

Implementing a Dairy Education Module in Private Inner-City High Schools

A Senior Project

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by

Veronica Tabora

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ABSTRACT

The objective of this project was to determine how knowledgeable private inner-city high school students are about basic information regarding the dairy industry. The project also sought to identify areas of interest these students may have concerning the dairy industry. Upon determining the level of knowledge and areas of interest an online dairy education module covering two main lessons was created. A survey was conducted to identify what type of information to include in the module. The survey was conducted through an online database and consisted of twenty questions. Different styles of questions were used to collect sound data that could be analyzed with ease. A random sample of upper division private inner-city San Francisco high school students participated in the survey. The sample size consisted of 65 students and resulted in a 70.8 percent response rate.

The results of the survey displayed that majority of the students who participated have little to no knowledge about the dairy industry. Based on the questions that were mostly answered incorrectly, an online module was created. The module targets two main ideas: basic dairy cow information and basic dairy production material.

Based on current trends in technology, it was determined that an online module would be the best way to allow easy access to inner-city students to learn more about the dairy industry. The module is easily accessible and simple to implement in the classroom, in homes, and anywhere internet is available via the mobile version. The module allows for a new pool of potential future dairy industry employees to become interested in attending higher education programs targeting this industry.

Key Words: agriculture education, dairy education, online learning, module

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INTRODUCTION

Generation Z, the upcoming generation of students and future employees, will need to rely heavily on the expansion of the agriculture industry and, more specifically, the dairy industry. In the future, urban communities will be the basis of the workforce sustaining the United States economy (Lytle, 1992). This generation that predominantly inhabits inner and urban cities across the United States has not had much exposure to an industry that sustains the way they live. Being some of the top dairy consumers, it is important for the future to begin to educate Generation Z at a critical developmental stage (Sebastian et al., 2010).

The California dairy industry has recently suffered many losses that resulted in the closure or relocation of dairies. The dairy industry could benefit from creating dairy education programs targeted towards inner-city high school students who are interested in obtaining higher level degrees. Educating this group could result in a positive growing interest in the industry. Future dairy producers are coming from families with generations of involvement in dairy. For the necessary growth and success in the future, the dairy industry needs new perspectives that could be obtained from these students who come from nontraditional farming backgrounds.

The objective of this project was to determine how knowledgeable private inner-city high school students are about basic information regarding the dairy industry. The level of knowledge as well as interest in the dairy industry was examined to construct a dairy education module. Following the completion of this project, the module will be live on the web for future use.

LITERATURE REVIEW

Generation Z

Currently, Generation Z has a working definition with some considering members being born as early as 1991 (Looper, 2011) and others considering the year 2000 as its starting point (Palley, 2012). Members of Generation Z do not know a life without internet access. Even before birth these children had a presence in the digital world via published sonograms online (Palley, 2012). These consumers rely heavily on convenience and expect new innovative technological products as they continue to mature. Generation Z children are tech savvy and connected to the global world more so than their predecessors. These children rely heavily on electronic devices and, according to a study done by Palley (2012), if any of their devices were to be taken away they would significantly miss them. According to this same study, 76 to 78 percent of the 400 Generation Z children aged 8-17 who participated have access to internet via a desktop computer or laptop (Palley, 2012). With so much information accessible at the tips of their fingers, Generation Z members are more susceptible to knowing about the challenges that they will face in the future. These children have grown up aware of the dangers of global warming, witnessed terror alerts, and watched as their families or families around them have suffered from the economic crisis (Looper, 2011). Consequently, this generation is expected to be more drawn to careers that will be beneficial to society and sustain their future (Looper, 2011). According to the U.S. Census Bureau, one in four Americans is younger than 18 (Looper, 2011), meaning that they are the bulk of the future population of the world. As this group begins to mature,

teaching institutions will need to adapt to keep up with the demands of Generation Z, a generation that has “been raised in an environment where every piece of technology is intuitive, logical and mature” (Looper, 2011). Research done in 2011 by Bridgewater University concluded that, by the time American kids reach middle school, 83 percent of them will be addicted to their mobile device (Palley, 2012). Institutions must use the presence of mobile devices in their favor by creating interactive classroom experiences that utilize these devices in an engaging and educational way. Brands, educators, and employers alike must learn how to tap into the open-minded and globally-oriented mindsets this generation will possess (Palley, 2012).

Agricultural Education

The importance of agricultural education has been long standing in United States history. It has been reported as early as 1906 that the USDA launched the Division of Agricultural Education (Lane, 1942). Agricultural education has thrived in the public school system in America for many decades. However, agricultural education needs to expand into urban and suburban settings (Esters et al., 2004). Expansion into urban and suburban settings will allow room for growth in an industry that has suffered many losses in recent years. It is reported that the U.S. economy, in the next 20 or so years, will rely heavily on workers coming from urban communities (Esters et al., 2004). In recent years the U.S has experienced many demographic changes. To maintain the growth of the industry there will need to be a heavy reliance on students from nontraditional backgrounds developing interest in secondary agricultural education programs (Esters et al., 2004). According to the U.S. Census Bureau, a secondary agricultural education

program consists of four different components. The four different components are: the classroom, laboratory, Future Farmers of America (FFA), and Supervised Agricultural Experience (SAE). Programs such as FFA and SAE not only teach high school level students about agriculture, but they also help students develop career, leadership, and life skills that are important for the future.

With demographic changes also comes a complex and rapidly changing U.S. agri-food system, creating challenges for preparing future generations of consumers and agriculturalists (Trexler et al., 2013, 2013). Agriculture students with nontraditional backgrounds will need to be agriculturally educated to make informed decisions for the future of agriculture. As the agri-food system continues to grow, agricultural education will be needed across all school districts in the U.S. It is necessary to create programs of agricultural education in urban and inner city areas to increase diversity in agriculture (Bowen, 2002). Because of the amount of growth in the agriculture industry, there is fear of decreased enrollments in agricultural education programs at the secondary level (Esters et al., 2004). If enrollments decreased at the secondary level, they would surely decrease at the university level, which would negatively impact the industry in the future. Although agriculture universities are more drawn to students with agricultural backgrounds, it is beneficial for the industry to begin branching out to inner cities. The opportunity for growth of urban agricultural educational programs is prevalent and new successful programs must be implemented soon to sustain the growth of the agri-food system.

Dairy Education

Dairy education may be of greater importance than other agricultural education programs. This is because dairy knowledge could be vital for survival from hunger (Kosikowski, 1964). Although the dairy industry has been a strong agricultural force in the U.S., the amount of farms has decreased, causing the elimination of many dairy science programs nationwide (Kahnke et al., 2006). However, even with the decreasing number of farms, the dairy industry continues to prosper, bringing along with it a demand for “qualified, knowledgeable professionals” (Kahnke et al., 2006). To supply the demand, students must become interested and educated in the field at the secondary level. Recruitment of these students to dairy programs at the university level is critical in ensuring the future of the industry. Unfortunately, there is little knowledge about dairy science education (Kosikowski, 1964). Educators at the high school level have stated that they have a “lack of knowledge about the dairy industry and more specifically dairy foods” (Kahnke et al., 2006). High school level instructors need proper dairy training and a set dairy education curriculum to implement in the classroom. Educating high school level students about the dairy industry allows for more exposure to dairy products and potential interest in dairy science careers (Kahnke et al., 2006). According to the results of a study done on a high school agricultural education program where a ready-made Dairy Foods Curriculum Packet (Kahnke et al., 2006) was distributed, the number one barrier of implementing dairy instruction at the high school level is “funding and lack of dairy foods instructional materials appropriate to the secondary education level” (Kahnke et al., 2006). Furthermore, the results of the study done by Kahnke (2006) proved that if given the resources and sufficient training, high school instructors would be able to

successfully implement dairy education programs. These dairy education programs at the high school level are critical for the future of dairy programs at the university level.

