



**SOUTH DAKOTA
STATE UNIVERSITY**

MEETING THE GRAND CHALLENGES

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Honolulu, Hawaii
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WHY Honors and the Grand Challenges?

- **Partnership between Honors, College of Agriculture and Biological Sciences, College of Education and Human Sciences, and SDSU Extension.**
- **Big, challenging, complicated issues**
 - Best and brightest minds
 - Multidisciplinary approaches
 - Problem solving, critical thinking
 - Ethical and human issues
 - Personal and professional implications



OUR GRAND CHALLENGES

United States Department of Agriculture Higher Education Challenge Grants Program

- Climate Change
- Sustainable Energy
- Food Safety
- Hunger and Food Security
- Diabetes and Obesity

The '9 Billion people problem'



OUR APPROACHES

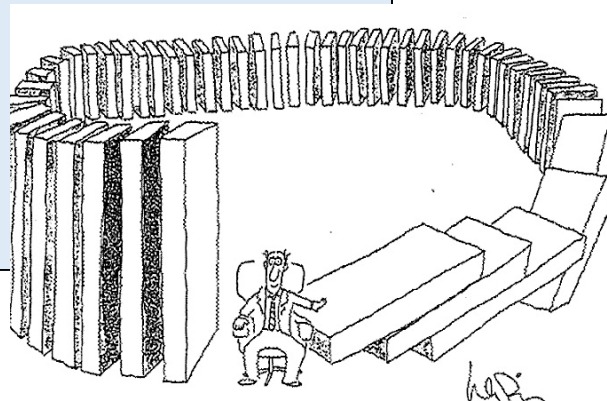
Meeting the Grand Challenges

- **Systems Thinking: Student and Faculty Development**
- **Interdisciplinary Honors Courses
(HON 383 – Honors Colloquium)**
- **Undergraduate Research Projects**
- **Outreach and Engagement**
- **Certification as Honors Grand Challenge Scholars**



Systems Thinking: Faculty and Student Development

- Admiring the Problem
- The Iceberg
- Ladders of Inference
- Mental Models
- Inquiry and Advocacy
- Balancing and Reinforcing Loops
- Archetypes
- Leverage Points
- Systemic Solutions

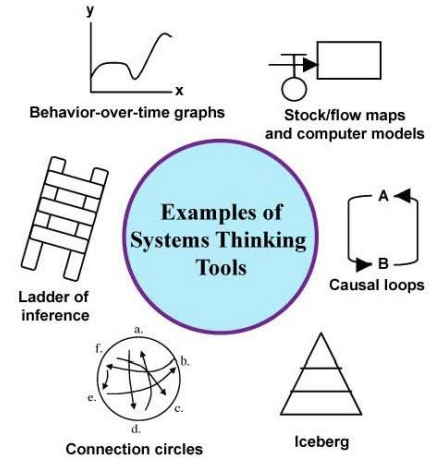


- Intensive Workshops
- Course Integration

We live in a complex, dynamic world where everything is connected to everything else



We need better approaches to study, understand and manage complexity



Interdisciplinary Honors Courses

- **All students at SDSU are required to take Honors 383, Honors Colloquium, in order to graduate with Honors College distinction.**
 - A multidisciplinary examination of a contemporary topic of interest emphasizing academic rigor, critical thinking, research, ethics and communications.
- **A series of colloquium are being developed and delivered focused on the themes of the grand challenges.**



HONORS COLLOQUIUM

Meeting the Grand Challenges

- Climate Change
- Sustainable Energy
- Food Safety
- Hunger and Food Security
- Diabetes and Obesity



- Key assessments
 - Quizzes
 - Book Panel Discussions
 - Interdisciplinary Case Studies
 - Leading Readings & Social Media
 - #honorsgrandchallenges
 - <https://twitter.com/search?q=%23honorsgrandchallenges&src=typd>
 - Personal Responsibility
 - Educational Outreach
 - Community Engagement
 - Brookings Backpack Project
 - Hunger Banquet
 - Serving Brookings Harvest Table



