

**ONE HEALTH KNOWLEDGE ASSESSMENT, CURRICULUM DEVELOPMENT, AND
EVALUATION FOR MIDDLE SCHOOL STUDENTS**

by

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D.V.M

FIELD EXPERIENCE REPORT

Submitted in partial fulfillment of the requirements for the degree

MASTER OF PUBLIC HEALTH

Master of Public Health Program
Graduate School

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2013

Approved by:

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Abstract

The One Health concept is of critical importance to public health. The One Health concept promotes awareness and understanding of the interconnections among human, animal and environmental health. This study was designed to target middle school students in order to promote the One Health concept and thereby have a long-range impact on their health through education. In the first phase of the study, two Kansas public middle schools were identified as the sites for the research: one on a military base and the other in an affluent suburban community. A sample population of 198 students participated in a One Health Knowledge Assessment to determine their One Health related knowledge in order to have an understanding of their knowledge base. It was found that on average the students responded to 70% of the knowledge assessment questions correctly. In the second phase of the research, a different group of 292 students from the same schools attended a One Health lesson and performed pre-lesson and post-lesson surveys to determine the extent to which they gained knowledge about the One Health concept. The student learning outcome was a mean gain of learning score of $g=0.42\pm 0.09$. This study provided information about middle school students' knowledge of the One Health concept and ability and interest to learn more. This outcome could positively impact the health of these students and their communities.

Acknowledgements

Beth A. Montelone

Robert Larson

Cathleen Hanlon

Jacqueline Spears

Sally Yahnke

Val York

Megan Buer

Joanie Hayden

David Neubecker

Joan Leavens

Jodi Freifeld

Michael Cates

Barta Stevenson

Tosha Sampson-Choma

Dedication

To the glory of God and for the health of all people, animals and our environment

Introduction

Background and Significance

The One Health Initiative website defines the One Health concept as a worldwide strategy for expanding interdisciplinary collaborations and communications in all aspects of health care for humans and animals.¹ One Health is not a new concept; however, it gained more prominence in the 1980's and 1990's when threatening diseases increased by more than 20%.² Zoonotic diseases continue to increase in the US and around the world. Research has shown that early intervention and awareness leads to a reduction in outbreaks.³

The One Health concept gained national attention when the American Veterinary Medical Association One Health Initiative Task Force Report called for world health through collaboration in July 15, 2008.⁴ On October 1, 2008 the independent pro bono One Health Initiative website was launched. The two most prominent One Health advocates in the U.S are the One Health Commission and the One Health Initiative. The aim of the One Health Commission is to improve the health of people, animals, and our environment by uniting public health professionals and promoting professional collaborations.⁵ The One Health Initiative has used the internet to educate people about the connection between human health, animal health, and ecosystem health, while promoting the group work effort of health care professionals for the improved health of all.⁶ Although these two organizations have made great strides for the cause of One Health, neither of them have sought to develop a One Health curriculum for K-12 students.

The recent increase of emerging and reemerging zoonotic diseases that affect both humans and animals has caused an increase in the need for communication and education about the One Health concept at all levels of academia. It is the responsibility of veterinary, medical, health educators and public health professionals to articulate to their communities the One Health message; that health is an interconnection between human, animal, and environmental health. We must educate the public at all levels in the One Health concepts so that we may prevent disease and promote public health. It is now time to change our health paradigm from a treatment-oriented, human-only focus to one that emphasizes prevention, healthy people, healthy animals and a healthy environment.

Colleges and universities have expanded their courses, majors, and degree offerings to increase public health awareness. However, the number of public health positions has increased faster than the number of qualified public health professionals⁶; agencies such as the Centers for Disease Control and Prevention (CDC) are recruiting students to fill their additional positions. The earlier students are informed about One Health and public health, the more likely they are to consider them as professions. One Health Kansas at Kansas State University was designed for connecting animals, people and their environment through education. It has expanded the One Health target audience to include K-12 students.