Surveying

A survey is a common tool used to collect data that can be useful when trying to determine answers to key topics within a targeted population. Conducting a survey can be a way of collecting information that may represent the views of a specific interest group (Hampton et al., 2013). To collect this type of information there are three common types of surveys, case study surveys, sampled surveys, and census surveys (Hampton et al., 2013). Surveys are typically written and can be distributed in different ways. They may be distributed by email, mail, or fax, as well as in person or over the phone (Hampton et al., 2013). It is important to note that when developing a survey questions can take many forms. Moreover, the information that is collected from a survey is presented in a uniform manner which allows thorough analysis (Hampton et al., 2013). Distributing a standardized survey ensures that answers are drawn from the experience of the respondent.

When considering whether or not to use a survey, one must decide if the data collected will produce the necessary information needed. Information about behaviors, needs and opinions can be collected through surveying (Hampton et al., 2013). Written surveys possess many advantages. For example, a written survey allows people to respond at their convenience, avoids interviewer bias, provides a written record, and can be distributed to a large number of people (Hampton et al., 2013). With the growth of technology, conducting surveys over the internet has gained popular interest. Online

surveys can be conducted quickly with faster turnaround times. It has been noted, however, that online surveys receive a lower response rate (Schonalu et al., 2002). Regardless of which media a survey is conducted through, the information that can be collected is beneficial for research.

Teaching through Online Modules

Technology is advancing every day, with new devices on the market nearly every month. Professor Ian McDonald of Victoria University stated, “The way we learn in our society is based around communication, and the way society operates, is that more and more of our communication is digital.” Whilst communication is becoming more digital, the educational landscape is shifting (Watson et al., 2010). Much like agricultural education expanding to a broader demographic, online learning has been reaching a wider audience. Access to the internet has allowed people to receive education and training anytime and anywhere (Nord, 2011). Through creating a virtual classroom, the reach, scope, and accessibility of education has expanded (Rosenberg, 2001). Online learning, or E-learning, can enhance learning by providing information through audio and video, interactive practice exercises, and many other learning strategies (Nord, 2011). In recent years this type of teaching has expanded due to its efficient delivery and generally low costs. Even with this expanding market, face-to-face learning environments are still very important to teaching. However, face-to-face learning can be enhanced with an online component (Watson et al., 2010). By placing courses online, there is an increase in flexibility of time and location. Students are allowed to work at a pace that is comfortable for them, within a certain framework that is determined by the instructor. Additionally,

students can work on the course at any time they have internet access, allowing for diverse geographical locations (Watson et al., 2010). By placing the course online, students can more easily share information and utilize online resources. Online courses can have much variation in instructional model, but most have established a way to instruct an assessment of learning through practice problems, reflection exercises, homework assignments, and testing (Nord, 2011). As with most new ideas, online learning is plagued with critique. Some instructors have several concerns about implementing online courses. Instructors are concerned about losing the in-class interactions. They have yet to be convinced that online learning is effective or are afraid of change. In some cases, instructors do not possess the correct tools to get started (Watson et al., 2010; Nord, 2011). In order for there to be a shift to online education, instructors must see the benefits and the reasons for the change (Watson et al., 2010). Online programs, mixed with classroom interactions, are very much the future of our education system.

MATERIALS AND METHODS

Population

The population for this project included upper division high-school students who attend a private inner-city high school located in San Francisco. The sample size was 65. The sample was chosen at random and completely anonymous. Randomizing the sample within the selected population allowed for more diversity in responses. Based on the location of the school, it was presumed that the sample of students selected had little to no agriculture background.

Survey

A twenty question online survey (Appendix A) was developed to collect data. The length of the survey was determined by keeping in mind the idea that less is more. The survey was generated through “Google Forms”, a free Google tool to create, send, and run a survey in an easy, streamlined way (Google Help). The survey was sent via a link in an email to the selected sample. Providing a specific link allowed for assurance that only the sample at hand was allowed access to the survey. The survey administered can be labeled as a sampled survey, a survey that asks a sample portion of a group to answer questions (Hampton et al., 2013). Each question required an answer to collect consistent data. Questions varied in style by: multiple choice, fill in the blank, drop down menu, true or false, yes or no, and short response. Variation in questions allowed students equal opportunity to choose an educated response. The variation also contributed in

keeping the interest of the student all the way till the end of the survey. Although the survey contained open ended questions, which can be more difficult when analyzing results, majority of the questions were structured to provide adequate data. The questions were structured in a way that could clearly demonstrate information regarding dairy cows, dairy products, and industry facts. By displaying dairy facts throughout the survey it was anticipated that by the end the student would want to learn more.

The questions could be split into three different sections: dairy cow information, dairy products information, and industry information. Questions displaying dairy cow information were kept simple. Many questions provided multiple options for answers as well as true or false or yes or no styling. These questions covered information about cow breeds, reproduction, simple anatomy, and proper terminology concerning the dairy cow. The second section displayed information about dairy products. These questions began by establishing if and how much dairy products the student consumed. Questions like these allowed the student to personally relate to the survey and share a little information about him or herself. The material covered by these questions was associated with milk, milk processing, and cheese processing. These questions were simple in nature, however, may have seemed a bit more difficult if the student had never been exposed to dairy processing terminology. The third and final section of questions was mainly free response. These types of questions allowed students to think for themselves and come to an educated guess if they did not know the answer. Additionally, this section of questions allowed the students to exhibit if they would be interested in learning more about the dairy industry, and if so what topics they would be interested in learning about.

Teaching Module

Data collected from the survey were used to identify the problem areas amongst the sample of students in regards to their level of knowledge of the dairy industry. Based on this data a learning module (Appendix B) was created. Consistent with current new teaching trends, the module was created through a free online web development platform called Wix.com, Inc. Placing the module online allowed anyone with access to internet, whether through a computer, laptop, tablet, or smartphone, to participate in the module. The module was streamlined for any type of device, whether it is a laptop or smartphone. The module was designed to flow easily with a common theme found throughout, allowing any person to be able to use the website with ease. The module was designed to be comprehensive with emphasis on the dairy cow as an animal as well as dairy production processes. The module was intended to be used in grade levels 9 through 12. The module can be accessed by visiting:

www.veronicatabora.wix.com/letslearnaboutcows.

Taking into account that the module is online and an instructor or administrator need not be present while the student completes each lesson, a membership requirement was added to the site. To acquire membership a name and email must be given (Appendix B). This feature requires anyone, who wishes to access the lessons or quizzes on the module, to login first. The administrator of the module can access a table where member actions are tracked (Appendix B). By tracking activity, the instructor is able to monitor which students are accessing the module and at what time they are accessing it. The login/sign up link can be found at the top right hand corner on every page of the website.

Homepage. The homepage (Appendix B) is aesthetically pleasing to the eye, with bold colors and photos. From the homepage, one can easily determine where to go next to participate in the module or find out more information. Present on every page of the module is the top banner which contains the different sections of the website: Home, Objectives, Lessons, and Additional Resources. The homepage contains a short welcome and summary of what is expected to be found throughout exploring the module. The bottom right portion of the homepage demonstrates via bullet points the main ideas of the two lessons in the module (Appendix B). The bottom left portion exhibits a Thank You note from the creator of the module (Appendix B).

