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PROGRAM PROFILE

Nutrition, Dietetics, and Food Sciences Department: Mission and Goals

The Nutrition Science (NS) program is one of three Bachelor of Science (BS) degrees offered by the Department of Nutrition, Dietetics, and Food Sciences. The mission and goals of the NS program are integrated with the broader departmental mission and goals.

The mission of the Department of Nutrition, Dietetics and Food Sciences (NDFS) is to enhance the quality of life and well being of our constituents in Utah, the nation, and internationally through our programs in education, research, and Extension. This mission reinforces those of our College of Agriculture and Applied Sciences and Utah State University.

To achieve the mission of the NDFS we have outlined the following goals:

The teaching goal of the NDFS department is to develop within our students the knowledge and skills required to be productive and advance in their professional field of endeavor. Our education programs include both specialized and liberal studies that lead to satisfying professional careers and life enrichment. The NDFS department is a diverse science-based department with teaching emphases in Nutrition Science, Food Science, and Dietetics. Prior to fall 2018, the department offered only one BS degree in Nutrition, Dietetics, and Food Sciences with students declaring an emphasis (e.g., Nutrition Science) that determined their course of study. The affiliation of nutrition science and food science is advantageous given the interrelationships of nutrition, food, and human health. However, the individual areas of emphases represented by NS, Food Science, and Dietetics are clearly different paths of study preparing students for diverse career trajectories. In fall of 2018 the department received approval to offer three BS degrees: one in Nutrition Science, one in Food Science, and one in Dietetics.

The research goal of the NDFS department is scientific discovery that benefits the people of Utah, the nation, and the world. Research areas of emphasis include molecular and cellular nutrition, public health nutrition and epidemiology, microbiology and food safety, dairy and muscle foods processing, and dietetics administration.

The outreach and extension goal of the NDFS department is to disseminate and apply scientific knowledge in nutrition and food sciences to the people of Utah and the nation. Key areas of outreach reflect the department's scientific expertise and include nutrition, food safety, food quality, and dairy and meat processing.

The NDFS department fosters equal opportunities for women and minority students and faculty, and welcomes foreign and domestic students and visiting professors. We endeavor for a work environment characterized by collegiality and respect for individuals and ideas.

Summary of Nutrition Science Program

Undergraduate program

As was mentioned previously, a Bachelor of Science (BS) Nutrition Science degree was recently (Fall 2018) approved to replace the previous emphasis area within the BS Nutrition, Dietetics, and Food Sciences degree. The new BS NS degree offers two optional emphasis areas in Pre-Health Professions and Sports Nutrition. Having a BS degree in NS, rather than an emphasis in NS for the broader BS degree in Nutrition, Dietetics, and Food Sciences is beneficial because it: 1) distinguished NS from the other disciplines in the department and recognizes that NS has a core curriculum different than both Food Science and Dietetics; 2) it allows for better advising and tracking of students and graduates; and 3) makes it easier for students interested in the unique training provided by our program to recognize what degree is most appropriate for them. A description and purpose of the NS BS degree and the emphasis areas is provided in **Table 1**. The admission requirements for this program are consistent with the Food Science and Dietetics degrees also offered by our department. New freshmen admitted to USU in good standing qualify for admission to the NS program as do transfer students from other institutions and other USU majors with a total GPA of 2.5 or higher.

Table 1. Nutrition Science BS degree programs, credits, and description and purpose

	Required credits	Elective credits	Description and purpose
Nutrition Science	77 (28 from NDFS)	19	<p>The nutrition science program is designed for students who are interested in studying the molecular and cellular aspects of how nutrition relates to human health and disease.</p> <p>This degree prepares students for employment in the food and supplement industries, government or private agencies in the area of nutrition and health, research laboratories, or for advanced degree programs in nutrition or related fields.</p>
Nutrition Science – Sports Nutrition emphasis	77 (28 from NDFS)	20	<p>The sports nutrition emphasis is designed for students who are interesting in learning more about how nutrition supports exercise and physical performance. Electives include courses in physical education and kinesiology.</p> <p>This degree prepares to students to work as professionals within the health and fitness industries and is a nice complement to personal training and other certificate programs.</p>
Nutrition Science – Pre-Health emphasis	77 (28 from NDFS)	20	<p>The pre-health emphasis is designed for students who are planning to apply to a professional health program.</p> <p>Electives include classes in chemistry, biology, and physiology. The curriculum fulfills admission</p>

			requirements for most health professional graduate programs including medical, dental, pharmacy, physician assistant, and physical therapy schools.
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Graduate programs

The NDFS department offers traditional plan A (thesis) Masters of Science in Nutrition, Dietetics, and Food Sciences and PhDs in Nutrition, Dietetics, and Food Sciences. NS faculty members work directly with students who are interested in focusing their study in the area of human nutrition. NS faculty may also work directly with students seeking Master of Public Health (MPH) degrees. The MPH Nutrition program offers plan A, B, or professional degree options. A description and purpose of the NDFS graduate degrees with an emphasis in Nutrition Science and Public Health is provided in **Table 2**.

Starting in 2024, registered dietitians (RDs) will be required to have a master's level degree to establish entry-level professional requirements; and NDFS graduate degrees, including the MS and PhDs in NS, and MPH degrees provide opportunities for RDs to earn the advanced degree that they will soon need. The NDFS department offers a BS degree in Dietetics and graduates approximately 24 students in this program each year. This is a vital pool of candidates for graduate degrees offered through the NDFS department.

Admission requirements for all graduate students in the approved NDFS graduate degrees meet the USU School of Graduate Studies minimum requirements. Applicants must attain Graduate Record Examination (GRE) scores at the 40th percentile minimum on the Verbal, Quantitative, and Analytical Writing tests, and must have a 3.0 or higher GPA for the last 60 semester credit hours at the institution where they earned their BS degree.

Table 2. Graduate degree programs in the NDFS department with an emphasis or focus in NS.

	Required credits	Elective credits	Description and purpose
Master of Science in Nutrition, Dietetics, and Food Sciences – emphasis Nutrition Science (plan A)	30 (at least 13 from NDFS)	5-11	This degree provides specialized training in a research area that may be needed to help promote the growth of science and industry and can also serve as a “stepping stone” to doctoral programs in nutrition or related subjects.
PhD in Nutrition, Dietetics, and Food Sciences – emphasis Nutrition Science	70 from a BS 48 from a MS (at least 23 from NDFS)	13-18	This degree provides specialized training in a research area that may be needed to help promote the growth of science and industry.
Master of Public Health, Public Health Nutrition (plan A, B, or professional degree options are available)	42 (15 credits from NDFS)		This degree provides students with a strong foundation in the core disciplines of public health including biostatistics, epidemiology, environmental health, socio-behavioral public health, and public health policy and administration. The curriculum follows guidelines of the Council on Education for Public Health and the Association of Schools and Programs of Public Health.

			This degree prepares students to become public health nutritionists, public health educators, and directors of public programs that offer nutrition or other health services.
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Courses

The NS BS degree curriculum includes basic science courses and laboratories in chemistry, biology, physics, and mathematics and statistics in addition to courses in NS.