Dr. Lisa Freeman, former Associate Vice President of the K-State Olathe Innovation Campus, said, "One Health is a concept endorsed by the major national organizations representing physicians, veterinarians and public health professionals. Collaboration among these groups is needed in Kansas, so that citizens of our state can understand and manage the complexity associated with emerging zoonotic diseases, globalization of the food system, blurring of the urban-suburban-rural interface and many other challenges affecting the health of Kansas children and adults." ⁷

One Health and public health issues affect people of all ages, gender, race and socio-economic status, so the better informed that members of the public are, the more they can do to reduce their risks of zoonotic, food-borne, and environmentally transmitted diseases. It is never too early to start learning how to protect or enhance health. One Health Kansas is an innovative program that seeks to promote awareness and understanding of the interconnections among human, animal and environmental health. It offers hands-on, interactive learning opportunities for K-12 students, teachers, and the general public about zoonotic diseases, environmental health, and the human-animal interface. K-12 outreach programs are offered on the K-State Manhattan campus and at numerous community colleges and high schools throughout Kansas. The outreach and education programs assist K-12 educators in integrating One Health concepts into their lessons. One Health Kansas and community partners collaborate to present programs to the general public that educate them about core One Health issues. One Health Kansas collaborates with programs including 4-H and Girls Researching Our World (GROW) at K-State to deliver One Health content to school age children.⁸ These programs educate students about infectious diseases, food borne illnesses, and zoonotic diseases. These programs engage youth in exciting year-round activities that get them interested in One Health related topics. As a result of these

programs, more diverse young people are aware of career fields related to public health and One Health. These programs also lead to a more educated citizenry. Education and awareness are very important when pandemics like the 2009 H1N1 influenza occur. One Health Kansas has developed some outreach programs related to One Health for K-12 students. But at this point, it has not developed a One Health curriculum for middle school students of Kansas.

A literature search indicated that while there are a variety of general health education curricula, very few formal curricula are specific to public health and none are directed toward the One Health concept for middle school students. Data bases such as ERIC, PROQuest, ISI Web of knowledge were searched. This indicated that there is a need for this One Health education research. Kansas does have relevant state science curriculum standards that impact student knowledge of health topics. The curriculum standards include the following: Science and Technology, Science in Personal and Environmental Perspectives, and History and Nature of Science. But at this point in Kansas, there is no One Health curriculum promoting the One Health concept to middle school students.

Purpose

The purpose of this study was to assess the One Health concept knowledge of middle school students and to assess the need for the development of a One Health curriculum for middle school students. This curriculum could be delivered during outreach sessions or in the health classes of middle school students. The curriculum could be delivered in multiple settings to different groups. The project encompassed components of at least two of the three core functions of public health by assessing some of the health needs associated with informing and educating the public.

Study Design

This study began with a knowledge assessment to assess the need for the development of a One Health curriculum. The results of the knowledge assessment indicated the One Health topics that were put into the One Health lesson and the pre- and post- lesson survey. The knowledge assessment was a brief survey among two groups of middle school students in Kansas. It used a web-based survey system (Axio survey) to determine the need for the curriculum, specific topic areas of interest, topic areas perceived to be in high demand, information on whether the

respondents would be interested in the One Health concept, how difficult they found the subject matter and their academic level. This knowledge assessment was administered to two different groups of middle school students of differing socio-economic status. It consists of 21 multiple-choice questions designed to assess the middle school student's One Health knowledge. It took about 10 to 15 minutes to complete. After the students participated they were debriefed about the purpose of the survey. An informed consent form was sent home to parents prior to the survey administration and was then collected from the teacher. The surveys and informed consent form were not stored together. No information in the survey was linked to the identity of the student. Schools were invited to participate in an affluent area (e.g., Shawnee Mission) as well as a less economically affluent area (e.g., Ft. Riley). Survey results were analyzed separately for the two school districts and compared. There were no questions on the surveys related to socio-economic status; only One Health knowledge-based questions appeared on the survey.

Methods

Participants

Student participants in this project were recruited from classes at two different middle schools, Fort Riley (USD 475 – Geary County Schools) and Indian Woods (USD 512 – Shawnee Mission School District). Approval to conduct this educational research was gained from the schools' administration. Two science teachers and a physical education teacher, and a family and consumer science teacher agreed to allow their classes to participate in this research project. The students who participated were those whom returned the parental informed consent forms. The participants ranged in age from 11 to 14 (6th – 8th grade), and included both genders, different ethnic groups, special education individuals and differing socio-economic status students (Table 1, 2). The knowledge assessment survey was administered to a total of 198 students. The knowledge assessment survey was administered to 68 Fort Riley Middle School students during a physical education class (6th - 8th grade). It was administered to 130 Indian Woods Middle School students in the 7th grade during a science class. The One Health lesson, pre-lesson and post-lesson survey were administered to a total of 292 students. The Fort Riley students consisted of 84 6th- 8th graders in a family and consumer science class. The Indian Woods

students totaled 208 7th graders in a science class. The two middle schools are similar in size: total student enrollment for 2012-2013 at Fort Riley was 643, and 696 at Indian Woods. However, Fort Riley has grades 6th – 8th while Indian Woods has only 7th and 8th grades. Fort Riley Middle School has a higher percentage of ethnic diversity and a higher percentage of students receiving free or reduced-price lunch than does Indian Woods Middle School (Table 1, 2).