Objectives. The following page, Objectives (Appendix B), explains the learning outcomes of the module. These are the objectives that are to be conquered through completion of the module. The objectives are displayed in bullet point format. There are a total of 15 different objectives listed. The objectives range from students being able to recognize different dairy breeds, to investigating the process of rumination, to listing the steps of milk processing, and to discovering career opportunities in the dairy industry (Appendix B). At the bottom of the Objectives page is a clause stating, “To access the Lessons please Login or Sign up” (Tabora, 2014).

Lessons. The main Lessons page (Appendix B) contains a drop down menu from the banner strip for quick access to Lesson One and Lesson Two. On the main Lessons page there is a summary explaining that the module contains two lessons, with several sub-units incorporated within each, and a quizlet (Appendix C) following each lesson. The lessons can be completed in any order, however, it is recommended to follow the

order designed by the module. On this main page, there is also a specific summary for each lesson, with direct links to each lesson.

Lesson One. Lesson One (Appendix B) covers material on the basics of the dairy cow. The lesson comprises three separate sub-units: dairy breeds, dairy cow anatomy, and fun facts and terminology. From the main Lesson One page there is access to each sub-unit via a button titled “Let’s get started”. On the main page there is a video titled *Cow Comfort* produced by Real California Milk that is placed at the top and is intended to be watched before starting the lesson. The first sub-unit, Dairy Breeds (Appendix B), presents basic information regarding the origin, color, size, and facts of six main breeds found in the U.S. At the bottom of the unit there is a button titled “Click Here when you’re ready to moo-ve on”, which directs the user to the second sub-unit. The second sub-unit of lesson one, Dairy Cow Anatomy (Appendix B), displays the different exterior parts of the dairy cow, explains the importance of knowing the anatomy, and demonstrates the process of rumination. At the very bottom of the page there is an image of a dairy cow that students can use to test their knowledge of the different parts of the cow. Directly below this image there is a button identical to the one found on the bottom of the page of sub-unit one, that links the user to the third and final sub-unit of the lesson. The final sub-unit, Fun Facts and Terminology, examines different myths about dairying, shares facts about dairy, and proper dairy cow terminology. This sub-unit also includes a short video documenting a California family owned dairy. Similar to the other unit pages at the bottom of this page there is a button linked to the next step, the first quizlet. After the quizlet is completed a button similar to the ones found on the previous pages directs the user to the second lesson.

Lesson Two. Lesson Two (Appendix B) consists of four different sub-units and follows nearly the same format as Lesson One. The information presented in Lesson Two is directed towards the production side of the dairy industry. This lesson touches base on the importance of the dairy industry to our economy, common terminology used by producers and processors alike, the process milk undergoes from the udder to the grocery store, and simple steps of cheese processing. The four sub-units, milk flow, dairy product terminology, how cheese is made, and a dairy economy, are accessible from the Lesson Two page. Additionally, the Lesson Two page contains an eight minute video titled *Journey of Milk* produced by the Western Dairy Association Dairy Council. The first sub-unit (Appendix B) explains the process of milk from farm to table. Included with the explanation are images and a flow chart from the Dairy Council of California to further demonstrate the process. At the bottom of the page is a button directing the user to the next sub-unit. The second sub-unit of Lesson Two consists of two columns that are filled with common dairy product terminology. Sample words that can be found in this section are: bulk tank, churning, holding pen, letdown, somatic cell count, and teat dip. To be directed to the third sub-unit, the user must again select the button found at the bottom of the page. The third sub-unit describes in six simple steps the process of cheese making. This page also holds step-to-step images for cheddar and Gouda cheese making as presented in a book by Christian Teubner, titled *The Cheese Bible*. Clicking on the button found at the bottom of the page links the user to the final lesson of the module. This fourth sub-unit of Lesson Two explains the importance of the dairy industry to the California economy and how to spot ‘The Real California’ seal on milk and cheese products in stores. To demonstrate this importance, a visual diagram retrieved from the

California Milk Advisory Board is included. Following this lesson the user is directed via the button on the bottom of the page to the second quizlet. The button found at the bottom of the quizlet page directs the user to a completion page (Appendix B). This page shares congratulations with the user in completing the dairy ‘moo-dule’, thanks them for participating, and reminds the user to access the Additional Resources page.

Quizlet. After fully completing each lesson, by following the path set out for the module, there is a quizlet (Appendix C) regarding the information presented in the appropriate lesson. The quizlet was generated by “Google Forms” and embedded into the website. To determine which answers belong to each respective student, both quizlet’s require the user to provide their full name in the appropriate box. Immediately after the quizlet is submitted results are collected in a spreadsheet (Appendix C). The administrator has access to each spreadsheet via “Google Drive”. To access the Google drive, the administrator must have a “Google Drive” account and be logged in. The spreadsheet found in the drive is formulated to automatically grade the results as they are submitted. The first quizlet asks 17 questions and the second quizlet asks 18 questions. The questions are multiple choice, fill in the blank by choosing the correct answer from a drop down menu, and true or false. The spreadsheet displays how many questions were answered correctly then based on the point value for each question determines a percent grade for each student.

Additional Resources. The final page accessible by the banner found on every page of the module is Additional Resources (Appendix B). This page is also accessible via a link on the completion page and a link in the module creator’s thank you note. The Additional Resources page contains links to different websites where more information

concerning the dairy industry can be found. Additionally, this page contains links to websites with more teaching material and a video highlighting a California college Dairy Science program. The final page is equipped with a comments section. The comment section can be used to provide feedback about the module. The page also contains a form that can be used to ask questions as the need arises. Questions sent through the form are forwarded to the administrator email. The form requires the user to include an email allowing the administrator to answer questions as efficiently as possible via email correspondence. The form is comparable to office hours an instructor might hold on campus.

RESULTS AND DISCUSSION

Results

During the development of this project several steps were taken to determine the outcome of the learning module. The survey that was conducted gave a 70.8 percent response rate. Out of the 65 students who were given the survey, 46 responded (Table 1). The survey was sent out on Monday, February 10, 2014 and remained accessible for three weeks. The final data was collected on Monday, March 3, 2014.

Table 1. Inner-City High School Students Dairy Industry Knowledge Survey Responses and Rate

Group	Total Students	Responses Received	Response Rate
<i>High School</i>			
Upper Division	65	46	70.8 percent

Although there was not 100 percent participation out of the 65 students who were given the survey, data collected still provided valuable information. Out of the 46 students that responded, 52 percent of them consume dairy products more than four times a week, 24 percent 2-4 times a week, 4 percent once a week, and 20 percent less than once a week (Figure 1).

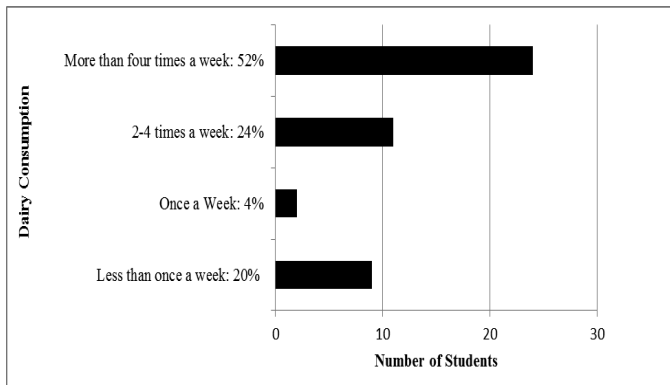


Figure 1. Inner-City High School student's dairy consumption per week.