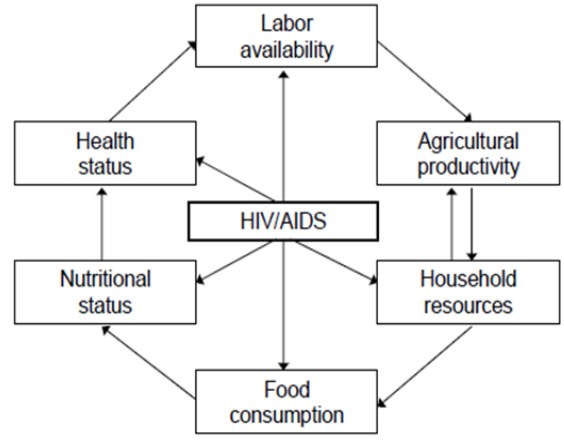
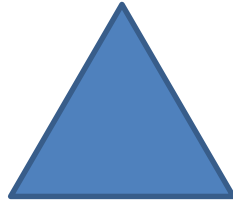


FOOD SECURITY

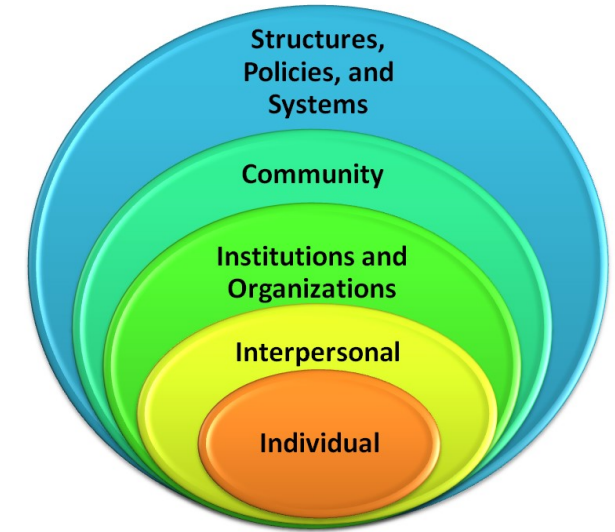
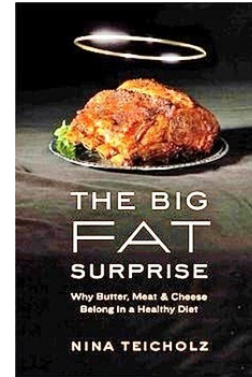
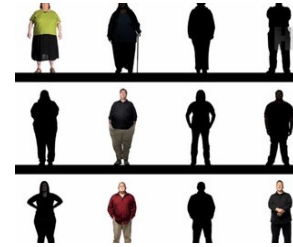
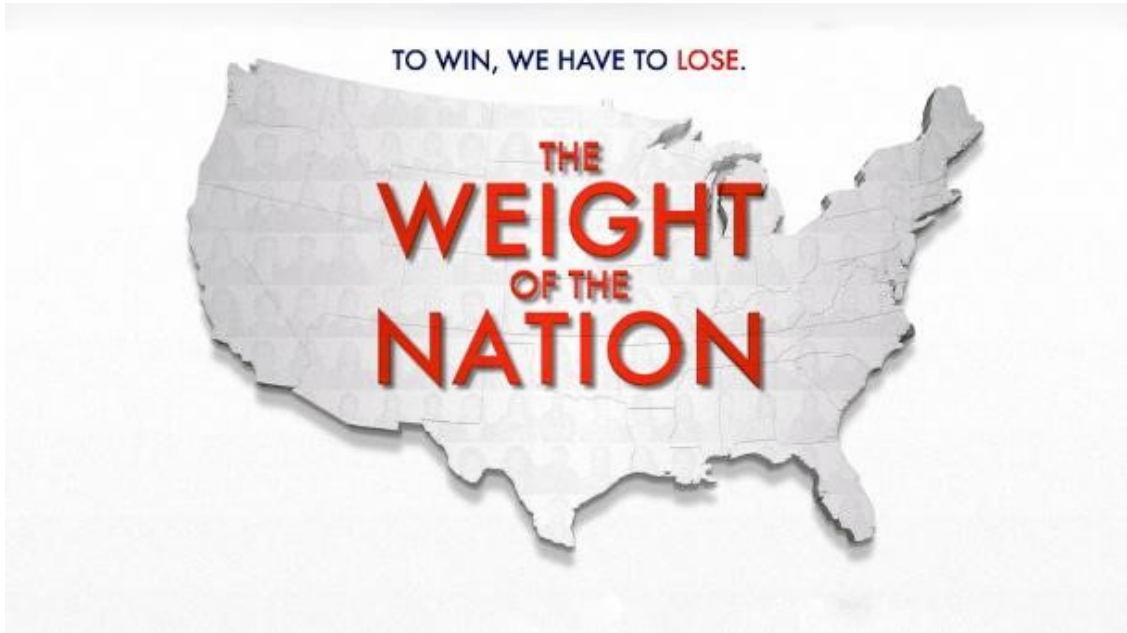
- SNAP Challenge