Survey Methodology

The knowledge assessment consisted of 21 multiple-choice questions covering various One Health topics and two qualitative assessment questions in a multiple choice format. The pre- and post-lesson survey consisted of 12 multiple choice questions and two qualitative assessment questions in a multiple choice format. The knowledge assessment and survey questions are shown in the Appendix. The same questions were presented in the pre- and post-lesson surveys. All the surveys were administered using the Axio survey system during the normal class periods.

Development and Implementation of One Health Knowledge Surveys and Lesson

This study was approved by the Institutional Review Board of Kansas State University for research involving human subjects. The study began with a knowledge assessment survey to evaluate the need for the development of a One Health curriculum. The results of the knowledge assessment were used to select the One Health topics that were taught in the One Health lesson and evaluated in the pre- and post-lesson surveys. The knowledge assessment survey was given to two groups of middle school students in Fort Riley and Shawnee Mission, Kansas. The survey was administered through a web-based survey system to determine the One Health topics that were covered in the lesson, information on the difficulty and whether the respondents were interested in the One Health concept and their academic level were obtained. This knowledge assessment was administered to two different groups of middle school students of differing socio-economic status as determined on the basis of their free and reduced-price lunch status. It consisted of 21 multiple-choice questions designed to assess the middle school student's One Health knowledge and took the students 10 to 15 minutes to complete. After the students participated, they were debriefed about the purpose of the survey. An informed consent form with parent's consent was collected from each participant prior to the administration of the

knowledge assessment survey. The surveys and informed consent forms were not stored together. No information in the survey was linked to the identity, racial or ethnic group, or socio-economic status of the student. The students accessed the surveys used on the Axio survey system on computers in their classrooms through a survey URL provided to them through a link set up by their teachers. The knowledge assessment questions for the survey were formulated based on current One Health topics perceived to be important to the health of middle school students. These questions were vetted by the researchers and then uploaded into the survey system. The results of the knowledge assessment were used to develop the questions in the pre- and post-lesson survey along with the slideshow lesson that was presented. During a 45 minute class period, the students took the pre-lesson survey, were presented the lesson and then took the post-lesson survey. All the data was collected by the Axio survey system and then exported the data to an Excel file.

Data Analysis

Microsoft Excel was used to process the data. Each answer of the multiple choice questions that had multiple correct answers due to the “all that apply” options was turned into a binary as a correct or incorrect answer, which changed the total number of questions from 21 to 61 for the knowledge assessment and from 12 to 49 for the pre- and post-lesson survey. This allowed for the maximal extraction of information from the data. The following information was calculated: total correct answers per student and per question, percent correct answers per student and per student and per question, average correct, maximum correct, minimum correct, median correct. For the qualitative questions the frequency of each answer was calculated and its percentage. All the same calculations were done for the pre- and post-lesson surveys. In addition, gain of learning (g) was calculated as follows: $g = (\text{Post-assessment} - \text{Pre-assessment}) / (100\% - \text{Pre-assessment})$. A Paired t -test was performed on the means of the total correct answers of the pre and post lesson survey using this formula: $t = \frac{\sum d}{\sqrt{(n(\sum d^2) - (\sum d)^2/n-1)}}$ and the Student's t -test $t = \frac{X_1 - X_2}{(S_{X_1 X_2} * \sqrt{(1/n_1 + 1/n_2)})}$ (unequal sample size)¹⁰

Middle Schools Demographic Tables

Table 1 Fort Riley USD 475

2012-2013 Building Headcount Enrollment by Grade, Race, and Gender

Grade	Total all	Total M/F	White M/F	Black M/F	Hispanic M/F	Free Lunch	Reduced-Price Lunch	Special Educ.
6	239	129/110	62/57	27/21	27/23	47/34	41/37	26/<10*
7	207	116/91	51/46	29/16	23/17	39/26	35/31	24/<10*
8	197	94/103	55/50	16/20	16/19	28/34	28/30	19/11
Total	643	339/304	168/153	72/57	66/59	114/94	104/98	69/N/A*
Grand Total		643	321	129	125	208	202	<100
%			49%	20%	19%	32%	31%	<15%

