FEEDING FRENZY: TURNING THE SCIENCE OF ZOO NUTRITION INTO A GAME FOR KIDS.

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Abstract

In 2012, Busch Gardens opened the Animal Care Center to the public to share general information about the techniques and science involved in preventative and emergency care of the 12,000 animal residents of the zoo as well as local injured wildlife. Zoo educators teamed up with the veterinary and nutrition staff to develop demonstrations and interpretive elements that would share advanced scientific principles with a general audience. The concept of using a board game to teach children the basic concepts of zoo nutrition was developed into a working prototype, starting with current nutritional data for common foods (Kerr 2014, Mazuri 2015, Schmidt 2005, USDA 2014) and approximate relative values for animal nutritional requirements. To simplify the numbers for gameplay, nutritional composition was scaled down to integers ≤ 6, while maintaining approximate relative values, and the animals requirements were set at a maximum of 20 "nutritional units". To ensure playability, the conceit was made that every animal represented in the game could have their nutritional needs met using five food cards, with multiple alternative solutions being possible. The resulting game is used as an interpretive tool by educators to start conversations about the science of nutrition and the interplay between animal husbandry, nutrition, and veterinary care.

Gameplay & Methodology

The game involves the use of "animal boards", three types of "food cards" (produce, pellet, meat), and three types of "food points" (protein, fat, carbohydrates). Each animal board displays a value for each type of food point needed to win, with each value equal to or less than 20. The boards also indicate which types of food cards the player may use to meet their animal's needs (referencing whether the animal is a carnivore, omnivore, or herbivore). The food cards are color coded as produce, pellet, or meat, and indicate a given value of the three types of food points. The goal of the game is to be the first player to meet the animal's requirements exactly.

For the purpose of the game, the value of carbohydrate was crudely estimated as:

$$\text{Carbohydrates by difference} = 100\% - (\text{water\%} + \text{protein\%} + \text{fat\%} + \text{ash\%})$$

Values for protein and fat content were derived from the USDA (Schmidt, 2005; USDA, 2014) and manufacturers' websites (Mazuri, 2015), as well as other resources for whole prey items (Kerr, 2014). All values were then scaled down to values less than six, rounded to the nearest integer.

Animal nutritional requirements were based on relative percentages of fat to protein to carbohydrate, scaled down so that no value exceeded 20. To ensure playability, a combination of five food cards was chosen for each animal based loosely on their diet given at the zoo, which led in some cases to deviation from established values. Some artistic license was also taken to

ensure each animal board showed different values, even if the animals had similar requirements on the smaller scale.

Turaco		17	15	68	4	4	17
Solution		16	16	80	4	4	20
106%	94%	107%	118%		100%	100%	118%
MAZURI ZULIFE SOFT-BILL DIET (5M12)	82	78.3	231.45		2	2	6
MAZURI ZULIFE SOFT-BILL DIET (5M12)	82	78.3	231.45		2	2	6
BANANA	9.84	10.305	221.5417		-	-	6
GREENS, MIXED CHOPPED	11.92	5.22	29.07775		-	-	1
APPLE	0.76	3.24	59.0267		-	-	1

Figure 1. Example of one five-card solution (using a pellet card twice), comparing original requirement values and simplified gameplay values.

	Protein	Fat	Carb.
PRODUCE			
Apple	0	0	1
Banana	0	0	6
Green Beans	0	0	1
Corn	0	0	1
Carrot	0	0	1
Grapes	0	0	2
Kale	0	0	1
Onion	0	0	1
Papaya	0	0	1
Pear	0	0	2
Romaine	0	0	1
Squash	0	0	1
PELLETS			
High Fiber Biscuits	2	1	4
Leaf-eater Biscuits	2	1	5
Low Iron Bird Pellets	2	2	6
Parrot Pellets	2	1	6
Primate Biscuits	2	1	4
MEATS			
Boneless Skinless Chicken Breast	3	1	0
Chicks	2	1	0
Ground Large Carnivore Diet	4	5	1
Ground Small Carnivore Diet	2	2	1
Hard-Boiled Egg	2	5	0
Mice	2	2	1
Rabbit	2	1	1
Rat	1	2	0

Figure 2. Summary of food card values used in prototype game.

	Protein	Fat	Carb.
Gorilla†	6	3	16
Hornbill*	9	9	3
Hyena*	16	13	3
Lemur†	2	1	16
Parrot†	2	4	18
Serval*	14	11	3
Sloth	4	6	8
Tiger*	14	9	3
Turaco†	4	4	20

* = can only use meat cards
† = can only use produce & pellet cards

Figure 3. Summary of animal nutritional requirements used in game prototype.

Figure 4. Example of animal board game piece used in working prototype.

Figure 5. Examples of food cards used in working prototype.

Discussion

Although originally designed to cater to children aged 9 and up, the game "Feeding Frenzy" has been very well received by guests of ages from 4 to adult. The carnivores have proven to be more challenging for guests to solve than herbivores, with the most common challenge expressed by guests to be balancing fat with protein intake. Time taken to reach a solution varies widely, with carnivores taking 2-3 times longer to solve than herbivores or omnivores. This divergence has been used to present two difficulty levels of the game to cater towards younger or older guests. The assurance of a five-card solution gives guests confidence that a solution exists, although many guests have discovered their own 3- or 4-card solutions. A surprising number of guests ignore visual clues given on the "pellet" cards indicating animal preferences, which commonly results in the parrot pellets being chosen in large quantity for the primates, and vice versa. Future versions of the game will likely include more omnivores and food choices, including a "browse" produce card that provides protein. The gorilla and sloth boards may also be modified in future versions so that a solution can be reached using the browse card. As an interpretive tool, the game has proven valuable in starting conversations about the interactions between animal husbandry, nutrition, and veterinary medicine, and the important role zoo nutrition plays in animal health and wellbeing.

Literature Cited

Kerr KR, Kappen KL, Garner LM, and Swanson KS. 2014. Commercially available avian and mammalian whole prey diet items targeted for consumption by managed exotic and domestic pet felines: Macronutrient, mineral, and long-chain fatty acid composition. *Zoo Bio* 33:327–335.

Mazuri: exotic animal food. c2015. St. Louis (MO): PMI Nutrition International. [accessed 2014 Mar]. http://www.mazuri.com/

Schmidt DA, Kerley MS, Porter JH, and Dempsey JL. 2005. Structural and nonstructural carbohydrate, fat, and protein composition of commercially available, whole produce. *Zoo Bio* 24:359–373.

U.S. Department of Agriculture, Agricultural Research Service. 2014. USDA National Nutrient Database for Standard Reference, Release 27.