

# Using Interactive Flash Games to Enhance Student's Learning

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# Introduction

- The objective of this paper was to demonstrate that computer-based **interactive flash games** used in animal science courses can be effective in enhancing student learning and improving student exam scores over **commonly used study guides.**



# Flash Games

- Template designed by UMC, ITC for faculty use
- Flash games, because study questions in the games were drawn randomly from a pool of questions like in flash card games



# Flash Games

- A single flash game contained 80 questions drawn from 5 to 6 chapters of each course:
  - Feeds and Feeding (sophomore level) and
  - Applied Animal Nutrition (junior-senior level) courses
- Total of 3 to 4 games for each course (240 or 320 questions/course)



Animal Nutrition 1

Level 1 of 16

Student

Class

Instructor

4: Which vitamin contains Cobalt in its structure?

B1 (Thiamin)

B2 (Riboflavin)

Vitamin C

B12

Animal Nutrition 1

Level 1 of 16

Next Question

✓ correct

Student

Class

Instructor

4: Which vitamin contains Cobalt in its structure?

B1 (Thiamine)

B2 (Riboflavin)

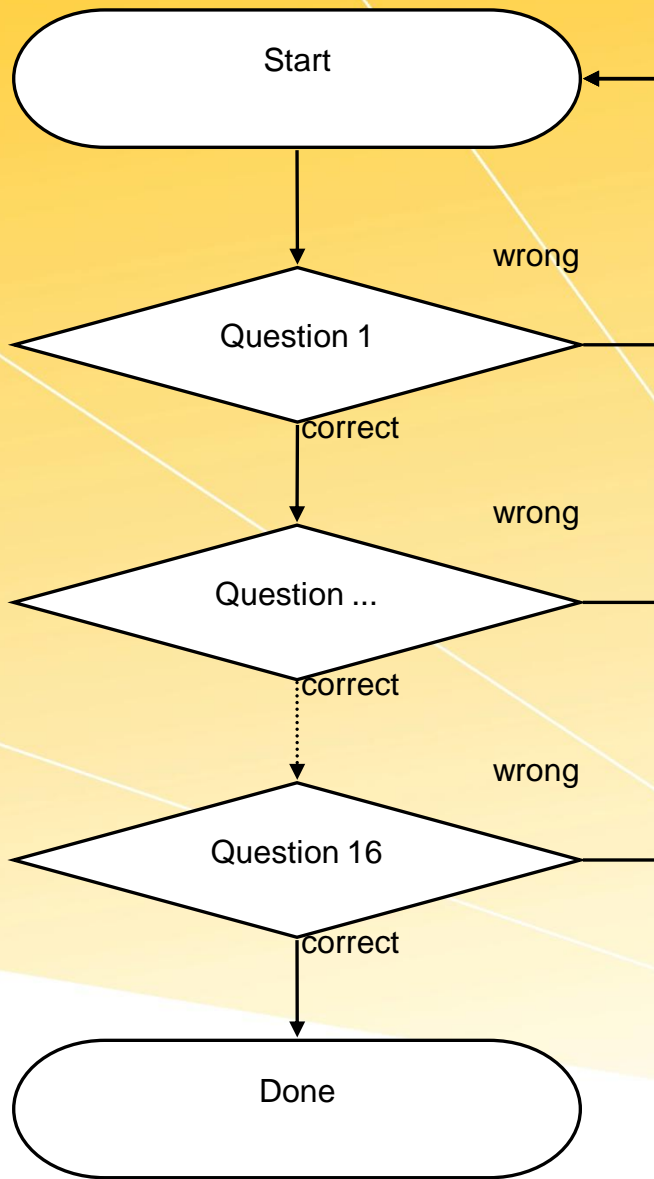
Vitamin C

B12

<http://www.edugamer.org/app/playGame.aspx?classicGameId=86>



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# Study Guides

- Each course was supplemented with a study guide containing no less than 30 short and long essay questions designed to cover the same 5-6 chapters as the flash games.
- This eliminated the effect of course material difficulty on experimental error.
- It is important to note that questions on the exam were slightly modified from the questions in flash games and study guides.