Degree requirements for a BS degree in NS are available online at http://catalog.usu.edu/preview_program.php?catoid=12&poid=9618

The basic science core includes 49 credit hours from the following courses in Chemistry, Mathematics and Statistics, Physics, and Biology: Chemical Principles I and II with accompanying laboratories (CHEM 1210,12015, 1220, 12125); Organic Chemistry with accompanying laboratory (CHEM 2310, 2315); Introductory Biochemistry with accompanying laboratory (CHEM 3700, 3710); College Algebra (MATH 1050), Trigonometry (MATH 1060), Calculus (MATH 1210), and Statistical Methods (STAT 2000); General Physics I and II (PHYS 2110, 2120); Biology I and II with accompanying laboratories (BIOL 1610, 1615); Human Anatomy (BIOL 2320), Human Physiology (BIOL 2420).

The NS core courses include 26 credit hours from the courses listed in **Table 3**. An additional 21 credit hours of NS courses are available for students to take as electives in their program. The number of credits and courses that students may include in their program of study depends on their degree emphasis and personal interests. These elective courses are listed in **Table 4**.

Course syllabi for the courses listed in **Tables 3** and **4** can be found in **Appendix A**.

Table 3. Nutrition science core courses by credit hour, semester (sem), and instructor

Course number	Course name	Credit hr (sem)	Instructor
NDFS 1020	Science and Application of Human Nutrition	3 (F, Sp)	Wengreen, Graf, Norris
NDFS 3600	Medical Terminology for Health Care Professionals	2 (F)	Staff
NDFS 4020	Advanced Nutrition	3 (F)	Wengreen
NDFS 4080	Community Nutrition	3 (F)	Savoie Roskos
NDFS 5210/6210	Advanced Public Health Nutrition	3 (Sp)	Munger
NDFS 5230/6230	Communicating Current Issues in Nutrition	3 (Sp)	Wengreen
NDFS 5400/6400	Nutritional Neuroscience (added in 2017)	3 (F)	Cho
NDFS 5410/6410	Nutrient Gene Interactions	3 (Sp)	Hintze
NDFS 5310/6310	Fundamentals of Nutrition Research (added in 2016)	3 (F)	Lefevre

Table 4. Nutrition science courses that may be included as elective credits by credit hour, semester (sem), and instructor

Course number	Course name	Credit hr (sem)	Instructor
NDFS 3020	Nutrition and Physical Performance	2 (F)	Hintze
NDFS 4550	Nutrition Assessment	3 (F)	Charlton
NDFS 4560	Medical Nutrition Therapy II	4 (Sp)	Charlton
NDFS 5200/6200	Nutritional Epidemiology	3 (F)	Munger
5320/6320	Advanced Sports Nutrition (added in fall 2017)	3 (F)	Wengreen
5600/6600	Current Topics in Obesity (added in 2014)	3 (F)	Durward
5800/6800	Motivational Interviewing and Counseling (added in fall 2017)	3 (F)	Savoie Roskos
5010/6010	Hunger Issues and Solutions	3 (Sp)	Savoie Roskos
5520/6520	Current Issues in Food Regulatory Affairs	3 (Sp)	Cho

The courses listed in **Table 3** and **4** at the 5000 are also listed at the 6000 level and may be taken at the 6000 level for graduate credit. Instructors typically have additional assignments or different grading criteria for students who take the class at the 6000 instead of the 5000 level.

Degree requirements for graduate degrees in NDFS with an emphasis in NS are available online at: http://catalog.usu.edu/preview_program.php?catoid=12&poid=9616&returnto=3800

Degree requirement for the MPH Nutrition are available online at: http://catalog.usu.edu/preview_program.php?catoid=12&poid=19397

FACULTY

The NDFS department has 31 faculty, six (19%) of which constitute the NS curriculum committee. This committee is responsible for determining the learning objectives, curriculum, and assessment plan for the program. The chair of this committee is Associate Professor Korry Hintze. Faculty on the committee teach courses in the core curriculum of the NS bachelor and graduate program. Three additional faculty members in the NDFS department teach classes in the core curriculum of NS (indicated with an * in **Table 5**), but have primary responsibilities to the Dietetics program, and one additional faculty member with a primary responsibility to the Dietetics teaches a class listed as an elective course (indicated with an ** in **Table 5**). A list of NDFS faculty can be found at online at: <https://ndfs.usu.edu/directory/faculty/index>. The names of NS faculty along with their rank, credentials, area of emphasis, and % of role dedicated to teaching are provided in **Table 5**. Curricula vitae of the six faculty that constitute the NS curriculum committee can be found in **Appendix B**.

Table 5. Name and description of Nutrition Science faculty

Name	Rank	Credentials	Emphasis	% of role dedicated to teaching
Rebecca Charlton**	Assistant PP [^] Professor	RD, MS	Medical nutrition therapy, pediatric nutrition	95
Clara Cho	Assistant Professor	PhD	One-carbon metabolism, methyl nutrients, obesity, metabolic syndrome	35
Carrie Durward	Assistant Professor	RD, PhD	Community nutrition, program evaluation, nutrition behavior measurement	15
Marlene Graf*	Associate PP Professor	RD, MS	Community nutrition, dietetics	95
Korry Hintze	Associate Professor	PhD	Nutrition and chronic disease, microbiome, animal models of nutrition	45
Michael Lefevre	Professor	PhD	Gut health, diet and chronic disease risk, dietary bio-actives, clinical trials	30
Ron Munger	Professor	MPH, PhD	Epidemiology and public health nutrition	25
Natalie Norris*	Assistant PP Professor	RD, MS	Sports nutrition	95
Mateja Savoie Roskos*	Assistant Professor	RD, MPH, PhD	Community nutrition	45
Heidi Wengreen	Professor	RD, PhD	Child nutrition, dietary assessment methods, behavior change	65

[^] Professional practice

All of the NS faculty members are on the tenure track with role statements that include both teaching and research or extension; three of six are full professors, one is an associate professor, and two are assistant professors. All have doctoral degrees and two are Registered Dietitians. **Table 6** compares characteristics of the NS faculty with the faculty of other programs in the NDFS department.

Table 6. Characteristics of faculty in the NS program compared to other programs in the NDFS department

	Nutrition Science	Food Science	Dietetics	Extension/Other
Count	6	11	10	4
% female	50%	40%	100%	100%
% tenure track	100%	100%	22%	100%
% term faculty (annually-renewed)	0%	0%	88%	0%
% with doctoral degrees	100%	100%	20%	25%
% with RDN credential	33%	0%	100%	0%
Primary research roles	66%	100%	0%	0%
Primary teaching roles	16%	0%	100%	0%
Full professors	50%	64%	20%	50%
Associate professors	16%	9%	30%	0%
Assistant professors	33%	27%	50%	50%
Average number of undergraduate graduates per year over the past 5 years	16	4	26	NA

Teaching and Outreach

Teaching is a critical part of the mission of the NS program. Members of the NS curriculum committee teach 7 of the 9 required nutrition courses in the NS curriculum. The other two courses are taught by faculty with primary roles in the department's Dietetics programs. Over the past five years (2014-2019) the NS faculty has been working to expand the course offerings in the NS undergraduate and graduate programs. Seven new courses have been developed and integrated into the NS curriculums (add dates for new classes are indicated in **Tables 3** and **4**). These courses are consistent with the areas of expertise of the faculty that developed and teach the course and strengthen the NS curriculum by providing greater breadth and depth of knowledge. Recent additions to the curriculum have been informed by interviews and surveys of recent graduates of our program, as well as current trends and needs in the area of NS. In addition to offering the set of core and elective courses that constitute the NS undergraduate and graduate programs, the NS faculty teach several courses that are required for other NDFS majors, or are electives for majors in other departments. For example, NDFS 1020, the Science and Application of Human Nutrition is a required course for all NDFS majors as well as 15 other programs in different departments and fulfills a Breadth Life-Science general education requirement for the University. This course is taught to approximately 1200 students each year, including students from across the world who take the online format of the course. Several of the NS courses are also required courses for the Dietetics program including Advanced Nutrition, Sports Nutrition, Communicating Current Issues in Nutrition, Community Nutrition, Nutritional Epidemiology, and Nutrient-Gene Interactions. Core classes in the NS program are required by 18 other major or minor degree programs across the USU campus (see **Appendix C** for a list of programs requiring NS courses by course name). We have an open enrollment policy

for all of our courses and are happy to accept students from other majors as long as they meet our pre-requisite requirements. Having classes with both NS and Dietetics, as well as students from outside of our major enriches the depth of discussions occurring in these courses. **Figure 1** displays the total student credit hours taught by the NS curriculum committee by year and course level.