Free Lunch $208/643=.32$ 32% Reduced-Price Lunch $238/643=.31$ 31%

Table 2 Indian Woods USD 512

2012-2013 Building Headcount Enrollment by Grade, Race, and Gender

Grade	Total all	Total M/F	White M/F	Black M/F	Hispanic M/F	Free Lunch	Reduced-Price lunch	Special Educ.
7	364	191/173	142/122	15/<10*	26/26	37/34	15/19	22/12
8	332	179/153	132/102	10/14	29/24	40/37	14/10	30/<10*
Total USD	696	370/326	274/224	25/N/A*	55/50	77/71	29/29	52/N/A*
Grand Total		696	498	<50	105	148	58	<74
%			71%	<7%	15%	21%	8%	<10%

Free Lunch $148/696=.21$ 21% Reduced-Price Lunch $58/696=.08$ 8% * The Family Educational Rights and Privacy Act (FERPA) prevent the disclosure of personally identifiable student information. KSDE has determined that any quantities less than 10 maybe personally identifiable.

Results

The results of the One Health Knowledge Assessment indicated that, on average, students from Fort Riley and Indian Woods Middle Schools had knowledge of One Health concepts on the order of 70%. The maximum score achieved on the 61 question knowledge assessment was 97% while the minimum score was 34% (Table 1). Students had the most difficulty in questions related to dog bite prevention - 7d (32% answered correctly); how zoonotic diseases are spread - 10c (40%) and 10e (21%); what percentage of new infectious diseases in humans originate in animals - 11 (9%); what is rabies - 12 (49%); how to prevent rabies - 13c (47%) and 13e (41%), ways to avoid getting an illness or disease from the outdoors - 16c (27%) and environmental change affecting the spread of diseases - 17a (30%) and 17c (48%)(Table 2). These topics were used to develop questions for the One Health lesson. The majority of the students found this One Health Knowledge Assessment to be somewhat to slightly difficult and somewhat to very interesting (Table 3).

The topics that the students found more difficult were used to develop the lesson and pre- and post-lesson questions. The mean score on the 49 questions for the pre-lesson survey was 36 correct answers (73%), whereas the post-lesson survey mean was 41 correct answers (84%). These values are significantly different by Paired *t*-test, $t(582) = -12.1, p < .0001$ (Table 4). The “gain of learning” statistic (*g*) was determined: this represents the average increase in students’ scores on the post-lesson test divided by the average increase that would have resulted if all students had perfect scores on the post-lesson survey. The measured *g* was determined to be 0.42 ± 0.09 , which is considered a favorable indicator for the effectiveness of the lesson (Hake ⁹) (Table 5). The majority of the students that participated in the pre-lesson survey found the content to be somewhat or moderately difficult and slightly or somewhat interesting (Table 6). However, the majority of the students rated the post-lesson survey content to be moderately or very difficult and not at all or slightly interesting (Table 7).

Upon comparing the pre and post-lesson survey means for each school, Ft. Riley Middle School’s pre-lesson survey average was 35 correct answers (71%), which was significantly different from their post- lesson average of 41 correct answers (85%) These values are significantly different by Paired *t*-test, $t(166) = -7.51, p < .0001$. Indian Woods Middle School students’ pre and post-lesson averages were 36 correct answers (73%), and 41 correct answers

(85%), respectively. These values also were significantly different by Paired t-test, $t(414) = -9.64$, $p < .0001$ (Table 8).

The pre- and post-lesson surveys also were compared for the two different school groups. No significant difference was found for either the pre-lesson results or post-lesson results for students from Ft. Riley vs. Indian Woods $t(290) = -0.933$, $p = 0.350$, (USD 475 pre vs. USD 512 pre); $t(290) = 0.152$, $p = 0.872$, (USD 475 post vs. USD 512 post) (Table 8). The mean gain of learning scores for the two school populations showed no significant difference $t(290) = 0.727$, $p = 0.471$, (USD 475 g vs. USD 512 g), $g = 0.44 \pm 0.09$, Ft. Riley; $g = 0.41 \pm 0.09$, Indian Woods (Table 9). Hake reference⁹

Results Tables

Table 1 One Health Knowledge Assessment

Total students (198)	Total Correct Questions (61)	
	#	%
Mean	43	70%
Max	59	97%
Min	21	34%
Median	44	72%

Each answer of the multiple choice questions had multiple correct answers due to the “all that apply” options was turned into a binary as a correct or incorrect answer, which changed the total number of questions from 21 to 61.