# Data Collection

1. Two years data (2010, 2011)
2. Two Courses
  - Feeds & Feeding, 93 students
  - Applied Animal Nutrition; 43 students
3. Three exams/course/year





# Data Collection

## 5. Two study Methods

- Flash Games
- Study Guides

## 4. Two Exam Formats of Choice

1. All multiple Choice questions
2. Mixed questions (multiple choice and short/long answers)



# Results

- Data analyzed with Proc GLM/Mixed Model of SAS



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# Feeds & Feeding Exam Scores for 2010 and 2011

		AMC			Mixed			
Exam	n	Flash 100 pts	Study 100 pts	SEM	n	Flash 100 pts	Study 100 pts	SEM
1	77	84.4	53.8	1.5	16	91.7	76.8	3.3
2	64	85.3	61.8	1.6	23	92.9	76.4	2.3
3	61	85.0	51.4	1.4	21	90.3	81.9	2.5

# Animal Nutrition Exam Scores for 2010 and 2011

		<b>AMC</b>			<b>Mixed</b>			
<b>Exam</b>	n	<b>Flash 100 pts</b>	<b>Study 100 pts</b>	SEM	n	<b>Flash 100 pts</b>	<b>Study 100 pts</b>	SEM
1	43	80.5	50.1	1.5	10	84.7	62.4	3.3
2	28	78.2	46.5	1.6	24	74.8	52.4	2.3
3	27	67.7	45.1	1.4	23	74.7	48.4	2.5



## Differences of Least Squares Means for Feeds & Feeding (ANSC 2104)

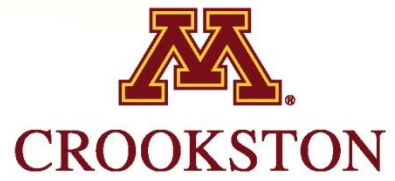
<u>Effect</u>	<u>Exam Format</u>	<u>Study Method</u>	<u>Exam Format</u>	<u>Study Method</u>	<u>Means Diff</u>	<u>SED</u>
<b>Method</b>		<b>Flash</b>		<b>Study</b>	<b>21.5</b>	<b>1.24</b>
<b>Format</b>	<b>AMC</b>		<b>MIX</b>		<b>-14.4</b>	<b>1.27</b>
Format x Method	AMC	Flash	AMC	Study	29.2	1.25
Format x Method	AMC	Flash	MIX	Flash	-6.6	1.77
Format x Method	AMC	Flash	MIX	Study	7.0	1.77
Format x Method	AMC	Study	MIX	Flash	-35.8	1.77
Format x Method	AMC	Study	MIX	Study	-22.2	1.77
Format x Method	MIX	Flash	MIX	Study	13.7	2.13



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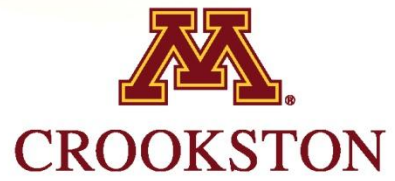
# Differences of Least Squares Means for Applied Nutrition (ANC 3104)

Effect	Exam Format	Study Method	Exam Format	Study Method	Means Diff	SED
<b>Method</b>		<b>Flash</b>		<b>Study</b>	<b>26.3</b>	<b>1.84</b>
<b>Format</b>	<b>AMC</b>		<b>MIX</b>		<b>-4.8</b>	<b>1.92</b>
Format x Method	AMC	Flash	AMC	Study	28.6	2.24
Format x Method	AMC	Flash	MIX	Flash	-2.4	2.66
Format x Method	AMC	Flash	MIX	Study	21.5	2.66
Format x Method	AMC	Study	MIX	Flash	-31.0	2.66
Format x Method	AMC	Study	MIX	Study	-7.1	2.66
Format x Method	MIX	Flash	MIX	Study	23.9	2.93



# Differences of Least Squares Means for both Courses

Effect	Exam Format	Study Method	Exam Format	Study Method	Means Diff	SED
<b>Method</b>		<b>Flash</b>		<b>Study</b>	<b>23.7</b>	<b>1.06</b>
<b>Format</b>	<b>AMC</b>		<b>MIX</b>		<b>-10.4</b>	<b>1.09</b>
Format x Method	AMC	Flash	AMC	Study	29.0	1.16
Format x Method	AMC	Flash	MIX	Flash	-5.0	1.53
Format x Method	AMC	Flash	MIX	Study	13.2	1.53
Format x Method	AMC	Study	MIX	Flash	-34.1	1.53
Format x Method	AMC	Study	MIX	Study	-15.8	1.53
Format x Method	MIX	Flash	MIX	Study	18.3	1.79



# Summary

- Flash games improved student exams scores over Study guides by:
  - 21.5 points for Feeds and Feeding course
  - 26.3 points for Applied Animal Nutrition course
  - 23.7 points for both courses
  - However, exam scores were improved by an average of  $16.0 \pm 1.6$  points when Feeds and Feeding, Applied Animal Nutrition, and Animal Reproduction data for 2003-2007 were used in a mixed exam model.





# Summary

- Students did better with a mixed exam format than an all multiple choice exam:
  - 14.4 points for Feeds
  - 5.0 points Applied Nutrition
  - 10.4 points for both



# Summary

- Interactive flash games are individual student learner-centered and allow for interactive collaborative learning.
- More than 90% of students indicated flash game-assisted instruction contributed to better learning.