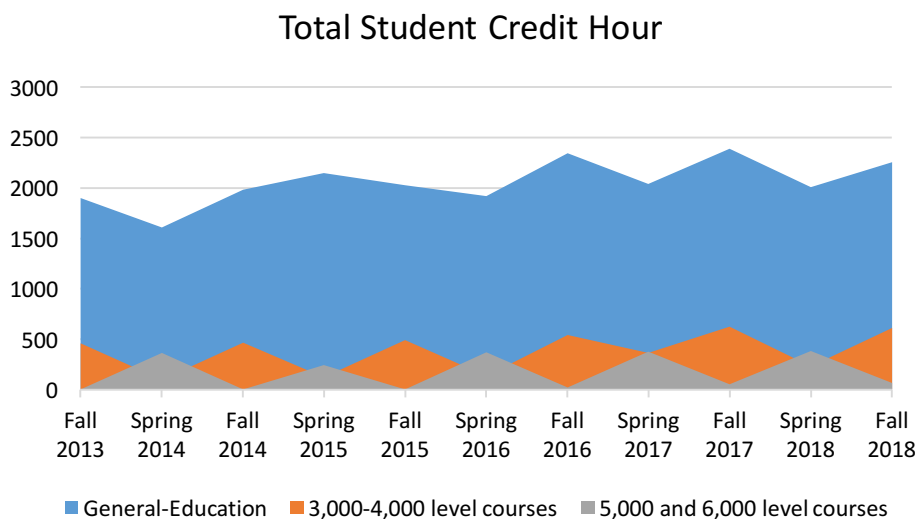


Figure 1. Student credit hours of NS courses by level of course and year.

Several (n=11) of our upper-division core or elective courses are cross-listed meaning that they are listed and taught at both the undergraduate and graduate level. Upper-level undergraduate students may cross-list these courses and earn graduate course credit while still enrolled as an undergraduate student. This allows for a seamless transition to graduate school for many of our undergraduates.

NS faculty use a variety of effective teaching pedagogies in their courses. Courses are taught in a variety of formats including traditional lectures, blended or flipped-classroom designed, and on-line and use a variety of techniques to enhance student engagement including debates and discussions, science-fair style demonstrations, and real-world assignments that are sometimes published (fact sheets, review articles). NS faculty regularly attend USU’s Empowering Teaching Excellence programs. Several of the NS faculty have won departmental, college, institutional and national awards for their effectiveness in teaching. The NDFS department has won the College of Agriculture’s departmental teaching award of excellence in two of the past three years. The 6 NS core faculty have an average Overall Average IDEA student evaluation score of 57.5 (2013-2018), which is higher than all courses in the IDEA database, used for comparison. While teaching assignments and documented success in the classroom represent important

parts of faculty teaching responsibilities, other aspects of faculty teaching roles that NS excel at include:

- Engagement with student learning outside of the classroom. NS instructors regularly involve students in undergraduate research opportunities and mentor students who are completing Honor's, Community Engaged Scholars, or other capstone experiences. Undergraduate researchers often have opportunities to present results at conferences and have been co-authors on peer-reviewed publications. Faculty consult with students regarding their evolving careers and often write letters of recommendation. Two NS faculty are members of the Pre-Health Evaluation Committee and conduct mock-interviews with students who are preparing to apply for pre-health programs.
- NS faculty actively advance the pedagogy for teaching within the field of nutrition.
- NS faculty attract graduate students and mentor them to the successful completion of their degree and publication of their research.

Advising

The professional advisor for the NS program is Launa Julander. Ms. Julander is located in the College of Agriculture and Applied Sciences advising office in the AGRS building. She meets with students on a regular basis and at least once per year to assist with the following things:

- Preparation and placement for required general education and introductory courses in mathematics and statistics
- Articulation of course equivalents for transfer students
- Tracking graduation requirements for undergraduate majors
- Processes student forms related to changes of major, course incompletes, and graduation applications

Dr. Heidi Wengreen is the NDFS department's Honor's advisor. Heidi meets with Honor's students each fall semester and assists them in finding a faculty mentor and helps them to track their progress through the Honor's program. One NS BS student has graduated with honors in the past five years.

Recruiting

Ms. Julander also leads the effort for undergraduate recruiting and regularly attends the USU Majors Fair, USU "A" Days (an orientation event for current students), and recruiting visits to state and regional high schools coordinated with the College of Agriculture and Applied Science's Student Ambassadors. The NS committee recognizes the need to be more pro-active with recruiting and has recently developed a NS-specific brochure (see **Appendix C**) that will be shared with those that advise the undeclared major students, the Ag ambassadors, the pre-health committee, and other groups on campus.

Research and Scholarly Activity

Faculty Research Interests

Clara Cho (60% research effort): Dr. Cho's research focuses on one-carbon metabolism and methyl nutrients and their role as determinants of obesity, metabolic syndrome and chronic disease risk. Dr. Cho's work utilizes animal models and human studies to answer mechanistic questions from genetic, epigenetic, physiologic, metabolic and microbiome perspectives. Her current research activities focus on the following two areas: 1) development of epigenetic alterations and energy regulatory pathways; and 2) diet, gut microbiome and trimethylamine-N-oxide (TMAO) metabolism.

Carrie Durward (80% Extension with applied research component): Dr. Durward's research focus is to develop effective, rigorous, and sustainable tools to evaluate the effectiveness of EFNEP and SNAP-Ed including: 1) developing a tool for evaluating the effectiveness of EFNEP and SNAP-Ed over time by assessing the quality of household grocery food purchases prior and after program participation; and 2) assessing the feasibility, validating, and pilot testing the Automated Self-administered 24-hour Recall (ASA24) for use in the low-income population.

Korry Hintze (50% research effort): Dr. Hintze's research program focuses broadly on nutrient, gene, and microbiome interactions in relation to chronic disease. His laboratory employs rodent models to investigate the molecular pathways of colorectal cancer, antioxidant protein regulation, iron metabolism, gut inflammation, and gut barrier function.

Michael Lefevre (60% research effort): Dr. Lefevre's research has focused on the role of diet composition in the risk for chronic disease, with much of this work involving human nutrition clinical studies. The vast majority of these studies have centered on the impact of diet on risk for the development of cardiovascular disease and/or metabolic syndrome. Dr. Lefevre's current research interest centers on the interrelationships between dietary flavonoid intake, gut microbiome composition and metabolism, gut inflammation and permeability, and biomarkers for cardiometabolic disease.