Table 2 Students’ performance on difficult topics (below 50% success rate)

Topics	Question	Percentage correct
Dog bite prevention	7d	34%
Transmission of zoonotic diseases	10c, 10e	40%, 21%
Percentage of new human infectious diseases originating in animals	11	9%
What is rabies	12	49%
Rabies prevention	13c, 13e	47%, 41%
Outdoor protection from illness and disease	16c	27%
Environmental change affecting spread of diseases	17a, 17c	30%, 48%

Table 3 Qualitative data for One Health Knowledge Assessment

Difficulty	Frequency	%	Interest	Frequency	%
Very	11	6%	Very	49	25%
Moderate	33	17%	Moderate	49	25%
Somewhat	67	34%	Somewhat	58	30%
Slightly	63	32%	Slightly	29	15%
Not at all	21	11%	Not at all	10	5%

*3 students did not respond values based on 195 students

Pre- and Post-lesson data for Ft. Riley and Indian Woods Middle Schools

Table 4 Pre- and Post-lesson survey data

Total questions (49)	Total Correct Answer			
	Pre-lesson		Post-lesson	
Total students (292)				
Mean	36	73%	41	84%
Max	46	94%	49	100%
Min	14	29%	10	20%
Median	37	76%	43	88%
STDEV	6		6	

Each answer of the multiple choice questions had multiple correct answers due to the “all that apply” options was turned into a binary as a correct or incorrect answer, which changed the total number of questions from 12 to 49.

Table 5 Gain of Learning of all students

Total questions (49)	Total students (292)				Gain of learning Pre vs. Post
	Pre-lesson		Post-lesson		
Mean	36	73%	41	84%	.42
Max	46	94%	49	100%	
Min	14	29%	10	20%	
Median	37	76%	43	88%	.50
STDEV	6		6		

Each answer of the multiple choice questions had multiple correct answers due to the “all that apply” options was turned into a binary as a correct or incorrect answer, which changed the total number of questions from 12 to 49.

Table 6 Qualitative data for Pre-lesson survey

Difficulty	Frequency	%	Interest	Frequency	%
Very	42	14%	Very	16	5%
Moderate	102	35%	Moderate	47	16%
Somewhat	104	36%	Somewhat	81	28%
Slightly	39	13%	Slightly	92	32%
Not at all	4	1%	Not at all	55	19%

Table 7 Qualitative data for Post-lesson survey

Difficulty	Occurrence	%	Interest	Frequency	%
Very	128	44%	Very	15	5%
Moderate	98	34%	Moderate	47	16%
Somewhat	52	18%	Somewhat	69	24%
Slightly	10	3%	Slightly	79	27%
Not at all	3	1%	Not at all	80	27%

Table 8 Ft. Riley & Indian Woods Schools Pre- vs. Post-lesson survey comparison by school

Total questions (49)	Ft. Riley Middle School 84 participants				Indian Woods Middle School 208 participants			
	Pre-lesson		Post-lesson		Pre-lesson		Post-lesson	
Mean	35	71%	41	85%	36	73%	41	84%
Max	46	94%	48	98%	46	94%	49	100%
Min	19	39%	21	43%	14	29%	10	20%
Median	37	74%	43	88%	37	76%	43	88%
STDEV	6		6		6		6	

Each answer of the multiple choice questions had multiple correct answers due to the “all that apply” options was turned into a binary as a correct or incorrect answer, which changed the total number of questions from 12 to 49.

Table 9 Ft. Riley vs. Indian Woods Middles Schools Gain of Learning

Total questions (49)	Ft. Riley middle school 84 for participants	Indian Woods middle school 208 participants
	Gain of Learning	Gain of Learning
Mean	.44 44%	.41 41%
STDEV	0.29	0.30

Each answer of the multiple choice questions had multiple correct answers due to the “all that apply” options was turned into a binary as a correct or incorrect answer, which changed the total number of questions from 12 to 49.

Discussion

This study assessed the knowledge of middle school students in two middle schools: Ft. Riley Middle School (enrollment: 643), a school on a military base and Indian Woods Middle School (enrollment: 696), a suburban, public school. Although both schools are in the state of Kansas and are similar in their enrollments, they differ in their student demographics. Approximately 63% of Ft. Riley Middle School students qualify for free or reduced lunch, in contrast to the 29% of students from Indian Woods Middle School who qualify for free or reduced lunch. Within the Ft. Riley Middle School, 49% of the racial population is white, 20% black, 19% Hispanic, and the remaining 12% are other. Conversely, 71% of Indian Woods’ students are white, 7% are black, 15% are Hispanic, and the remaining 7% are other. Part of the rationale behind the selection of these particular school settings had to do with an assumption regarding the correlation between social class and knowledge of public health. The goal for both schools was to assess prior knowledge of public health and One Health concepts, the impartation of, human, animal, and environmental health concerns, and finally to assess the ability of these students to learn this type of health information while promoting enthusiasm, intrigue and a desire to pursue One Health related fields in the future. Although the students found the One Health topics to be slightly to somewhat difficult, 80% of the students found it to be moderately to very interesting. This potential interest in the field could lead to these middle school students into career paths related to One Health. This could help to address the public health workforce shortage in Kansas and therefore improve the health of all Kansans.