When asked whether or not these students knew where the dairy products they consume come from, 25 responded yes and 21 students responded no. Out of these students 48 percent (22 out of 46) responded that out of dairy foods, vegetables, fruits, or meats, they consume dairy foods the most (Figure 2). When asked if they knew how these dairy products were made, 26 percent (12 out of 46) responded yes while 74 percent (34 out of 46) responded no (Figure 3).

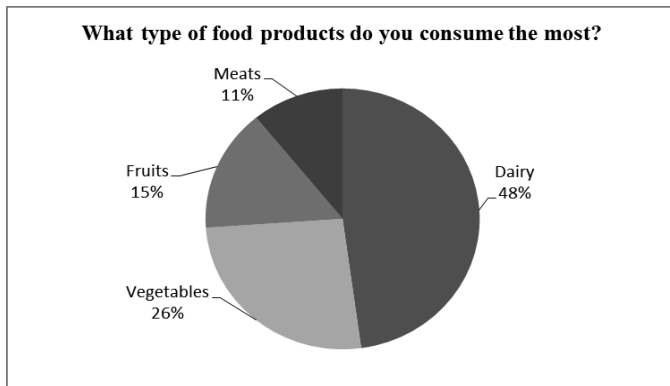


Figure 2. Inner-City High School student’s food product consumption.

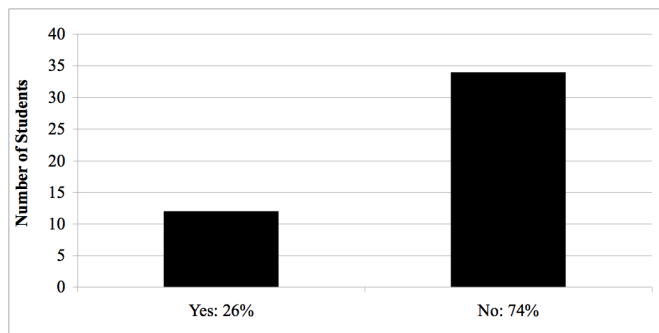


Figure 3. Inner-City High School student’s knowing how dairy products are made.

The results for whether or not the student had ever touched a cow were nearly evenly distributed with 22 responding with a yes and 24 a no. Following this question, students were then asked a few basic questions about dairy cows. The students were asked if they thought cows were carnivores or herbivores. Four of the students responded that cows were carnivores and 42 responded that they were herbivores. When asked if the

colors of the popular Holstein cow breed was either black and white, brown and white, light brown/tan, or black, 46 percent of students responded black and white, 24 percent brown and white, 22 percent light brown/tan, and 4 percent black. Eighteen students responded that dairy cows are typically pregnant 280 days, 17 students responded 250 days and 11 students responded 200 days. The question that followed was true or false and stated that cows have four stomachs. Out of the 46 students 27 stated true and 19 stated false.

When asked what a female cow over six months of age is called given the options, calf, heifer, or dam, 24 percent picked calf, 39 percent heifer, and 37 percent dam (Figure 4). The final question associated with basic cow facts asked if the students had ever seen a cow being milked. Over half, at 70 percent responded that they had not seen a cow being milked, while 30 percent responded that they had.

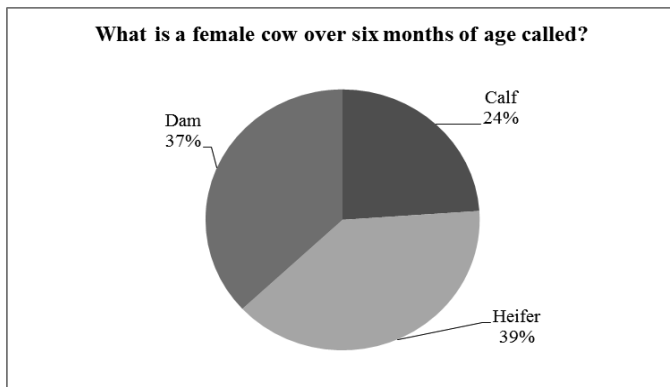


Figure 4. Inner- City High School students selecting what a female cow over six months of age is called.

The remainder of questions was associated primarily with dairy products. The first question asked whether extra amounts of Vitamin A, Vitamin D, or Vitamin C are usually added to milk. Out of 46 responses, 33 responded with Vitamin D, 12 responded with Vitamin A, and 1 responded with Vitamin C. The question that followed asked what the name of the sugar found in milk is given the following choices: sugar cane, lactaid, lactose, and none of the above. None of the students selected sugar cane, 11 selected lactaid, 27 selected lactose, and 8 selected none of the above. The students were asked to pick between pasteurization, homogenization, or lactation to complete a sentence that asked what the process of heating milk to a high temperature is called. The results were nearly evenly distributed between the answers pasteurization and homogenization, with 24 of the responses pasteurization and the remaining 22 homogenization (Figure 5). Students were then asked if butter, milk, cheese, or yogurt was made by adding a substance called rennet to heated milk. The data resulted in 7 percent of the responses stating butter, 2 percent milk, 48 percent cheese, and 43 percent yogurt (Figure 6). The final question directed towards dairy products was another true or false that stated antibiotics could be found in milk. There were 13 true responses and 33 false responses.

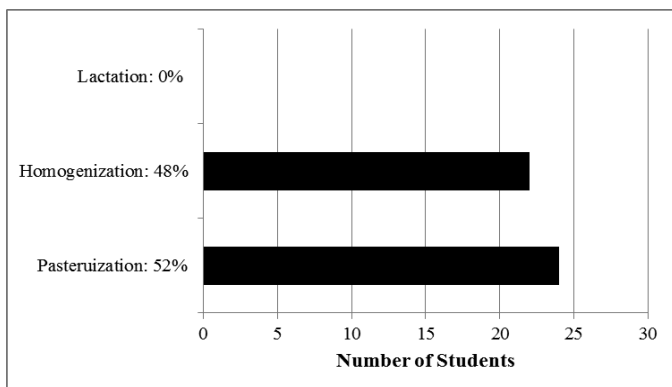


Figure 5. Inner-City High School student’s determining what the process of heating milk is called.

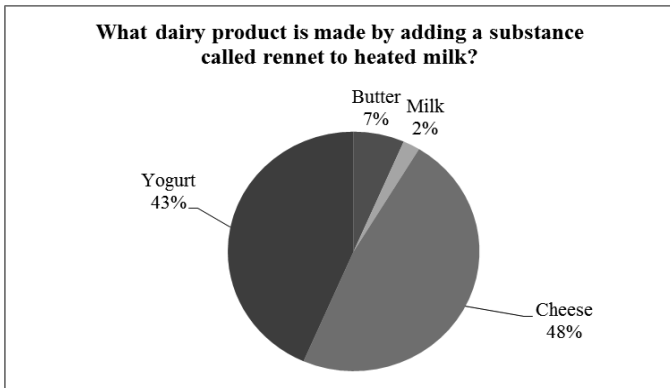


Figure 6. Inner- City High School student’s selecting which dairy product is made by adding rennet.

The final questions on the survey were free response questions that were targeted towards the industry as a whole. The first question asked for the number of dairy farms located in California. The data ranged from 25 dairies to 40,000 dairies. The question that followed asked the students to state what percent of licensed dairy farms in the United States had been shut down in the last 20 years. The results ranged from 10 percent to 85 percent. With 35 percent of results stating 50 percent of dairy farms were shut down in the last 20 years. The students were then asked, when thinking of the dairy industry, what were two jobs that came to mind. They listed 17 different types of jobs (Table 2). The most commonly mentioned jobs were farmer, milking cows, and making cheese.