Ronald Munger (50% research effort): Dr. Munger is a nutritional epidemiologist with a keen interest in population-based studies of nutrition and human health across the lifespan—from fetal development to the conditions of the oldest old. His population-based epidemiologic studies span across multiple domains including osteoporotic hip fracture in a statewide study in Utah, Alzheimer's disease risk in Cache County, Utah and craniofacial birth defects in Utah, the Philippines, and India.

Heidi Wengreen (30% research effort): Dr. Wengreen's research interest and activities include the development and validation of several methods of dietary assessment for specific populations employing different statistical approaches to study associations between nutrients, food, and dietary patterns and risk of health and disease. This work has been applied to the study of relationships between dietary patterns and risk of cognitive decline and dementia in

the aging populations. Her research also encompasses behavioral interventions in public schools aimed at motivating children to consume more fruits and vegetables and community-based interventions among young and older adults aimed at helping them to make healthier lifestyle choices as a means to improve health and quality of life.

Research Funding Through Grants and Contracts

Figure 2 shows the dollar amounts of grants and contracts by year and by type. Data presented in Figure 2 represent new awards in each of the years and does not include ongoing funding from prior years. Across the five years, NS investigators generated \$2.717M of funding as principle investigators, with the majority (87%) derived from external grants and contracts. Importantly, NS faculty served as Co-Principle Investigator or Co-Investigator on an additional \$6.159M in grants and contracts originating in departments/universities other than NDFS. This attests to the highly collaborative nature of the NS faculty and speaks to the demand for our faculty to participate in ultimately successful interdisciplinary research proposals originating outside of our program.

Of concern, however, is the drop-off in new, NS faculty-initiated proposals in the last three years. While some of this has been associated with a realignment of roles (e.g., increased allocation of time to teaching; development of an MPH program) with less time devoted to research, this drop-off undoubtedly also reflects an increasingly competitive environment that may fairly or unfairly, disadvantage smaller, less well known programs. Apart from ensuring that our future proposals are of the highest quality, it will be a goal to raise the overall profile of the NS research program through prioritizing publications in high impact journals and presentations at high profile meetings.

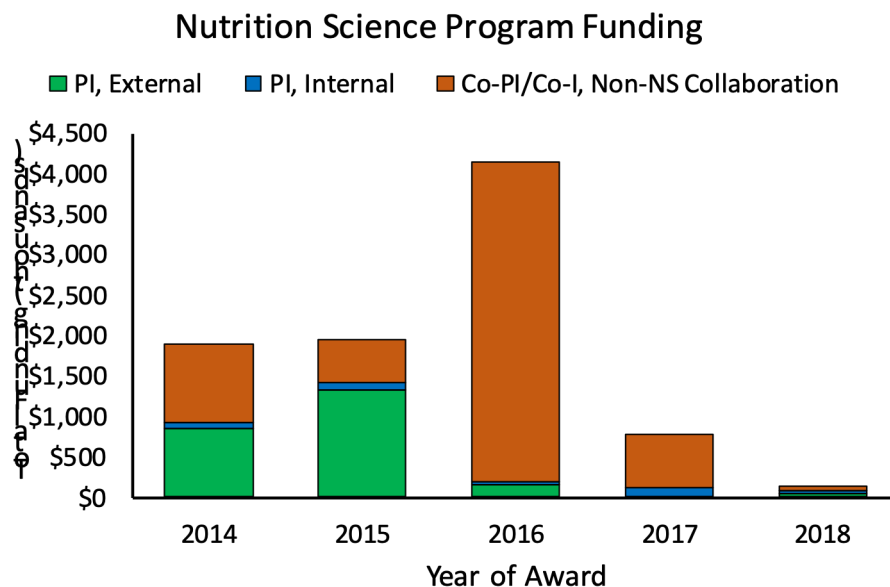


Figure 2. Total new awards by year to Nutrition Science faculty as either Principle Investigator (PI), Co-Principle Investigator (Co-PI) or Co-Investigator (Co-I).

Scholarly Communications

Figure 3 displays the scholarly output by year and publication type. Over the five years reviewed, the number of peer-reviewed publications ranged from a low of 7 to a high of 16 per year. At least one review or book chapter has been published in each of the five years reviewed. The large number of other scholarly output in 2018 reflects the publication of peer-reviewed nutrition fact sheets by Dr. Durward. A complete list of publications is presented in

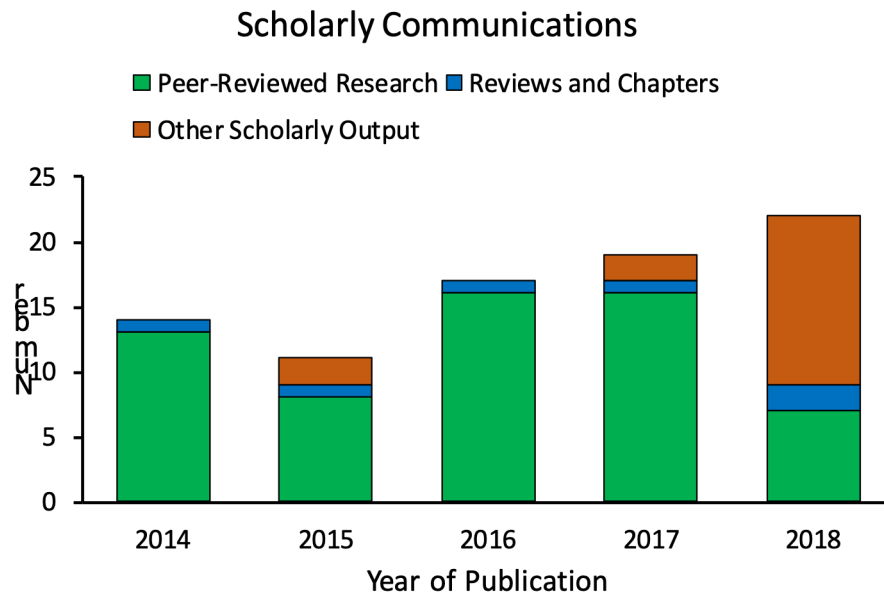


Figure 3. Total scholarly communications of Nutrition Science faculty by year and by type

Appendix D.

Figure 4 provides the range of JCR impact factors for journals in which the NS faculty have published in the last five years. The majority of papers have been published in journals with impact factors between 2 and 6 with a median of 4.0. This compares favorably with a median impact factor of approximately 2.0 for the field of nutrition and dietetics. Two papers, co-authored by Dr. Munger, were standout papers published in journals with very high impact factors (Nature, Nature Genetics).