THE
New Face
of Hunger
BY TRACIE McMILLAN

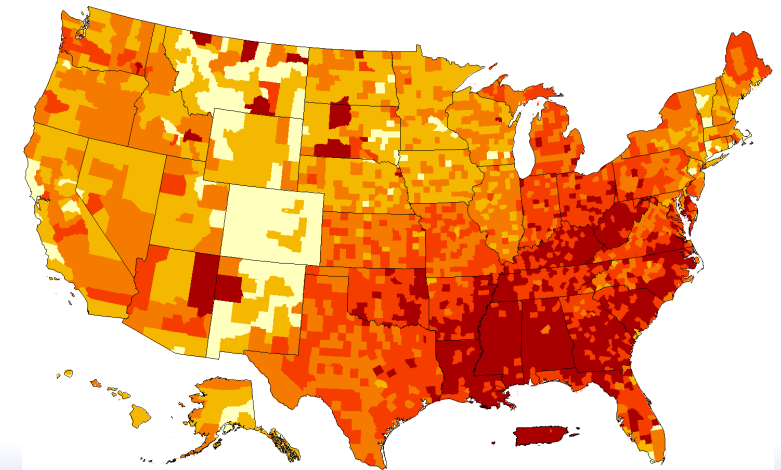
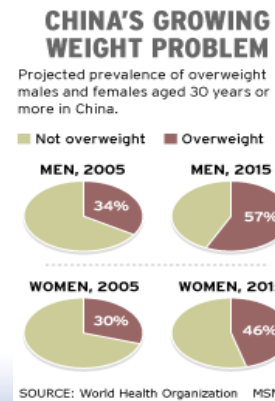