Table 2. Number of Times Jobs Mentioned

JOB TITLE	NUMBER OF TIMES MENTIONED
USDA	2
Farmer	28
Milking Cows	15
Making Cheese	24
California Milk Board	2
Food Maker	1
Churning butter	1
Milk Producer	5
Dairy Products Producer	3
Herding	3
Processing plant worker	1
Selling Milk	1
Production Manager	1
Ice Cream Producer	2
Milk Tank Driver	1
Veterinarian	1
Feeding	1

The final question asked the students whether or not they would be interested in learning more about the dairy industry. Two of the students responded no, 20 responded maybe, and 24 responded yes. Attached to this question was an area where if the respondent replied yes, he or she could identify areas they would be interested in learning about. The results of this question produced a wide variety of ideas (Appendix A). Some students expressed that they felt it was important to know where their food comes from and how it is made, others expressed interest in cheese making.

Discussion

Taking into account that the survey was online and responses could have been altered by using web based search engines, the data collected from the survey only further supported the idea that inner-city high school students do not have much knowledge about the dairy industry as a whole. With 52 percent of this group consuming

dairy products more than four times a week and 48 percent consuming dairy food products the most, it is important to extend dairy education to the demographic represented by the sample group. As the results stated, only 35 percent of this group know how the dairy products they consume are made. Inner-city high school students have little to no exposure to farm animals. Only half of the students had actually physically touched a cow, and out of this half it is unknown if this occurred at a state fair, petting zoo, or on an actual farm. The majority of the students have not seen a cow being milked. The data collected demonstrates that there is a lot of room for presumptions about what goes on in the dairy industry, which can create a negative image for the industry. With false media coverage, people gain false knowledge. This often ends up harming the image of the dairy industry.

Since several of the question results show that answers were split almost evenly, one can determine that the students made an educated guess when answering questions they did not know answers to. This is seen in the data results of the answers to students selecting what a female cow over six months of age is called (Figure 4), what the process of heating milk is called (Figure 5), and which dairy product is made by adding rennet (Figure 6). Overall, the students answered most of the questions incorrectly.

Since internet is accessible nearly anywhere, the learning module was created online. Online learning or E-learning is a new niche for education. The module focused first on the basics of the dairy cow, as the results indicated that little was known about simple facts. The module then presented the production side of the dairy industry. Through the results, it was apparent that this group of students not only expressed a want of learning more but also a lack of knowledge of how dairy products are made.

Further analysis of the results and taking into account the areas students were interested in learning more about, the sub-units for the lessons were chosen. It was decided that first the most basic information of dairy cow breeds should be provided because not even the simplest question on the survey, asking whether a cow was an herbivore or carnivore, was answered completely correct. Then the different parts of the external anatomy would be explored and the process of rumination explained, which connects why cows are classified as ruminant animals. Questions from the survey asking to define specific terminology were also not answered completely correct, therefore, it was decided to include terminology describing the dairy cow as well as dairy product processing. The other main component of the module, milk production and processing, was chosen mainly because the free response answers display interest in how dairy products are made. Furthermore, it can be concluded from the results that the sample group had a limited view on the impact of the dairy industry to the workforce and economy. Therefore, a small section of the module was dedicated to the impacts of the dairy industry.

This project had limitations. Since all the information is online based, one can only make assumptions that answers on the survey were not a result of outside sources. Additionally, the learning module does not incorporate labs or hands-on learning experience. In the future, lab days or special field trips to dairy farms in the north coast or central region of California can be implemented as requirements for the students to participate in. This will also allow the students to receive face-to-face interactions with the instructor and hands-on learning, which are two critical areas for successful teaching. At the time of this project there was no quantitative measure at how effective the teaching

module is. However, the module is equipped with features that will assist in measuring the retention and comprehension of the material presented. The features it contains are, two quizlets (one per lesson) with automatic grading and an area for users to leave feedback. In addition to these features, an assessment can be made to analyze how well the module presents material to the students. The assessment can show if the objectives of the module are met and how interested the students are in continuing with dairy education in the future. This project can potentially be used in years to come by inner-city schools around the state with no agriculture program or those without emphasis on dairy.

CONCLUSIONS

This project sought to determine the level of knowledge among inner-city high school students. Through evaluating these students via an online survey, it can be concluded that this demographic of consumers have very little knowledge about the dairy industry. With increasing demand of more food sources, there must be new advancements in agricultural education, specifically dairy education. Evaluating inner-city high school students allowed for the creation of a simple two lesson online learning module. Placing the module online allows for ease into any current agricultural curriculum present in high schools, as well as for those without an agriculture program. The module can be used in the future to help dairy science programs stay afloat by presenting nontraditional students with valuable information about the agri-food system. Thus, it can be anticipated that there will be growing interest in obtaining a degree in dairy science and furthermore a career in the dairy industry. The online dairy module is the first step needed to begin implementing agriculture programs in secondary level schools statewide.

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**APPENDIX A: SURVEY
A1**

How much do you know about the dairy industry?

A quick survey to help determine areas of dairy farming that inner-city high school students may not know much about. * **Required**

1. How often do you consume dairy products? *

Check all that apply.

Less than once a week

Once a week

2-4 times a week

More than four times a week

2. Do you know where these products come from? *

Check all that apply.

Yes

No

3. What types of food products do you consume the most? *

Mark only one oval.

Dairy

Vegetables

Fruits

Meats

4. Do you know how dairy products are made? *

Check all that apply.

Yes

No

5. Have you ever pet/touched a cow? *

Check all that apply.

Yes

No

6. Cows are carnivores or herbivores? *

7. What color is the Holstein cow breed? *

Mark only one oval.

black and white

brown and white

light brown/tan

black

8. Dairy cows are typically pregnant... *

complete the sentence with the correct answer.

Mark only one oval.

250 days

200 days

280 days

9. Have you ever seen a cow being milked? *

Check all that apply.

Yes

No

10. Extra amounts of what vitamin are usually added to milk? *

Mark only one oval.

Vitamin A
Vitamin D
Vitamin C

11. **T/F Cows have four stomachs. ***

Check all that apply.

True
False

12. **What is the name of the sugar found in milk? ***

Mark only one oval.

Sugar cane
Lactaid
Lactose
None of the above

13. _____ **is a process where milk is heated to a high temperature. ***

Fill in the blank.

Mark only one oval.

Pasteurization
Homogenization
Lactation

14. **What is a female cow over six months of age called? ***

Mark only one oval.

Calf
Heifer
Dam

15. **What dairy product is made by adding a substance called rennet to heated milk? ***

Mark only one oval.

butter
milk
cheese
yogurt

16. **T/F Antibiotics are in milk. ***

Check all that apply.

True
False

17. **How many dairies do you think are located in California? ***

18. **In the last 20 years, the United States lost ____ percent of its licensed dairy farms. ***

Fill in the blank.

19. **What are the first two jobs that come to mind when you think of the dairy industry? ***

20. **Would you be interested in learning more about the dairy industry? ***

Check all that apply.

Yes
No
Maybe

If answered yes above, what areas would you be interested in learning about?