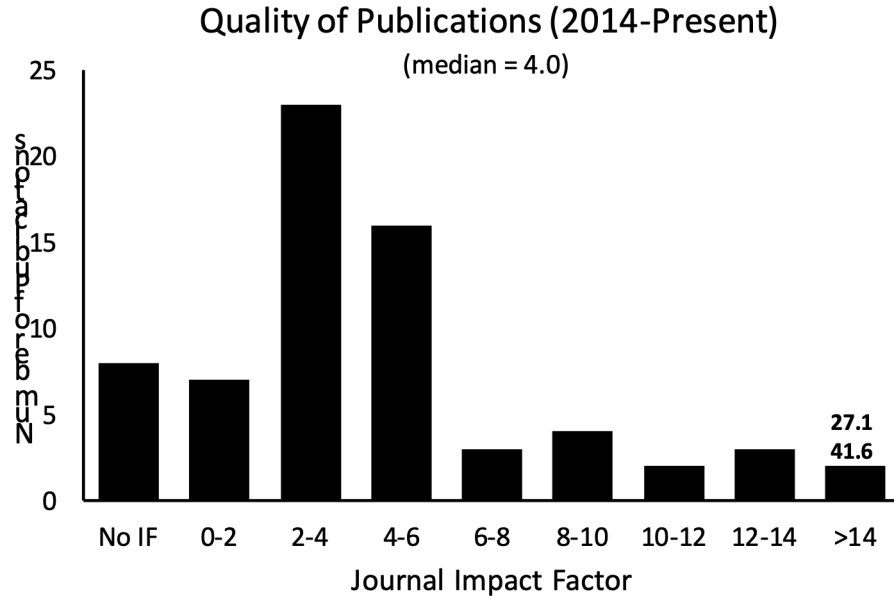


Figure 4. JCR Impact Factors for journals in which the Nutrition Science faculty have published in the last five years.

STUDENTS

Enrollment and Graduation rates

Table 7 shows total fall enrollment (# enroll) for undergraduates declaring a NS emphasis in the NDFS BS program, number of degrees awarded (# grad) by academic year, and the percent of enrolled that graduated. Beginning in fall of 2018 we began offering a BS degree in NS with two emphasis area options, including Sports Nutrition and Pre-Professional Health. We will continue to track enrollment and degrees awarded in the areas of emphasis moving forward. **Table 8** provides a comparison of degrees granted by difference degree emphasis areas within the BS in NDFS.

Undergraduate students have opportunities to subsidize their education through departmental and college scholarships. Award amounts generally range between \$500 and \$1,000 for an academic year, and can be combined with general USU scholarships. As a reference, tuition and fees for full-time NS students currently average between \$7,000 and \$8,000 per year.

Table 7. NS emphasis in the NDFS BS program, enrollment (enroll) and graduation (grad) totals

	F13	Sp14	F14	Sp15	F15	Sp16	F16	Sp17	F17	Sp18	F18	Sp19
# enroll	77	77	67	67	70	67	74	70	57	59	59	
# grad	4	25	5	10	2	10	4	18	3	4		17*
% enroll that grad**		38%		22%		18%		31%		12%		29%

* Expected number, ** = (number enrolled fall semester / number who graduated in academic year

Table 8. Number of NDFS BS degrees granted by year and emphasis area within the BS in NDFS.

	Nutrition Science	Food Science	Dietetics	Total
2013-2014	29 (48%)	7 (7%)	25 (41%)	61
2014-2015	15 (38%)	3 (8%)	22 (55%)	40
2015-2016	12 (27%)	4 (9%)	28 (64%)	44
2016-2017	22 (44%)	2 (4%)	26 (52%)	50
2017-2018	7 (17%)	5 (12%)	29 (71%)	41

Graduation rates

Over the past five years the NDFS department has graduated 233 students with BS degrees in NS (n=82, 35%), Dietetics (n=130, 56%), and Food Science (n=21, 9%). Over the past five-years, graduation rates in NS have been 12-38% of fall enrollment numbers (**Table 7**). Considering that the BS in NS is a four-year program, our projected percent graduating of total enrolled students should be ~25%. In the past five years we have exceeded 25% twice (in spring of '14 and '17) and fell short of this number three times, including spring of 2018 when our graduation number was the lowest it has been in five years. We saw a decrease in our enrollment numbers over the past two years, and experienced the lowest graduation numbers in the past five years in spring of 2018. We are not sure of the reason for our dip in enrollment and graduation numbers. Over all more students have transferred into our program than have transferred out of our program; the one exception to this occurred in spring of 2016 when 6 students transferred out and only three students transferred in. In fall of 2015 Biology instigated a Human Biology emphasis to their traditional biology degree and we believe this major may be attracting some of the pre-professional health students that were previously interested in the pre-health track of NS due to the applied nature of our curriculum. Though our graduation numbers were low in academic year 2017-2018, our projected numbers for 2018-2019 are greater and indicate that perhaps the dip in graduation numbers in 2017-2018 was an anomaly instead of a true downward trend.

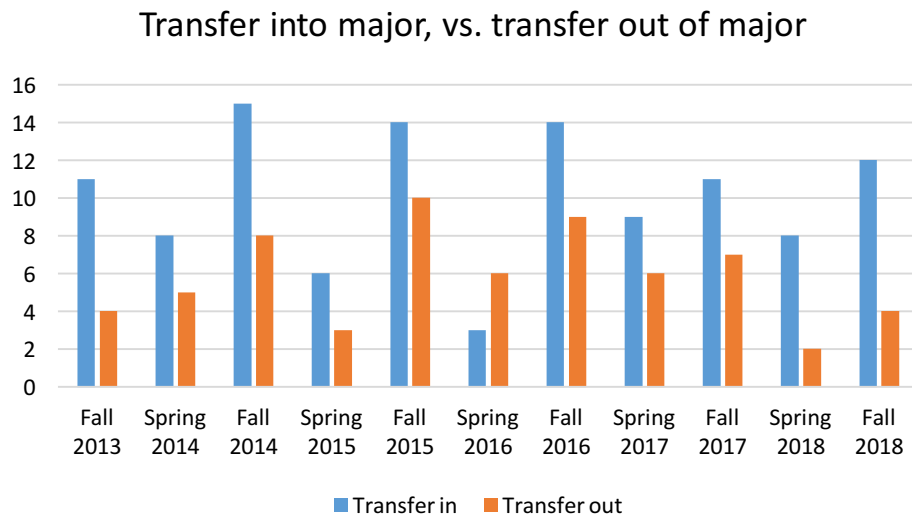


Figure 5. Number of students transferring in to and out of Nutrition Science (BS)

Transfer data

Over the past 5 years 119 students have transferred into our program (as an emphasis to a degree in NDFS prior to fall of 2018) and 69 students have transferred out of our program (see **Figure 5**). Students transferred out of our program into a variety of other programs on campus; 17% transferred into Human Movement Science, 9% transferred into Family, Consumer, and Human Development, and 6% into Health Education and Promotion, and Pre-Business. Three or fewer students transferred into other varied programs. Students also transferred into our program from a variety of other institutions and programs; 22% of our transfer ins were from other institutions, 18% were from exploratory studies, 16% were from biology, and 13% were from USU’s regional campus and distance education program. Five or fewer students transferred into our major from other varied programs.

Student placement rates and salary data

In the spring of 2018 we conducted an online survey with our alumni to collect information on what our graduates are doing after they graduate. One hundred thirteen people were sent the survey and 33 responded. Of the 26 who responded having earned a BS degree in NS in the past 5 years, 9 (35%) were employed full-time in a job that they identified as being in the field of nutrition, 6 (23%) were employed full-time in a job that they identified as being outside of nutrition, 6 (23%) were in graduate school, and 5 (19%) were either employed part time in nutrition or were not employed but not seeking employment. Seven of the 9 graduates who reported being employed full time in the field of nutrition reported earning \$40,000 - \$60,000 per year.