OBESEITY

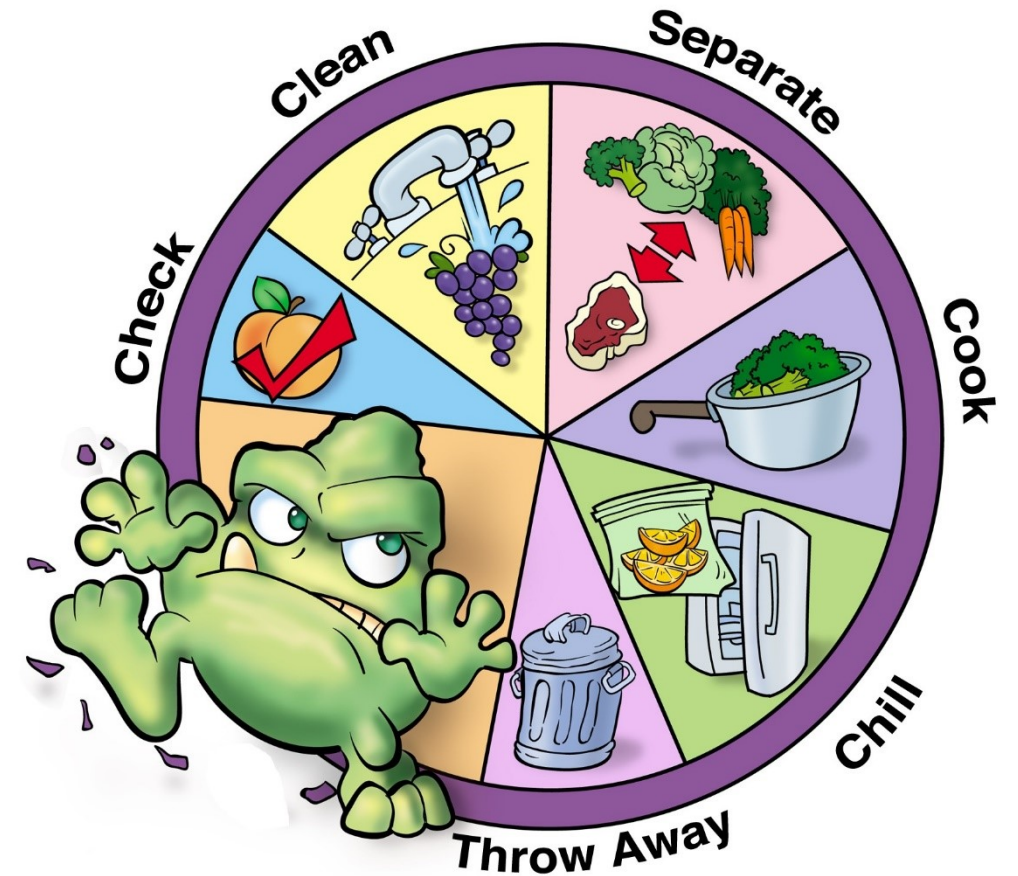


Addressing barriers to healthy foods and physical activity

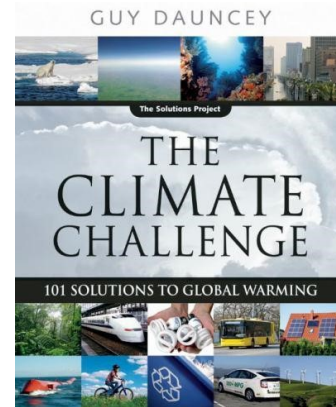
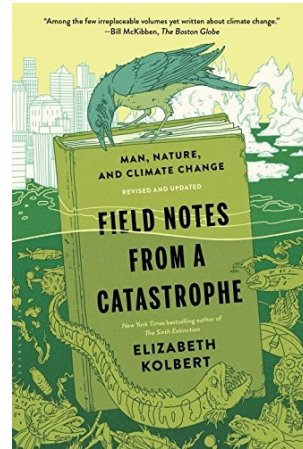
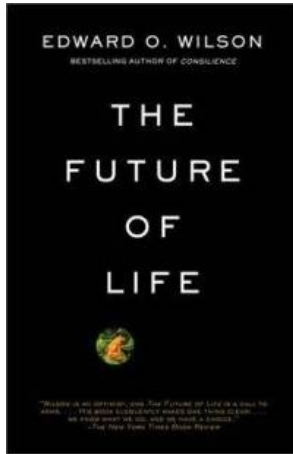
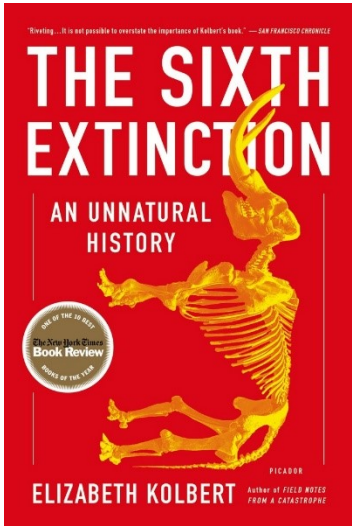
‘Making the Healthy Choice the Easy Choice’