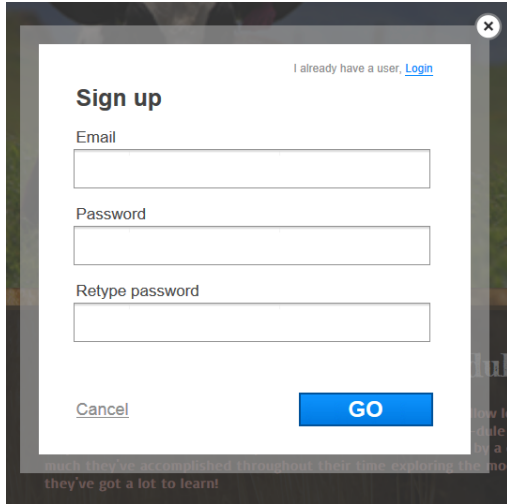
APPENDIX A: SURVEY A2

Free response results

how to farm dairy cows
how to make cheese breeds, products, and jobs how cows produce milk
how to make cheese because I love cheese
what the difference is between the black cows and the ones that are black and white
cheese making and basic cow information cows! Cheese making and cow basics
Anything
There seems to be a lot I don't know. I would love to learn as much as possible about something I am consuming that often. Any areas.
How I get the products I consume! The industry as a whole, it is very important to know where our food comes from. Although I have some knowledge, I would like to know more. after taking this survey I felt like I should know some of these facts and would be interesting in learning about cows.
anything that would allow me to make my own cheese I am open to anything because I guessed on everything and feel I should know more since I eat it.
how cheese is made
Where all my dairy products come from, if they are local. What is actually added in milk
how daily dairy products are made How everything works, how cows are treated, what kind of products go into making milk General knowledge would be great. Mostly interested in information that allows me to be a better and smarter consumer.
The industry as a whole, as a high dairy consumer I think I should know what I am eating, where it came from, and how it was made. I already know a lot because I like to know where the food I eat comes from, but I do think I have a lot to learn.
How my dairy food is made and where it really comes from I already know a lot of information because my grandfather is a farmer, but I would like to know more about the production side.
how the food I eat is made and how cows are really treated

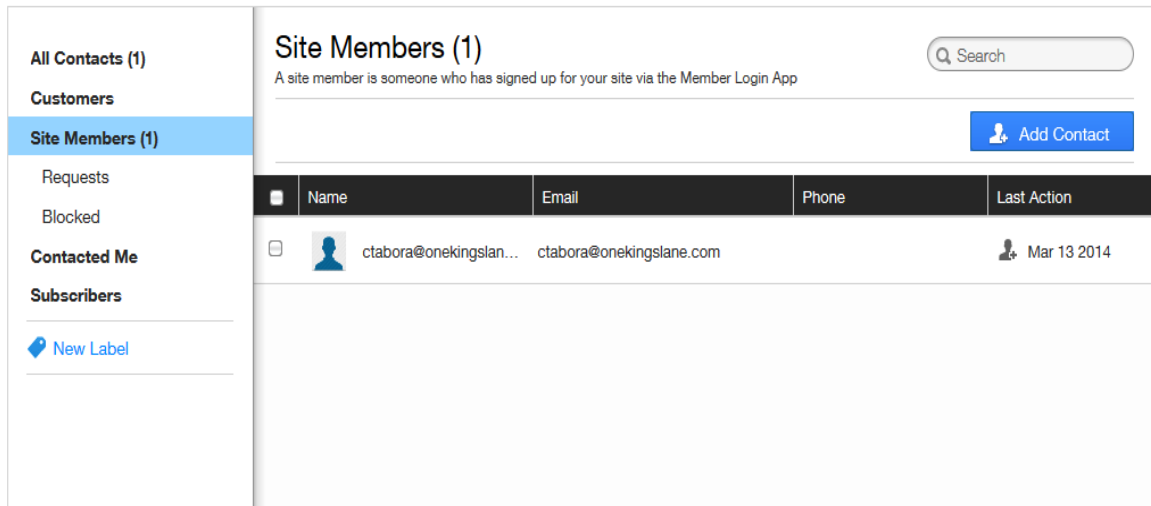
APPENDIX B: ONLINE MODULE B1

Membership login prompt box.





A modal dialog box titled "Sign up" with a close button (X) in the top right corner. It contains a link "I already have a user, [Login](#)". Below the title are three input fields labeled "Email", "Password", and "Retype password". At the bottom left is a "Cancel" link, and at the bottom right is a blue "GO" button.

Member Activity Log.



The interface shows a sidebar on the left with categories: "All Contacts (1)", "Customers", "Site Members (1)" (highlighted), "Requests", "Blocked", "Contacted Me", "Subscribers", and "New Label". The main content area is titled "Site Members (1)" and includes a search bar and an "Add Contact" button. Below this is a table with columns: Name, Email, Phone, and Last Action.

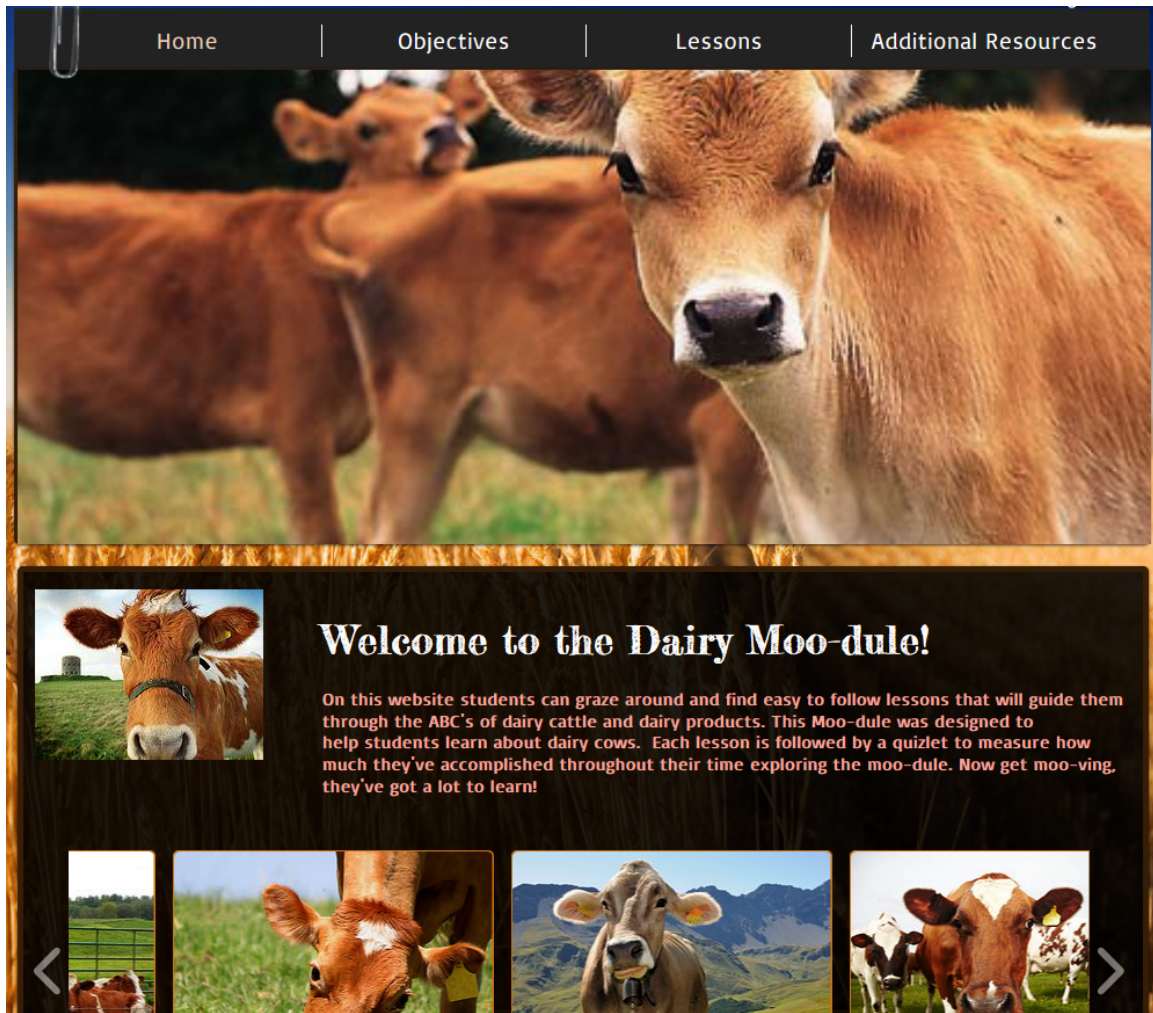
Name	Email	Phone	Last Action
 ctabora@onekingslan...	ctabora@onekingslane.com		 Mar 13 2014

APPENDIX B: ONLINE MODULE B2

Menu Banner with Login/Signup located in top right hand corner.