Noteworthy successes (2013-2018):

- The co-valedictorians for the College of Agriculture and Applied Sciences were both NS students in 2017.
- Ninety-three % (n=29) of students who earned a BS in NS in 2013-2018 and applied to medical or dental school were accepted to a medical or dental school of their choice. The average percent of students accepted to medical school from USU in 2013-2018 was 35%.
- All NS faculty actively support and regularly provide experiential learning experiences for students outside of the classroom. These opportunities often lead to students being co-authors on publications and presentations and successfully completing their academic programs with Honors and or Community Engaged Scholar designations.

PROGRAM COSTS

Table 9 contains summary information from NDFS’s business manager Josh Johnson about the instructional budget for NS program (each new fiscal year begins on July 1st.) Education and General (E&G) funds allocated by the university, largely through legislative appropriation, provide the bulk of the NS program budget for teaching purposes.

Table 9 Instructional budget for the NS program fiscal year (FY) 2014 – FY 2018.

	FY14	FY15	FY16	FY17	FY18
Funding:					
Appropriated Funds	\$982,046	\$955,632	\$778,124	\$1,133,970	\$1,096,899
RCDE	\$41,417	\$22,976	\$13,319	\$2,390	\$4,057
Grants & Contract	\$203,869	\$219,215	\$297,709	\$964,373	\$991,235
Other	\$183,991	\$182,521	\$283,666	\$171,151	\$423,055
Total	\$1,411,323	\$1,380,344	\$1,372,819	\$2,271,884	\$2,515,246
Instructional Expenditures	\$1,023,462	\$978,608	\$791,443	\$1,136,359	\$1,100,956
Positions Supported by E&G:					
Full-time (Salaried)	4.14	4.87	3.58	4.70	6.65
Teaching Assistants	1.02	0.75	0.43	1.65	2.15
Part-time (May include TA's)	1.02	0.06	0.28	2.26	0.91

PROGRAM SUPPORT

Facilities

C. Anthon Ernstrom Nutrition and Food Science Building

Built in 1975, the three floor, 72,653 square foot C. Anthon Ernstrom Nutrition and Food Sciences (NFS) Building houses the NS, Dietetics and Food Science Programs. The building houses the NDFS administration office, the Western Dairy Center, three lecture rooms (seating capacity of ~100, 30 and 20), a teaching laboratory, a pilot dairy plant, the Aggie Ice Cream store, a meat laboratory, a sensory evaluation lab, a product development lab, a metabolic kitchen, a shared equipment laboratory, business and advising offices, faculty and graduate student offices, individual laboratories for faculty, and a shared conference room and a study room for students. The building's basement, originally designed as an animal facility, has been renovated to house faculty and student offices. The building has internet access through both hardwire (offices and laboratory) and WiFi.

Nutrition Faculty Offices and Laboratories

The NS program occupies approximately 9,200 square feet within the NFS Building. This includes faculty offices for Drs. Cho, Durward, Hintze, Munger and Wengreen (each approx. 100 sq. ft.) and wet laboratory space for Drs. Cho, Hintze and Munger (each approx. 1,500 sq. ft.). Dr. Lefevre is housed in the USTAR BioInnovations Building 650 located 0.5 miles from the NFS Building. Dr. Lefevre is provided with a 140 sq. ft. office, two large cubicles for graduate students, 2,200 sq. ft. of wet laboratory space including four cubicles of research associates/students. Additional space is provided within the BioInnovations Building to house centrally-alarmed biological freezers (6 total) for Drs. Lefevre and Munger. All offices are equipped with telephones, high-speed internet services, personal computers (PC or Macs) with Microsoft Office and Adobe software, laser printers and access to centralized file storage (Box) for data backup and file sharing. All laboratories are similarly equipped with personal computers with high-speed internet services, centralized de-ionized water supply, fume hoods and emergency eyewash/showers.

Departmental Research Support

Center for Human Nutrition Studies: The Center for Human Nutrition Studies is located in the USTAR BioInnovations building with state of the art facilities for clinical nutrition research. The CHNS is directed by Dr. Michael Lefevre. The clinic facilities occupy 3,000 square feet on the first floor of the BioInnovations building. This facility is dedicated to the clinical research trials for the Center for Human Nutrition Studies and is not shared with other users. The unit is designed for easy access and convenience of research volunteers with spacious free parking dedicated for volunteers and accessibility by a free countywide bus system. The clinic includes 3 general examination rooms, 1 interview room, and a procedures room for daylong outpatient studies and body composition analysis by dual energy X-ray absorptiometry (Hologic Discovery

Series W). Two additional rooms are dedicated for phlebotomy use and sample processing. All exam rooms are equipped with digital scales, stadiometers and automated blood pressure devices. The unit also contains six administrative offices (for staff physician, coordinators, and investigators), a reception and waiting area, a medical records library and a temperature-monitored storage room for product storage. The Center has a contract arrangement with LabCorp for routine blood tests with turnaround times of 24-48 hrs. Specialized testing is done in Dr. Lefevre's laboratory or through collaboration with outside investigators. Finally, the clinic is directly adjacent to a dividable classroom, which can accommodate a maximum of 50 persons for educational sessions. All exam rooms have dedicated computers for direct entry of participant information into a central study-specific database. The Center is staffed by a full-time certified (CCRP) clinic coordinator.

Metabolic Research Kitchen: The CHNS Metabolic Research Kitchen is located in the NFS Building. This facility contains all the equipment required for the preparation and service of all meals for 50 individuals per day. The Research Kitchen includes a preparation area, dish room, walk-in cooler, walk-in freezer, and dry storage. The kitchen equipment includes a 31 cu. ft. reach-in refrigerator, microwaves, blenders, electronic balances, cryovac, tray lidder, meat slicer, food processors, an induction cook-top, two combi-ovens under a 6-foot hoods, blast chiller/freezer, baking area with a twenty-quart mixer, dishwasher, dish dryer, an ice machine, and service counter area. The Metabolic Kitchen staff includes Registered Dietitians and Dietetic/Nutrition Students and is supervised by Ms. Sheryl Aguilar.

College of Agriculture and Applied Sciences Research Support

Center for Integrated BioSystems: The Center for Integrated BioSystems (CIB) is a centralized resource for agricultural and life science research on the campus of Utah State University (<http://www.biosystems.usu.edu>). Originally established as the Biotechnology Center, the center was restructured and renamed in 1991 to embrace the shift in biosciences from isolated studies to integrated and collaborative research. The CIB encompasses 30,000 square feet with state-of-the art equipment for use in genomics, proteomics, flow cytometry, fermentation, and protein purification. The CIB offers an array of high-end equipment all under one roof for use by USU investigators as well as off-campus academic and industrial collaborators.

