

Experiential Learning in Quantitative Genetics Online: CyberSheep

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Introduction

- Experiential learning
 - Entails active engagement of students
 - Encourages deeper learning of complex topics

Increasingly incorporated
into instructional programs

(Kolb and Kolb, 2005)

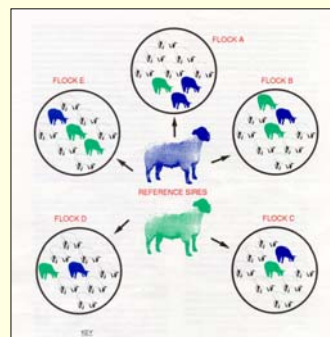
Introduction

- Technology-mediated simulations
 - Provide authentic context for learning
 - Allow application of discipline-specific concepts to solve real-world problems
- Used in quantitative genetics instruction
 - Typically emulate cattle breeding scenarios
 - Seldom incorporate economics

(Edlund et al., 1979; Hocking et al., 1983; Buchanan et al., 1988; Casellas et al., 2009)

CyberSheep

- Web-based game
 - Run at Virginia Tech
 - New interface fall 2012
- Emulates sheep breeding cooperative
- Considers genetic and economic principles



Today's objectives:

- Describe CyberSheep
- Summarize student feedback

Game objectives

Genetic change



(Photo D. Thomas)

Game objectives

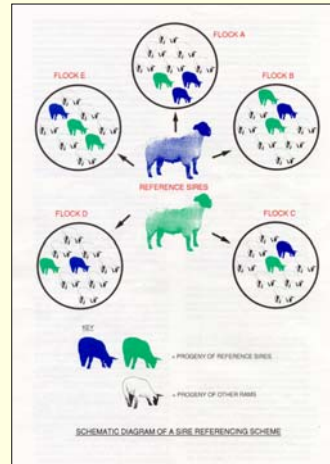
Earnings

Round	Transaction	Details	Amount
1	Initial Balance	Initial balance	\$1500
1	Purchased Genotype Test	User bought genotype tests for 1 animals	\$16
1	Culled Rams	Culled 2 rams	\$50
1	Culled Lambs	Culled 36 lambs under threshold weight (2980.75 pounds)	\$2712.48
1	Retained Sire	Retainer fee for 1 reference sires	\$500
1	Sold Semen	Sold 30 straws of semen	\$450

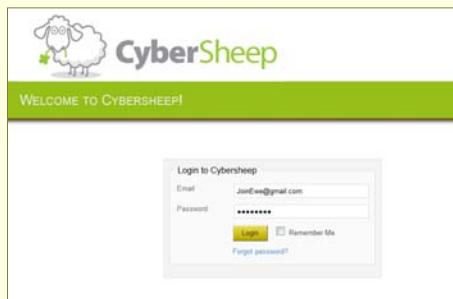
Stochastic simulation

- Traits
 - Market weight
 - Litter size
 - Simply-inherited lethal
- Evaluations
 - Linear animal model (BLUP)
 - Inbreeding coefficients
- Parameters amendable

(Lewis and Simm, 2000)



Play



Joining the play

Play

SIRE DECISIONS

Reference Sire Nominations
Acceptance Deadline: 2012-10-25 16:00:00

Selection Decisions

Minimum Ewes: 25
Maximum Ewes: 40
Rams Selected: 0

Mating Decisions

Artificial Insemination (A.I.) Ewes: 0
Current A.I. Costs: 0
A.I. Batch Size: 20
Projected Balance: 1500

Primary Mate: 4478 (Natural Sire)
Remove previous mate: 4445 (Reference Sire)
4519 (Natural Sire)
4519 (Natural Sire)

Primary Mate	Backup Mate	Genotype	Animal ID	EBV	Live Weight	F	Sire	Dam	Dam Age	Birth Year	Birth Day
0	0	--	2151	12.1	114.4566790	0.0000	1013	77	4	2008	14
0	0	--	2170	17.1	101.9735562	0.0000	1013	469	3	2008	23
0	0	--	2173	16.0	87.6637946	0.0000	1013	474	3	2008	6

Sire decisions

Selection decisions

Mating decisions

Play

RAM MARKET

Place Ram on Market

Place	Genotype	Animal ID	EBV	Live Weight	F	Sire	Dam	Dam Age	Birth Type	Rearing Type	Birth Year	Birth Day
Place	--	4478	11.2	105.5	0.0000	2765	2729	3	2	2	2012	3078
Retract	--	4518	13.7	131.0	0.0000	3364	2787	3	2	2	2012	3057
REF	--	4519	17.2	148.8	0.0000	3364	2787	3	2	2	2012	3057

1/1

Marketing rams

Play

Genotype testing

The screenshot shows a web interface for 'Genotype Tests'. On the left is a sidebar menu with options: User, Class, Select Team, Round Details, Team Account, Team History, Current Flock, Flock History, Game Statistics, Forum, Site Decisions, Selection Decisions, Mating Decisions, Ram Market, Genotype Tests, and Submit Decisions. The main content area is titled 'GENOTYPE TESTS' and includes a 'Genotype Tests Fee' of 16 and a 'Projected Total Genotyping Fee' of 32. Below this is a table with columns: Test, Genotype, Animal ID, Sex, EBV, Live Weight, F, Sire, Dam, Dam Age, Birth Type, Breeding Type, and Birth Year. The table contains several rows of data, with some rows highlighted in green and others in light blue.