Homepage



APPENDIX B: ONLINE MODULE B2

Homepage continued.



Thank You!

I just wanted to quickly thank you for visiting this moo-dule. I hope you have gained valuable information by participating in this moo-dule. If a question arises, fill out the form found [here](#). Don't forget to leave feedback and to share this moo-dule with your friends!

Lessons

Lesson One

- Different cow breeds
- Anatomy and rumination
- Dairy cow terminology and facts



Lesson Two

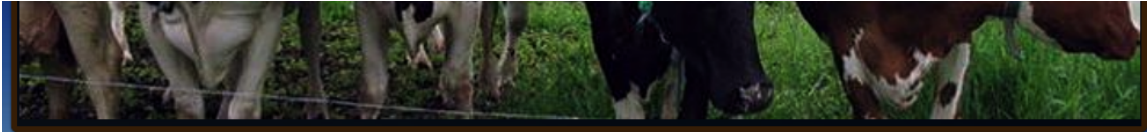
- Dairy product terminology
- From the cow to your fridge
- Dairy product processing
- Dairy industry impact on the economy



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APPENDIX B: ONLINE MODULE B3

Objectives Page



Objectives

Throughout the course of this moo-dule, students are expected to learn a fair amount of new material. To help make sure they accomplish the learning outcomes set out for them, a summary of the objectives can be found here.



Students will be able to:

- Recognize different dairy breeds.
- Present key attributes of each dairy breed.
- Investigate the process of rumination.
- Develop an understanding of a dairy cow anatomy.
- Comprehend facts concerning dairy.
- Identify proper dairy terminology.
- Distinguish the difference between myth and factual information in regards to dairy.
- List the steps of milk processing.
- Apply newfound knowledge to everyday life.
- Demonstrate the importance of the dairy industry.
- Recognize the economic impact of the dairy industry.
- Explain how milk travels from farm to table.
- Illustrate basic knowledge of terminology associated with milk processing.
- Discuss basic cheese production.
- Discover the career opportunities provided by the dairy industry.


To access the Lessons please Login or Sign up.

APPENDIX B: ONLINE MODULE B4

Main Lesson Page

Lessons


This moo-dule contains two main lessons. The first lesson is comprised of three different sub-units. The sub-units primarily present information regarding the dairy cow. The second lesson is comprised of four different sub-units and displays dairy product production information. In order to measure the level of comprehension, students will be presented with a quizlet.



Lesson One

In this lesson students will learn about different dairy breeds. Students will be shown the different body parts on a dairy cow. After completing this lesson students should be able to describe the process of rumination. Finally, proper dairy cow terminology will be presented as well as fun facts about dairy.

Concluding the three sub-units contained in this lesson will be a quizlet about the information presented.



Lesson Two

In this lesson students will learn about the importance of the dairy industry to our economy. Students will be presented with common terminology used by producers and processors. After completing this lesson students should be able to describe how milk comes from cow to grocery stores. Students should also be able to list the main steps of cheese processing.


Concluding the four sub-units contained in this lesson will be a quizlet about the information presented.

APPENDIX B: ONLINE MODULE B5

Lesson One main page

Home | Objectives | Lessons | Additional Resources


Cow Comfort



0:00 / 11:10

It's All About Her

Foster Mothers of the Human Race

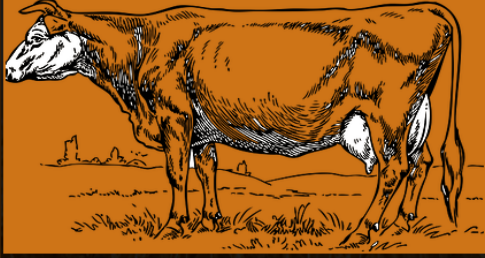


Dairy Breeds

This unit covers the background of the six common dairy breeds in the United States. The Holstein, Jersey, Guernsey, Brown Swiss, Ayrshire and Milking Shorthorn.

Let's get started!


Dairy Cow Anatomy



This unit covers basic cow anatomy and the process of rumination.


Let's get started!

Fun Facts and Terminology



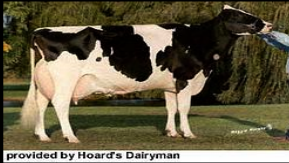
This unit shares fun facts about dairy cows as well as proper terminology when talking dairy.

Let's get started!

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Lesson One Unit-1

Dairy Breeds



Holstein

Origin: Netherlands

Second oldest of the pure dairy breeds

Color: Black and white or red and white (mostly in Europe)

Size: 1500 lbs, the largest of U.S. Dairy Breeds

Accounts for 93% of all dairy breeds in the U.S.

Highest milk producer

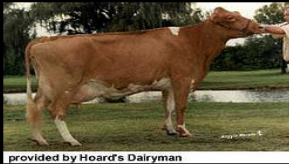
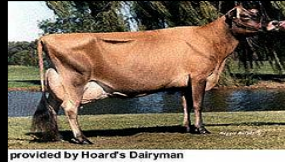
Jersey

Origin: Isle of Jersey (off the coast of the British Isles)

Color: A shade of fawn or cream with or without white markings, black muzzle with light colored ring

Size: 900-1000 lbs, smallest in body size

Highest milk fat, ideal for cheese production



Guernsey

Origin: Isle of Guernsey

Color: A shade of fawn with clearly defined white markings, clear (buff) muzzle is favored over a smoky or black muzzle

Size: 1100-1150 lbs, large frame

Makes golden milk and live a long time

Brown Swiss

Origin: Switzerland



Brown Swiss

Origin: Switzerland

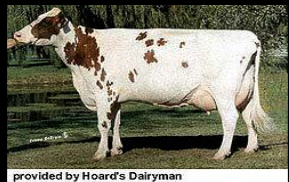
Oldest of the pure dairy breeds

Color: Solid brown varying from very light to dark, black muzzle

Size: 1400-1500 lbs

Strong and vigorous, known for long life and milking persistency

Milk is high in lactose, good for ice cream and used for cheese



Ayrshire

Origin: Scotland

Color: Light to deep cherry red, mahogany, brown, or a combination of any of these colors with white, or white alone