- **Genomics:** The genomics group offers a variety of gene analysis services. The CIB offers next generation sequencing services on the Illumina NextSeq, Illumina MiSeq, and Ion Torrent PGM. Applications include whole genome sequencing, RNA-Seq, methylation analysis, amplicon sequencing, genotyping by sequencing (GBS), microRNA sequencing, 16S ribosomal sequencing, ChIP-Seq and targeted sequencing. The CIB also offers size selection on the Blue Pippin automated size selection platform. Additional gene sequencing and fragment analysis is available on an ABI PRISM™ 3730 DNA Analyzer. Gene expression analysis is available on an Affymetrix GeneChip® platform. RT-PCR services are available using the DNA Engine Opticon 2. RNA/DNA quality control and quantification services are available using Bio-Rad Experion, Agilent 2100 Bioanalyzer, or

Thermo Scientific NanoDrop™ 8000 systems. A Fluidigm BioMark™ instrument is available to run real-time PCR, SNP genotyping, and digital PCR assays in a high-throughput, low volume fluidics chip

- Proteomics: The Proteomics group provides analytic services that involve mass spectrometric techniques including interpretation, design and optimization of experiments upon request. Services include liquid chromatography for small molecule mass and structural analysis (LC/MS), tandem mass spectrometry (LC/MS-MS), and chemical separation, identification and quantification (GC/MS). Support equipment includes a Waters GCT Premier Mass Spectrometer, Waters Q-ToF Premier, Waters Alliance 2795 Liquid Chromatography and a Waters NanoAcquity Ultra Performance LC™ (UPLC™) System. Protein purification to various levels is available using an ÄKTA FPLC or HPLC equipment. Protein identification/quantitation is available through standard 1D or 2D protein separation and Western Blotting using Bio-Rad 1- or 2-D precast gel Systems. 2-D differential gel electrophoresis (2D DIGE) using different fluorescent dyes to label control and treated samples with analysis of DIGE gel images is also available. The Proteomics group provides platforms for imaging, which include phosphorescent film, visible, UV, chemiluminescent and fluorescent gels, slides and plates. Equipment for gel imaging includes a SpectraMax 300 for plates, a Kodak 2000R Image Station for phosphorescent film or visible, UV or fluorescent gels or blots, an Alpha Innotech MultiImage Station and a GE Healthcare Typhoon Trio+ Laser Imager for UV and fluorescent gels and an Axon Genepix slide scanner for fluorescence on slides.
- Flow Cytometry: The facility provides instrumentation, personnel, and expertise to assist researchers in flow cytometry and fluorescence-activated cell sorting (FACS) applications. The laboratory is equipped with a BD Biosciences Special Order FACSAria™ II, which is a high-speed FACS that can perform high-resolution, multicolor flow cytometry analysis. The FACSAria™ II has 4 lasers that can detect up to 13 different colors in addition to the cell sorting functionality, and uses BD FACSDiva™ software for data acquisition and analysis.
- Bioprocessing: The CIB bioprocess facility provides services in microbial fermentation and animal cell culture. It features a 1,000 sq. ft. BSL-LS2 pilot scale fermentation laboratory capable of handling class II organisms, an adjoining 600 sq. ft. bench scale cell culture and fermentation laboratory with multiple fermenters and bioreactors for microbial, mammalian and insect cell culture. The facility is available for investigators to rent on a contract basis to conduct their own process. The facility can manufacture recombinant proteins, antimicrobial agents and metabolites as well as media optimization and cell culture scalability experiments.

Grant Writing Assistance: To reduce time spent by PIs on proposal logistics, the CIB Grants Office helps researchers with timeline construction, solicitation compliance, component planning and formatting, budget preparations, USU and sponsor agency form preparation, and

proofreading. To maximize proposal effectiveness, peer reviewers offer detailed comments and suggestions on project narrative and summary writing.

Statistical Support: A master's level graduate student is provided to faculty members to assist with basic statistical analysis and study design. More complex analyses are available through collaboration with interested faculty members within the Math & Statistics Department in the College of Science.

Utah State University Research Support

Laboratory Animal Research Center (LARC): The animal facilities managed by the LARC includes a state-of-the-art animal housing facility built in 2010 at the 650 Bioinnovations Building. The vivarium is a 20,744 square foot facility and has the capacity to hold 10,000 mice singly in HEPA air supplied microisolator cages. The AAALAC accredited facility consists of 35 animal holding and procedure rooms, quarantine, storage and support areas, surgical facilities for both large animals and rodents, and a biocontainment suite capable of supporting up to biosafety level 3 infectious disease research. Animal holding rooms are capable of housing diverse animal species and research models. The facility current supports research projects, including nutrition, behavioral, cardiovascular, diagnostic imaging and infectious disease. The vivarium is physically adjacent to research labs and investigator office space, providing easy access and strongly synergistic interaction between the laboratory aspects and animal care components of this research. In addition to the physical facilities the vivarium is staffed by individuals with training and experience in laboratory animal care. Key personnel include a veterinarian certified as a specialist by the American College of Laboratory Animal Medicine, and technical staff with certification through the American Association for Laboratory Animal Science. The experience and support these individuals provide to ongoing research projects helps to promote quality animal care and success in research endeavors.

Center for High Performance Computing: USU provides access to high performance computing resources through the [University of Utah's Center for High Performance Computing \(CHPC\)](#). The CHPC is located in Salt Lake City; a high bandwidth link between the Logan campus and the CHPC supports rapid data transfer.

Office of Research, Research Development Division: The Research Development division was established in 2008 to assist USU researchers in developing stronger and more competitive proposals for submission to external sponsors. The Research Development division is dedicated to expanding externally funded research at Utah State University through: 1) Management of the proposal development process on strategically important submissions; 2) Training researchers on the proposal development process; 3) Fostering interdisciplinary collaborations; and 4) Providing services to researchers that advance their skills and success in obtaining funding. Services provided by the Research Development Division Include:

- Faculty grant writing seminar that emphasizes the why as well as the how of proposal writing.
- Graduate student grant writing seminar that is a modification of the faculty grant writing seminar and is tailored to the needs of graduate students and those who have little to no grant writing experience.
- Proposal Writing Institute where faculty participants work on a specific proposal to an extramural funder that must be submitted as a result of the PWI activities.
- Seed grant programs to provide funding to obtain preliminary data for extramural grant applications.
- Access to DMPTool to assist in the development of good data management plans.
- Data Storage and Public Access through hosted datasets in DigitalCommons@USU where data are publicly available for download and back up with monthly usage reports provided to the researcher.

Equipment

The research faculty of the NS program are highly collaborative, both amongst themselves as well as with members of the NDFS department. As a consequence, equipment is freely shared between laboratories. Laboratories are typically equipped with basic equipment, including computers, table top centrifuges, microcentrifuges, analytical balances, shaking water baths, refrigerated circulators, rotators, hotplates/stirrers, vortexes, pH meters, refrigerators, thermal cyclers, electrophoresis and blotting apparatus, and both -20°C and -80°C freezers. Additional major equipment/instrumentation are as follows.

Description	Laboratory
UV/Vis Spectrophotometer	Cho, Hintze
Fluorescence/Absorbance Microplate Readers	Cho, Hintze, Lefevre
Luminescence reader	Hintze
Phosphoimager System	Hintze
Real Time PCR System	Hintze
Microplate Washer	Cho
Gel Imaging systems	Cho, Lefevre
Inverted Microscopes	Hintze, Lefevre
Laminar flow hoods	Hintze, Lefevre
CO ₂ Incubators	Hintze, Lefevre
Dual Gas Cell Hypoxic Incubator	Hintze
Cryo Storage Systems (Dewar Flask)	Hintze, Lefevre
HPLC with Diode Array Detector	Lefevre
Multiplex Bead Immunoassay System	Lefevre
Gas Chromatograph: Mass Spectrometer	Ward (Food Science)
Gas Chromatograph: Flame Ionization	Ward (Food Science)
Comprehensive Lab Animal Monitoring System (Columbus Instruments)	LARC
Small Animal Magnetic Resonance Imaging system	LARC
Confocal Microscope	BioInnovations Bldg

Professional Development

There are several sources of support for faculty success that are available from the department, college, and university. In 2016 and again in 2018 the department was awarded the departmental teaching excellence award by the College of Agriculture and Applied Sciences. The awards include \$25,000 to enhance the teaching of the department in whatever way is deemed most appropriate. In 2016 the award was used to remodel the department library and entry space so that it was a more usable space for student learning and collaboration. In 2018 the department head solicited individual proposals from faculty and programs for requests of funds that would support teaching. Of these requests \$1800 was awarded to NS faculty and these funds are being used to buy equipment to support an undergraduate-led community engaged learning project to glean unwanted fruit from people's yards and orchards after harvest for donation, reducing food waste and hunger. Under the direction of the Provost's office, USU's Empowering Teaching Excellence (ETE) provides training and recognition opportunities for faculty to further encourage teaching innovation and improvement. The NS faculty regularly participate and contribute to the resources and training made available to USU faculty through the ETE. Three of the NS faculty attended the ETE fall summer conference in 2018.

