Class
Due Date: 12 May 2018
Select Module: Module
Select Scenario: Scenario
Show Carrier Status
Show Inbreeding
Bull Market
Slaughterhouse
Based on your data, what, if any, relationship do you see between Birth Weight and Yearling Weight? Describe the nature of that relationship. Be as specific as you can, referencing your data.
What are the implications, if any, to increasing Yearling Weight? If so, please list.
Add a new question.
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Fall 2018 – Future Work

- Load test Educator Portal
- Incorporate *Intro to EPDs* animation
- Evaluate Interactive vs Static Feedback
  - Students will complete:
    - Pre-test
    - Single Scenario of *CowGames*
    - Reflection Questions
    - Post-test
    - Survey
- All materials built into application
- Contact us if you would like to participate!

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Acknowledgements

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Kansas State University
Michigan State University
South Dakota State University
Tennessee Tech
University of Guelph
U of Tennessee- Murfreesboro
Wilmington College

Funding Sources
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- MU STAR Grant
- NIFA Grant #2013-68004-20364
- NIFA Grant #2017-06884

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Questions or Comments?

CowGames is available at www.cow-games.com

Contact me at mth522@mail.missouri.edu or mariahaag@quetza.org for more information!

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