It is clear that the middle school students from both Fort Riley and Indian Woods schools had levels of knowledge that exceeded 60% (range of 9% to 98%) on the majority of One Health topics. Therefore, they are learning about some of the One Health topics in school. When

questioned about basic One Health related topics, students demonstrated overall proficiency in areas such as the understanding of One Health, Hand Washing, Zoonotic Diseases and Food Safety. But students did not perform as well on topics such as dog bite prevention; how zoonotic diseases are spread; what percentage of new infectious diseases in humans originate in animals; what is rabies, how to prevent rabies, environmental changes affecting the spread of diseases; and ways to avoid getting an illness or disease from the outdoors. These topics were chosen to develop the One Health lesson, pre-lesson and post-lesson survey because these were the ones on which students on average got below 50% correct. Students demonstrated that they could learn One Health concepts at a proficient level after just one lesson. The percentage of answers that the students responded to correctly increased by 11 percentage points from the pre-lesson to the post-lesson survey and along with their gain of learning score of $g = 0.42 \pm 0.09$ which clearly indicated learning of One Health concepts did occur. These results indicate that a One Health curriculum would improve the student knowledge of One Health. This demonstrated ability of middle school students to learn One Health concepts is very good for the future of public health and One Health. The results of this study did not support the assumption that One Health knowledge was correlated to socio-economic status. There was no significant difference found when comparing the pre-lesson or post-lesson surveys results of Ft. Riley Middle School vs. Indian Woods Middle School. The gains of learning are similar as well; therefore it can be assumed that at this stage of education and at this level of relative difference in socio-economic status is not a major factor in the learning process.

Conclusion

This study demonstrated that early promotion of public health and One Health topics can have significant impact on students' knowledge of One Health. It also indicated there is a need for a standardized One Health curriculum because although students are familiar with many One Health topics there are some that are still difficult for many students, but with instruction they can be learned well. Students had the opportunity to ask questions and to become excited about a field of study which they had little or no prior knowledge. Not only did this provide exposure to public health and One Health, but it resulted in students being able to consider the ways in which public health and One Health is reflected in their daily lives and in the lives of their family members. Consequently, students will likely consider, if not implement some of the strategies

that promote public health, from hand sanitation, to heightened standards for food preparation and consumption, to dog bite prevention, to the avoidance of the spread of infectious diseases and zoonoses. Ultimately, this knowledge will potentially be transferred to the students' families and friends, resulting in larger range impact. In furthering this project, it would be insightful to study sample populations from more varied socio-economic backgrounds and Kansas geographic locations that represent a broader spectrum. The hope is that this research will provide the necessary evidence to support the continued promotion of One Health, both in the state of Kansas and nation-wide.

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Appendix

One Health Knowledge Assessment Survey

This quiz is being conducted to assess students' knowledge related to the concept of "One Health". Your responses to this quiz will assist in the development of a One Health lesson for middle school students.

You will be asked to answer 18 items about the concept of "One Health". This quiz should take about 10 to 12 minutes to complete. The quiz will not ask for your name, so your responses cannot be tied to your name.

Please answer each item thoroughly and to the best of your ability. Some items allow more than one response. (correct answers are bolded)

1. What is your grade level in school? (Circle one.)
6th grade 7th grade 8th grade Other:
2. What is meant by the term 'One Health'?
 - a. **It means that we recognize that human, animal, and environmental health are closely related and linked together**
 - b. It means that there is only one Health Care System in the United States
 - c. It means that each person is solely responsible for their health
 - d. It means that there is one way to keep all people healthy
3. One Health combines the following academic fields: _____.
 - a. Art and History
 - b. Math and Engineering
 - c. Biology and Chemistry
 - d. **Human Medicine, Veterinary Medicine, and Environmental Studies/Ecology**
4. Why is it important to wash your hands? (Circle all that apply.)
 - a. **It prevents me from spreading my illness to my friends and family when I'm sick**
 - b. It keeps me physically fit
 - c. Putting my hands in the water keeps my body hydrated
 - d. It keeps me healthy by giving me healthy nutrients
 - e. **My hands can transfer bacteria and germs to me that can make me sick**
5. Which of the following are important times you should wash your hands to prevent illness? (Circle all that apply.)
 - a. **Before eating or handling food**
 - b. Before going to bed
 - c. **After using the toilet**
 - d. **After handling garbage**
 - e. After folding laundry
 - f. **After touching an animal**