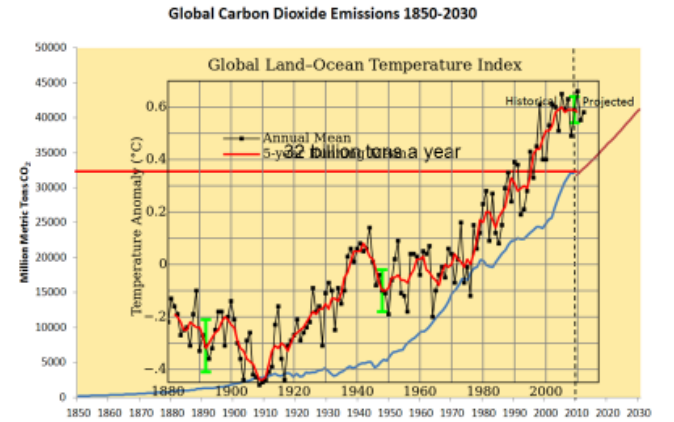
FOOD SAFETY



CLIMATE CHANGE



History and future trend of CO₂



THIS CHANGES EVERYTHING
**CAPITALISM vs
 THE CLIMATE**



Grand Challenges

Student Learning Outcomes Snapshot

After taking this course:

- I feel more aware and informed about the grand challenges 4.96**
- I feel a stronger sense of personal connection to the challenges 4.70**
- I have thought critically and creatively about solutions to the grand challenges 4.52**
- I have worked in an interdisciplinary group to grapple with one or more of the grand challenges 4.52**
- I better understand how to use some of the tools of systems thinking 4.30**