With regard to research, the department was awarded the departmental research excellence award by the College of Agriculture in 2017. This award again included a \$25,000 prize and these funds were used to support student research and travel to disseminate research findings. As described above, the College of Agriculture has a grant Proposal Development Specialist. The Office of Research and Graduate Studies also provides resources for grant development including an annual one-day Write Winning Grant Proposals Seminar, and a more extensive Proposal Writing Institute (PWI) workshop. The ORGS also supports three internal funding mechanisms to encourage the growth of promising research programs: the Grant-Writing Experience Through Mentorship (GEM – funding up to \$10K) for untenured research faculty, the Research Catalyst (RC – up to \$20K) grant for any research faculty, and the Seed Program to Advance Research Collaboration (SPARC – up to \$35K) for interdisciplinary projects involving any faculty from 2 or more USU departments. Each of these programs includes training from the ORGS through a one-day grant writing seminar, and requires the eventual submission of a proposal for external funding.

PROGRAM ASSESSMENT

The NS Program within the NDFS Department uses the following self-assessment process and resulting decisions to improve the NS program is based on data generated by the following methods.

Self-assessment Process

Student Evaluations

The standardized USU IDEA course evaluation form is provided to all students in all courses taught by NS faculty to allow the students an opportunity to evaluate both the course and the instructor. NS faculty are encouraged to map course objectives to the IDEA survey. NS courses have historically been highly rated for instructor effectiveness and contributed towards NDFS receiving the College of Agriculture and Applied Sciences teaching award for 2014.

Yearly Focus Group for Graduating Students

A yearly focus group for graduating students is used to collect input from students to help make data based decisions for the program. This student assessment of our program is vital and offers a unique perspective, resulting in curriculum changes to increase the overall effectiveness of the program

The discussions with our outgoing undergraduates have been vital in making sure we are meeting the needs of students, shaping our curriculum, and giving our future alumni a stake in the program.

Nutrition Science Overall Learning Objectives and Course Map (Appendix E)

NS faculty have worked to create a master document that includes program objectives for the NS program. This document will allow us to objectively assess program success in meeting student competency for specific objectives. Assessment data has been captured using grades from relevant assignments that map to specific competencies. This document allows the faculty to identify deficiencies and redundancies in the curriculum. This information coupled with the graduating senior exit interviews, allows for data based decisions to improve the overall program.

Faculty Program Assessment

Assessment information from these various sources is discussed and reviewed by NS faculty and used to improve and modernize program objectives, course content and degree requirements. The single most important department activity for reviewing assessment as well as all other aspects of the program is the yearly faculty retreat. This meeting provides a period of reflection on the past year; an opportunity to make changes and/or modifications to requirements, policies, and procedures; and a forum for planning the coming academic year.

Recent Data-Based Decisions

Initiative 1. Eliminate NDFS 5220: Endocrine Aspects of Nutrition

This decision was based on student exit interviews and our overall course map indicating that the material was largely redundant. Students interested in a more detailed course involving endocrinology are now advised to take ADVS 5630 as an elective.

Initiative 2. Creation of NDFS 5230: Communication of Current Topics

NDFS 5230 was developed in response to our faculty program assessment and student exit interviews. As a faculty, we recognized a program deficiency in this important topic and corresponding student skill set. Students also indicated their desire for another communication intensive course and in response this course was created to meet these needs.

Initiative 3. Changing NDFS 5250: Occupational Experience from a Required to an Elective Class

NDFS 5250 is a 1-credit course wherein students describe their experience working a real world job related to NS. However, the course has devolved into some students working jobs at the very periphery of actual NS and erosion of the original course intent. Student exit interviews and faculty discussion indicated that making this class an elective would eliminate this problem and improve the quality of this course.

Initiative 3. Elimination of NDFS 5300: Advanced Micronutrient Nutrition

This decision was made through examination of our course map, student exit interviews, and faculty discussion. These data sources clearly indicated that the material taught in this course was redundant and elimination of this course would allow faculty resources to be diverted into teaching more relevant, non-redundant courses.

Initiative 4. Creation of NDFS 5310: Fundamentals of Nutrition Research

This course was created by Michael Lefebvre based on student exit interviews and faculty discussion. We have learned through student exit interviews that many students are going on to pursue professional/graduate degrees. Establishment of this course will aid these students in this pursuit by making them better prepared to be involved with modern nutrition research.

Initiative 5. Creation of NDFS 6600: Current Topics in Obesity

NDFS 6600 was created by Carrie Durward in response to student exit interviews and faculty discussion. Obesity has become the most important topic in NS. Although covered in other NDFS courses, this graduate level class allows for more in-depth study.

Initiative 6. Creation of a Nutritional Neuroscience Course (NDFS 5400)

This course was created based on student exit interviews and faculty discussion. The faculty and exiting students recognized that coverage this topic was a deficiency in the program. This class was developed and is taught by Clara Cho.

Initiative 7. Creation of an Advanced Sports Nutrition Course (NDFS 5320)

Heidi Wengreen, Sheryl Aguilar and Natalie Norris developed this course. This course is in response to our new sports nutrition emphasis and will complement the joint NDFS/Athletics feeding station. The course is applied in nature and gives students hands-on experience with sports nutrition.

Initiative 8. Creation of a Dietary Supplement/Food Regulation Course (NDFS 5520)

This course is being developed in response to student exit interviews and to fill in a partial void created by the elimination of NDFS 5300. This course will emphasize aspects of the supplement industry and food regulation issues currently not covered in our curriculum including supplement regulations. This class is being developed by Clara Cho and Korry Hintze from NS and Robert Ward from food science.

Initiative 9. Assessment of the Nutrition Science program

Unlike food science and dietetics there is not an official sanctioning organization for NS curriculum at US universities. Therefore, NS programs rely primarily on traditions and anecdotal evidence from faculty members to inform program decisions. Moreover, there are currently no data-based tools in place to assess program success. As a result of this deficiency, the NS program is now being reviewed by both outside and internal reviewers. We are also developing a new set of program competencies and will use data from NS courses, specific to each competency, to assess effectiveness.

Initiative 10. Rearrangement of Nutrition Science Curriculum

Our annual focus group of graduating seniors has consistently remarked that they wished their NS classes were spread out through their college career instead of being weighted towards their senior year. We have been working with the NS advisor to create course maps that help ensure that students are taking more NS classes in their sophomore and junior years. We believe this will help with student retention and increase student satisfaction.