- g. **After sneezing into my hand or blowing my nose**
6. What is the proper way to wash your hands? (Circle the one best answer.)
- a. **Wet hands with water, use soap to build lather, scrub hands for 10 to 20 seconds, rinse hands while rubbing them together, dry hands by rubbing with paper towel**
 - b. Put soap on hands, wet hands with water as you lather soap, rinse hands while rubbing them together, dry hands by rubbing them on pants
 - c. Wet hands with water, use soap to build lather, scrub hands for 10 to 20 seconds, rinse hands while rubbing them together, dry hands by using hand dryer
 - d. Put soap on hands, wet hands with water as you lather soap, rinse hands while rubbing them together, dry hands by waving them in air
7. What should you do to prevent getting bitten by a dog? (Circle all that apply.)
- a. **Allow the dog to see and sniff you prior to petting it**
 - b. Run toward an unfamiliar dog so that it thinks you are playing with it
 - c. **Do not disturb a dog that is sleeping, eating, or caring for puppies**
 - d. **If knocked down by a dog, roll into a ball and lie still**
 - e. Stare down a dog to show it you are in control
8. What are zoonotic diseases? (Circle the one best answer.)
- a. **Diseases that can be spread from animals to people**
 - b. Diseases that animals can get from plants
 - c. Diseases that zoo animals spread to each other
 - d. Diseases that people get that make them act like animals
 - e. Diseases that plants get due to climate change
9. Zoonotic diseases may be a health risk to all of the following except _____.
- a. Mammals
 - b. Children
 - c. Adults
 - d. **Plants**
 - e. Birds
10. What are some ways zoonotic diseases may be spread? (Circle all that apply.)
- a. **By touching infected animals**
 - b. **Through bites of an infected insect, such as mosquitoes, ticks, or fleas**
 - c. **By eating or drinking contaminated food or water**
 - d. **Through animal bites and scratches**
 - e. **By touching contaminated bedding**
11. What percentage of new infectious diseases in humans originates in animals?
- a. 10%
 - b. 25%
 - c. 60%
 - d. **75%**

12. What is rabies?
- a fungus
 - a virus**
 - a bacteria
 - a parasite
13. How do you prevent rabies? (Circle all that apply.)
- Avoid contact with wild and stray animals**
 - Keep pets vaccinated against rabies**
 - Prevent your pet from having contact with wildlife**
 - If you find sick or injured animals, examine them to find out what is wrong
 - Contact the health department if you find a bat in your house**
14. Foodborne _____ occurs after the ingestion of contaminated food or water.
- Safety
 - Defense
 - Illness**
 - Wellness
15. What should you do to keep your food safe? (Circle all that apply.)
- Cook your food to the proper temperature**
 - Wash your hands and cooking surface before and after preparing your food**
 - Organize food in your pantry based on size and color
 - Separate raw meat from fruit and vegetables**
 - Leave food on the counter while you clean up the kitchen
16. How should you protect yourself when outside to avoid getting an illness or disease? (Circle all that apply.)
- Wear appropriate clothing to prevent insect bites**
 - Wear insect repellent to prevent insect bites**
 - Empty standing water to reduce the mosquito population**
 - Avoid approaching or feeding wild animals to prevent bites and scratches**
 - Avoid swimming in water that may be contaminated by animal urine**
 - Do not drink directly from any river or stream**
17. Which of the following environmental changes affects the spread of diseases? (Circle all that apply.)
- Cutting down forests**
 - Building homes in rural areas that were previously only inhabited by wildlife**
 - Worldwide climate change**
 - Change in animal migration patterns**
 - Building large homes where there used to be small homes

18. Which of these are benefits of the human-animal bond? (Circle all that apply.)
- a. **Service dogs enable people to live independently, regardless of disabilities**
 - b. People attending dog fights for entertainment
 - c. **Horses are used in riding therapy for children with diseases**
 - d. **People losing weight with their pets because they take walks together**
 - e. People getting a second dog to keep their dog company while they are away at work
19. What is included in the One Health concept? (Circle all that apply.)
- a. **Partnerships between medical doctors, veterinarians, and public health officials**
 - b. **Linking human, animal, and environmental health**
 - c. Focusing on the health of one person, such as treating cancer in one person
 - d. **Human and animal researchers working together to find cures for diseases**
 - e. Focusing on keeping one nation, the United States, healthy
20. How would you rate the overall difficulty of the questions on this quiz?
- a. Very difficult
 - b. Moderately difficult
 - c. Somewhat difficult
 - d. Slightly difficult
 - e. Not at all difficult
21. How interested are you in learning more about the One Health concept?
- a. Very interested
 - b. Moderately interested
 - c. Somewhat interested
 - d. Slightly interested
 - e. Not at all interested