- I have engaged my community on some of the issues of the grand challenges 4.78**
- I feel better prepared to help meet the grand challenges 4.78**

Open-ended, qualitative responses were also very positive. 100 percent of students indicated the colloquium was ‘an excellent course’.



HONORS COLLOQUIUM

Energy: Present Realities, Future Possibilities

- Energy in the News
- Personal Energy Audits
- Field Trips
- Guest Speakers
- Role Play Exercises



ENERGY Sources

Economic, social, environmental perspectives

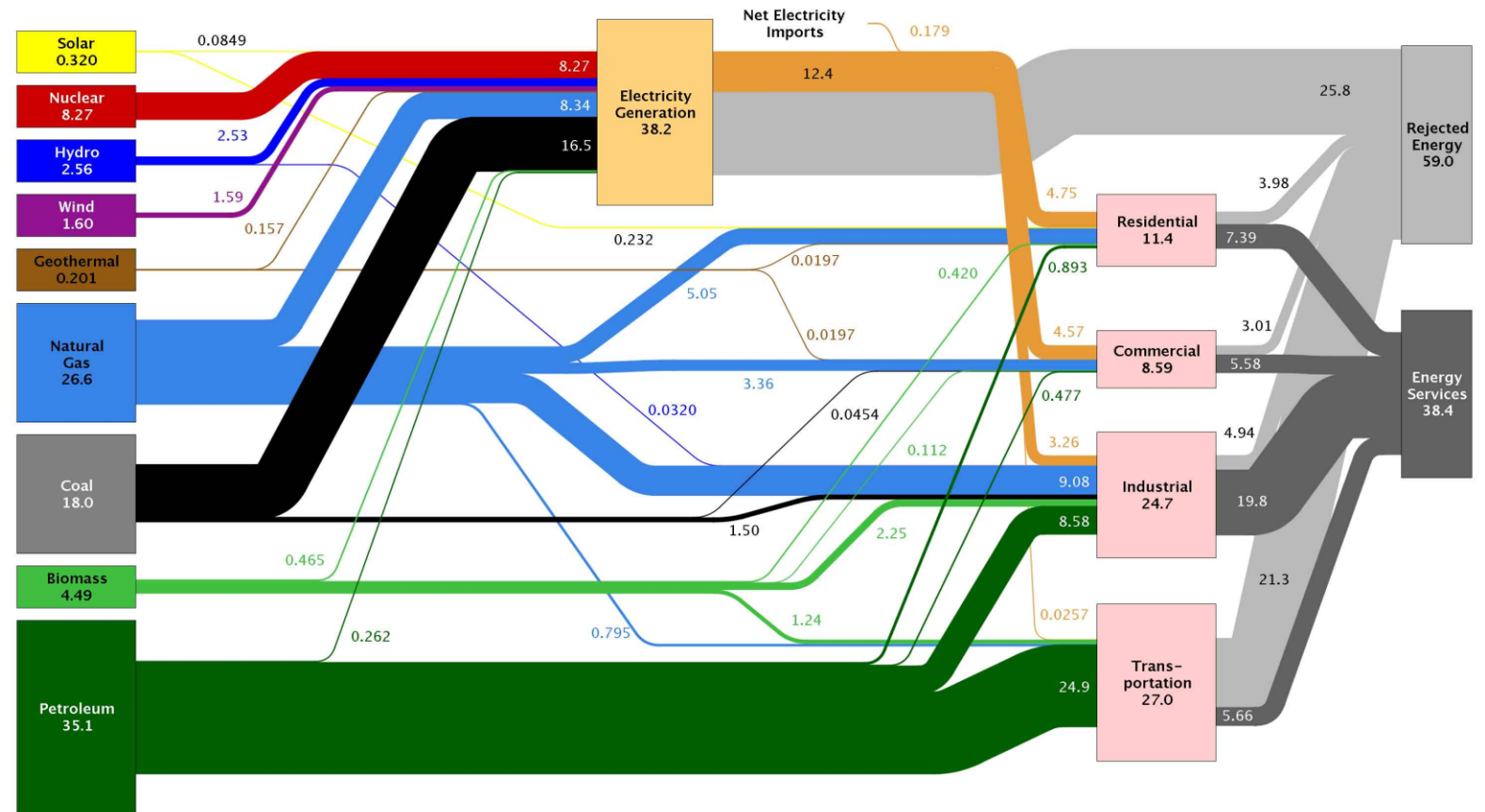
- Fossil Fuels
- Nuclear Energy
- Biofuels
- Solar Energy
- Renewable Energy