Test	Genotype	Animal ID	Sex	EBV	Live Weight	F	Sire	Dam	Dam Age	Birth Type	Breeding Type	Birth Year
<input type="checkbox"/>	Nx	2167	F	22.4	126.5	0.0000	1013	443	4	2	2	2009
<input type="checkbox"/>	Nx	4519	M	17.2	148.5	0.0000	3304	2787	3	2	2	2012
<input checked="" type="checkbox"/>	--	2170	F	17.1	101.9	0.0000	1013	469	3	1	1	2008
<input checked="" type="checkbox"/>	--	2173	F	16.0	87.6	0.0000	1013	474	3	2	2	2008
<input type="checkbox"/>	--	2729	F	15.4	140.9	0.0000	1001	72	5	2	2	2009
<input type="checkbox"/>	--	3324	F	14.9	99.8	0.0025	1001	2002	2	1	1	2010

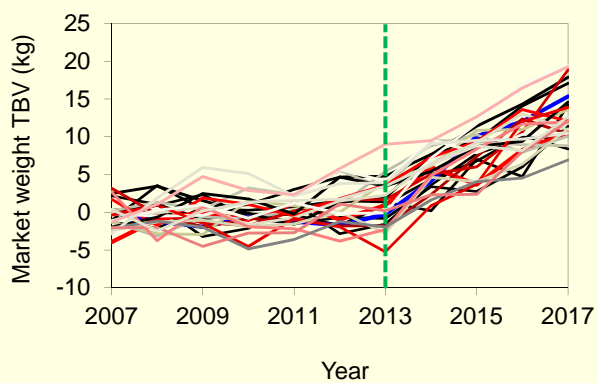
Pedagogy

Played in teams

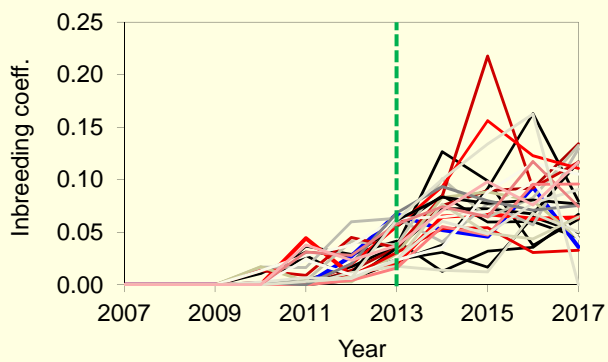
The screenshot shows the 'CyberSheep' forum interface. At the top is a logo of a sheep and the text 'CyberSheep'. Below the logo is a navigation bar with links: Board Index, Cybersheep, Fall_2012, and General Announcements. There is also a 'User Control Panel' link. The main content area is titled 'General Announcements' and lists several topics with their authors and dates:

- Guidelines and Rules** by rmlewis@vt.edu » Tue Oct 09, 2012 5:04 pm
- Principles of Co-operative breeding programs** by rmlewis@vt.edu » Tue Oct 09, 2012 5:00 pm
- CyberSheep Game Schedule** by rmlewis@vt.edu » Tue Oct 09, 2012 4:57 pm
- CyberSheep Instruction Manual** by rmlewis@vt.edu » Tue Oct 09, 2012 4:33 pm

Evaluations: genetic gain



Evaluations: inbreeding

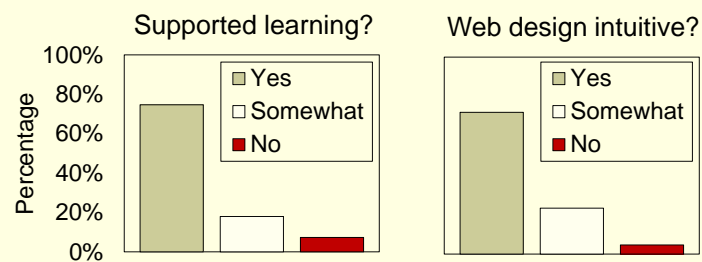


Student feedback

- Student online survey (anonymous)

- Fall 2012 & spring 2013
- 5 undergraduate universities
- 151/419 (36% response)

- Feedback



Conclusions

- CyberSheep is a technology-enriched tool
 - Fits undergraduate and graduate instruction
 - Reaches a geographically dispersed audience
- CyberSheep facilitates experiential learning
 - “It is more effective for them to be able to experience the practical effects of different behaviors and strategies in a learning situation than to passively observe them” (Morgan, 2008)



Thank you

- Web developers
 - Likhita Krishnamurthy
 - Daniel Boynton
- Peer reviewers
 - Mike Davis (Ohio State Univ.)
 - Charles Gaskin (Washington State Univ.)
- Instructional design review
 - Miriam Larson
- CyberSheep 'coaches'
 - Debra Aaron (Univ. of Kentucky)
 - Kristi Cammack (Univ. of Wyoming)
 - Joe Cassady (North Carolina State Univ.)
 - Alan Culham (Michigan State Univ.)
 - Mike Davis (Ohio State Univ.)
 - Basil Wolf (Aberystwyth Univ., Wales, UK)