One Health Lesson Outline

- I. Zoonotic Diseases
- II. Rabies
- III. Fomites
- IV. Zoonotic Disease Prevention
- V. Deforestation
- VI. Foodborne illness
- VII. Food Safety
- VII. Dog Bites
- IX. Dog Bite Prevention

Pre and Post One Health Lesson Survey

1. What is your grade level in school? (Select one.)
6th grade 7th grade 8th grade Other:
2. What should you do if you are approached by an unfamiliar dog? (Select all that apply.)
 - a. **If knocked down by a dog, roll into a ball and lie still**
 - b. Run from the dog and scream
 - c. **Remain motionless**
 - d. **Avoid direct eye contact**
 - e. Reach out to pet the dog
3. What should you do to avoid having your dog bite someone? (Select all that apply.)
 - a. **Never leave an infant or young child alone with your dog**
 - b. Let your dog run around the park to let it release its excess energy
 - c. **Consult a veterinarian before choosing a dog**
 - d. **Spay or neuter the dog**
 - e. Play aggressive games with your dog
4. What is the most important reason to protect yourself against bites from insects such as mosquitoes, ticks, and fleas?
 - a. They cause ugly bumps
 - b. The bites hurt
 - c. **They can spread diseases**
 - d. The bites itch
5. What are some ways people can get sick? (Select all that apply.)
 - a. **Eating or drinking contaminated food or water**
 - b. **Drinking directly from a river or stream**
 - c. **Drinking water contaminated with urine**
 - e. **Eating undercooked meat**
6. Which of these are ways that zoonotic diseases are spread? (Select all that apply.)
 - a. **Contact with urine**
 - b. **Direct contact with an infected animal**
 - c. **Ingestion of unpasteurized milk**
 - d. **Ingestion of food contaminated by feces**
 - e. **Insects carrying pathogens**
7. What can you do to prevent the spread of zoonotic diseases? (Select all that apply.)
 - a. **Wash your hands after petting animals, after going to the bathroom and before eating**
 - b. **Cook food to proper temperature and always use a food thermometer**
 - c. **Vaccinate, de-worm and treat your pets for fleas only when they are young**
 - d. **Do not eat or drink pasteurized milk, cheese or ice cream**
8. How can you protect yourself against ticks and the diseases that they spread? (Select all that apply.)
 - a. Wear shorts and sandals while outside

- b. **Check your body for ticks after being outside**
 - c. **Keep grass mowed short**
 - d. **Wear insect repellent such as Deet**
9. How can you protect yourself against mosquitoes and the diseases that they spread? (Select all that apply.)
- a. **Eliminate standing water**
 - b. **Use insect repellent**
 - c. Eat a lot of garlic and onions
 - d. **Use screens in your windows and doors**
 - e. **Avoid going out at dawn and dusk**
10. What impact does cutting down forests have on the spread of disease? (Select all that apply.)
- a. Decreases the spread of some zoonotic diseases
 - b. **Increases the spread of new disease**
 - c. Increases the natural habitat of animals that could harbor disease
 - d. **Increases the number of mosquitoes that are in contact with humans**
 - e. **Increases the spread of life-threatening diseases**
11. Which of the following objects could possibly spread disease? (Select all that apply.)
- a. **Urine contaminated bedding**
 - b. Clean bath towel
 - c. **Blood stained clothing**
 - d. **A used tissue**
 - e. Unused needle in a sterile wrapper
 - f. **Dog bowl**
12. Which of the following situations could be a source of rabies exposure? (Select all that apply.)
- a. **You were bitten by your unvaccinated pet**
 - b. You see a skunk in your back yard acting crazy
 - c. **A raccoon bites you**
 - d. **You wake up in a room with a bat**
 - e. A lizard runs across your hand while you are outside
13. How would you rate the overall difficulty of the questions on this survey?
- a. Very difficult
 - b. Moderately difficult
 - c. Somewhat difficult
 - d. Slightly difficult
 - e. Not at all difficult
14. How interested are you in learning more about the One Health concept?
- a. Very interested
 - b. Moderately interested

- c. Somewhat interested
- d. Slightly interested
- e. Not at all interested