ENERGY Portfolio Projects

- Present
- Sources
- Uses
- Critique
- Preferred Future
- Pathway
- Implications

Estimated U.S. Energy Use in 2013: ~97.4 Quads



Source: LLNL 2014. Data is based on DOE/EIA-0035(2014-03), March, 2014. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential and commercial sectors 80% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527



UNDERGRADUATE RESEARCH

Meeting the Grand Challenges

- **Call for proposals for projects to ‘meet the grand challenges’**
- **Students identified mentors and applied for research funding**
- **Review by faculty committee**
- **20 \$2500 research stipends awarded**
 - Wide range of projects ranging from education and nutrition to climate science, geographical information systems, molecular biology and sustainable energy
- **Paper and Presentations at Undergraduate Research, Scholarship and Creative Activity Day**

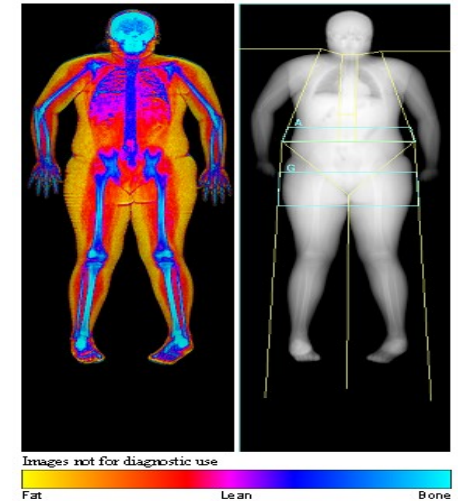


UNDERGRADUATE RESEARCH

Sample Student Projects

**20 @ \$2500 each, presented on campus, regionally
and nationally**

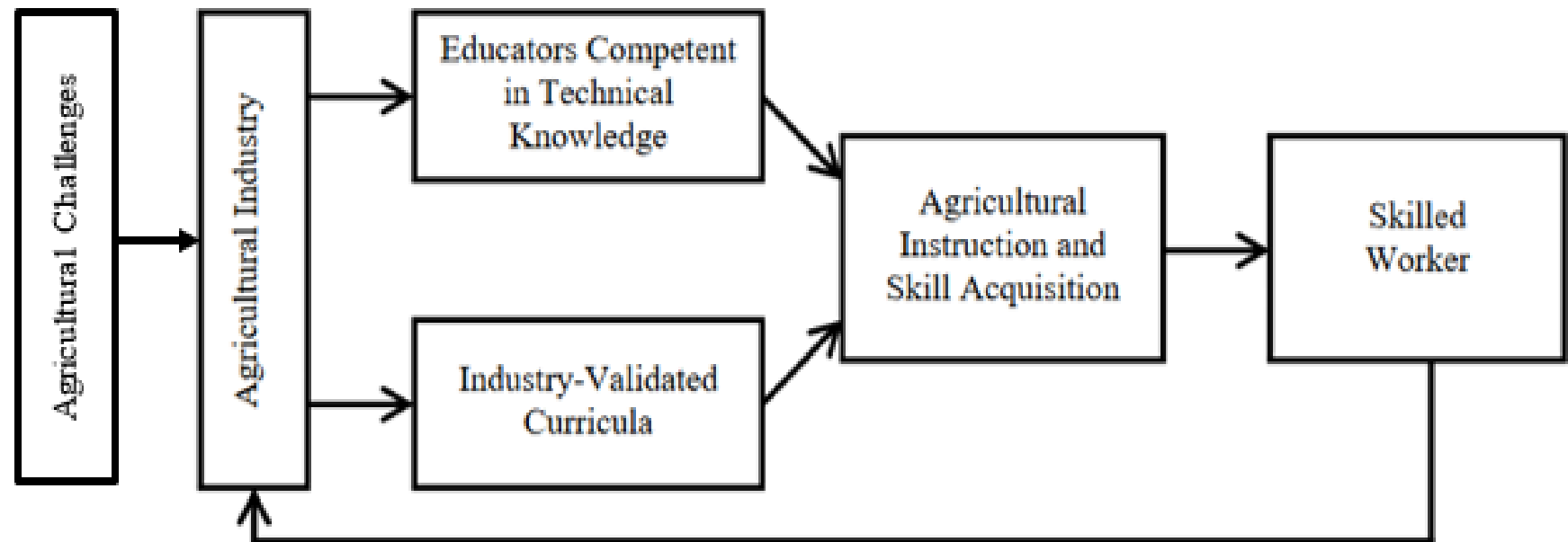
- SD Agriculture Education and the Grand Challenges
- Rural and Non-Rural Childhood Obesity
- Physical Activity in Rural Underserved SD Communities
- Mamas Against McDonalds
- Impact on Gut Microbiota and Metabolism of 2 Different Diets
- Factors Influencing Motility of Bull Semen
- Profitability and Yields of Alternate Oilseeds
- Flowability and Storage Properties of Soy-based Biomaterials
- Effects of Cooking Classes on Freshman Eating Behaviors
- Wellness Needs and Issues of First Year College Students



High School Agricultural Educators Preparing Students to Meet the Biggest Challenges Facing the Agricultural Industry

Instructional topics in agricultural education should take the form of problems and questions faced by the agriculture industry itself (Phipps, Osborne, Dyer, & Ball, 2008).

A modified version of “A Content-Based Model for Teaching Agriculture” (Roberts & Ball, 2008)



Objectives & Methodology

1. Identify to what extent high school agricultural educators teach topics related to sustainable energy, climate change, hunger/food security, obesity, and food safety.
2. Identify whether other secondary teachers educate students about the Grand Challenges subjects.
3. Explore the level of interdisciplinary communication among teachers regarding subject matter.
4. Determine the level of importance agriculture teachers place on the Grand Challenges topics.
5. Discover projected student interest in sustainable energy, climate change, hunger/food security, obesity, and food safety.

A survey was sent to all South Dakota high school agriculture educators. A total of 51 responses were collected for a 57.3% useable response rate ($n=89$). Teachers were asked to respond to a series of five questions for each of the Grand Challenges.



Results

Does another teacher in your school cover...	Yes	% of Respondents	No	% of Respondents	Unsure	% of Respondents
Obesity	33	64.71%	3	5.88%	15	29.41%
Food Safety	28	54.90%	10	19.61%	13	25.49%
Climate Change	21	41.18%	1	1.96%	29	56.86%
Sustainable Energy	15	29.41%	6	11.76%	30	58.82%
Hunger/Food Security	6	11.76%	7	13.73%	38	74.51%

Do you teach a class that covers...	Yes	% of Respondents	No	% of Respondents
Food Safety	40	78.40	11	21.60
Hunger/Food Security	40	78.40	11	21.60
Sustainable Energy	22	43.10	29	56.90
Climate Change	20	39.20	31	60.80
Obesity	9	17.60	42	82.40

Estimated student interest in...	Frequency:					Mean	S.D.
	1	2	3	4	5		
Sustainable Energy	0	7	23	15	6	3.39	0.86
Climate Change	0	4	27	16	4	3.39	0.74
Hunger/Food Security	1	11	22	15	2	3.12	0.86
Food Safety	1	17	16	15	2	3.00	0.93
Obesity	2	17	20	12	0	2.82	0.83

Grand Challenge Area	Topics Covered by Over 50% of Respondents
Sustainable Energy	Wind, Biofuel, Solar, Fossil Fuels
Climate Change	Climate Patterns, Greenhouse Gases, Fossil Fuels
Hunger/Food Security	Global Food Security/World Hunger
Obesity	Food Choices
Food Safety	GMOs, Spoilage/Preservatives, Pesticides, Proper Cooking, Food Transport

Do you think it is important that high school students understand...	Yes	% of Respondents	No	% of Respondents
Hunger/Food Security	50	98.00	1	2.00
Obesity	50	98.00	1	2.00
Sustainable Energy	46	90.20	5	9.80
Climate Change	45	88.20	6	11.80



Conclusions

- **Agricultural educators need to work to incorporate the Grand Challenges topics into existing curriculum. Many subjects that are already taught in agriculture classes can be related to these areas of need.**
- **Agriculture teachers must creatively approach the Grand Challenges in ways that elicit student interest.**
- **Agricultural educators should communicate more with teachers in other disciplines about what content is covered in courses outside of agricultural education.**
- **Further research needs to be conducted to establish if educators need professional development on the Grand Challenges areas and clarification of what curriculum is being covered which may specifically relate to the Grand Challenges areas.**
- **Research of the Grand Challenges must be conducted on a regional scale to see if these trends are similar in other states.**



COMMUNITY OUTREACH

Meeting the Grand Challenges

- Youth Outreach Internships
 - Partnership with Boys and Girls Clubs in Brookings, Flandreau, Yankton, and Lake Andes, SD.
 - Interns will work with Clubs to develop and deliver youth programs aimed at enhancing awareness and meeting the grand challenges.



- **BOYS AND GIRLS CLUB MISSION –**
 - To inspire and enable all youth, especially those who need us most, to realize their full potential as productive, responsible, and caring citizens.
 - Programming built around priority outcomes:
 - Academic success
 - Character and leadership
 - Healthy lifestyles



GRAND CHALLENGES SCHOLAR DESIGNATION

Meeting the Grand Challenges

- **Students complete a minimum of three of the ‘grand challenges’ academic and engagement initiatives to earn this recognition, presented at graduation.**
 - Honors Colloquia with an A or a B grade
 - Participation in Systems Thinking Workshops
 - Completed undergraduate research project
 - Served as community outreach internship



MEETING THE GRAND CHALLENGES

Lessons Learned and Looking Ahead

- Ambitious, multi-faceted project is a grand challenge in itself 😊
- Range of opportunities for participation has led to broad support
- Transdisciplinary approaches = challenges and opportunities
- Assessment leveraged for program improvement
- Engagement and connection are critical
- More participation = strongest outcomes
- Looking ahead:
 - Development of new courses
 - Undergraduate research & youth outreach internship evaluations
 - Awarding grand challenge scholar designation
 - Overall program assessment





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**THANK YOU
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