Size: 1200 lbs

Very few herds left

Milk used for butter and cheese

Milking Shorthorn

Origin: England

Color: Any combination of red, red and white, or roan

Size: 1250-1350 lbs

Dual purpose breed

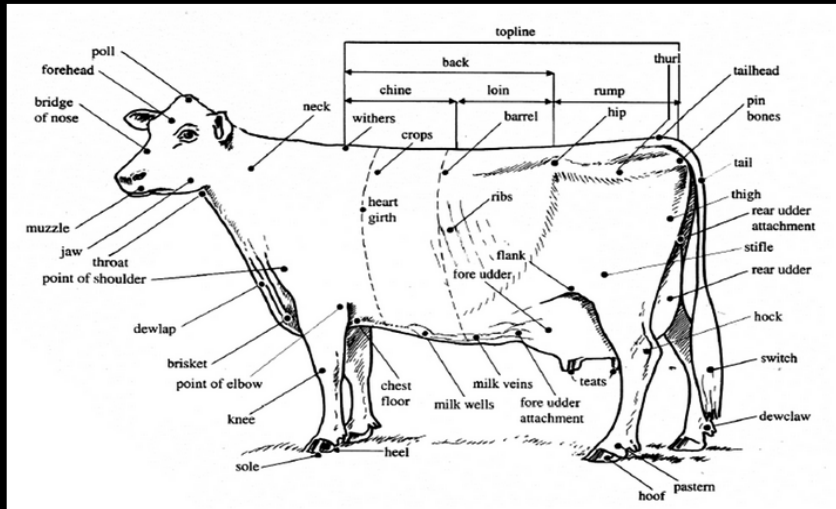


[Click Here when you're ready to moo-ve on.](#)

Lesson One Unit-2

What's going on in there?

Ever wonder if cows have the same body parts as humans? Well, now's your chance to find out! This unit will show you the different parts of a dairy cow as well as the process of rumination. *Key words are highlighted.



The image above displays the different parts of a dairy cow. As you can see, the cow has a few of the same body parts as people. Being able to identify all the parts of a dairy cow is very important for dairy judging competitions. You are probably wondering what that's all about. Many schools across the state, who have an agriculture program, participate in dairy judging competitions. The teams practice very hard before a competition. At the competition, the teams must be able to look at a set of cows and evaluate them. The cow's evaluation is based on four different sections: Frame, Dairy Strength, Rear Feet and Legs, and Udder. After each member of the team has considered and ranked the cow for each section, they must orally present reasons as to why one cow was placed over the other. In order to be able to give these reasons, each member must be very knowledgeable of the anatomy, inside and out.

**Now lets move on to
rumination!**

Lesson One Unit-2 continued

Cows are considered ruminant animals, meaning they have a **rumen** in their digestive tract. Because cows are **herbivores**, they need to be able to digest a lot of plant materials. Bacteria found in the rumen helps digest plant matter, which is very nutritious. So how does it all work?

1. **The cow swallows her food.**

2. **The food travels into the first compartment of her stomach, the rumen.**

The rumen can hold up to 200 pounds of food

The rumen contains millions of microorganisms like bacteria, protozoa, and fungi

These microorganisms are very important because they digest plant cells.

When the microorganisms eat the plant cells, the cells turn into loose proteins and fatty acids that the body can absorb.

3. **Next the food travels to the reticulum.**

The reticulum has a pH that allows bacteria to grow and multiply extremely fast.

In the reticulum the partially digested plant matter and bacteria come together to form cud.

This is why it is often when looking at a cow people will say she's "chewing her cud".

Did you know cows can spend up to 9 hours a day chewing cud? That's nearly a third of her day!

The process of chewing cud requires the cow to bring up some cud from the reticulum and back into her mouth for some more chewing.

4. **After the cow re-chews her cud, she re-swallows it, and off the cud goes to the omasum.**

In the omasum, the cud is strained in order to remove water from the cud.

5. **The remainder of the cud then travels to the abomasum.**

This part of the stomach is similar to our stomachs.

The pH levels in the abomasum end up killing the bacteria, and the cow's enzymes digest the microorganisms.

All of this happens just in the stomach! After the food leaves the stomach it follows a path much like our own.

Rumination

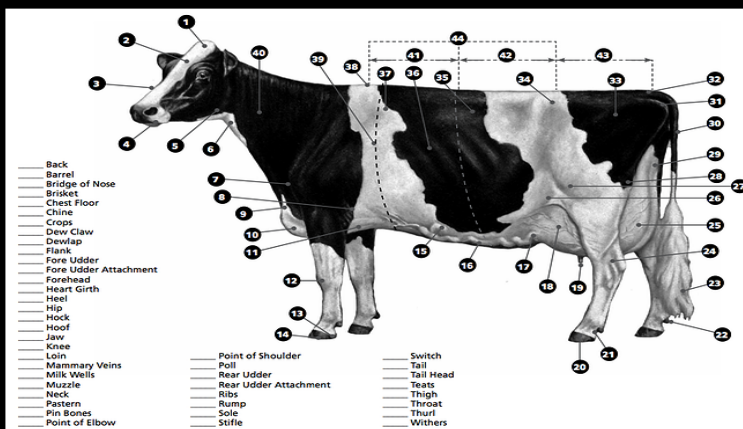
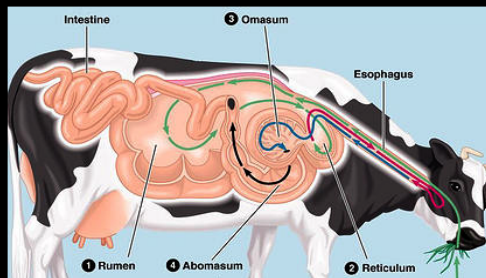


Diagram courtesy of the Holstein Foundation, Inc.

Time to test your knowledge!

Without scrolling back up, match the number to the correct body part.

When you're done, scroll back up to see if your answers were correct!

[Click Here when you're ready to moo-ve on.](#)



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Did you know?

Myths vs. Facts

Myth: Dairy cows are treated like nothing more than a milk machine.

Fact: The health and well-being of a dairy cow is very important. Dairy farmers are dependent on the health of their cows for their livelihood. Cows that are unhealthy do not produce high quality milk, which is important to the farmer and consumer.

Myth: Dairy cows are cramped in barns that are dirty and have no access to outdoors.

Fact: Cleanliness and adequate housing is a top priority for dairy farmers. Cows have access to food and water 24 hours a day. Their bedding is dry and clean. There are many regulations set in place in order to guarantee cows are housed properly.

Myth: Family farms no longer exist due to large corporate farms moving in.

Fact: According to the USDA, 97% of all U.S. dairy farms are family-owned and operated.

Fun Facts

- Dairy farmers follow strict regulations concerning food safety, cleanliness, and safety.
- Milk is better than water for cooling your mouth after eating spicy foods. Casein, a protein in milk, cleanses the taste buds.
- More than 400 years ago, cheddar cheese was first developed in a town in England called Cheddar Gorge.
- An average cow produces about 350,000 glasses of milk in her lifetime.
- A newborn calf can weight anywhere from 70-100 pounds.
- On average a cow will produce 6-7 gallons of milk each day.
- You would have to eat 2 ¼ cups of broccoli, 6 ¾ oranges or 6 slices of wheat bread in order to get the same amount of calcium found in 8 ounces of milk.
- On average, a cow can drink 30-50 galls of water each day, nearly the size of a bathtub.



Terminology



- **Bull**- mature male dairy animal
- **Calf**- young female dairy animal, a young male is a bull calf
- **Cud**- The partially digested food that the cow regurgitates from the first compartment of the stomach into the mouth to be chewed again
- **Cull**- to remove cow from herd, can be due to health, injury, or low milk production
- **Cow**- mature female dairy animal, has produced one or more calves
- **Dam**- mother or female parent in a pedigree
- **Downer cow**- cow unable to stand up due to disease or injury
- **Dry cow**- cow that is not producing milk
- **Forage**- cow feed, high in fiber and low in digestible nutrients, i.e. oats, barley, wheat, and legumes
- **Fresh cow**- cow that has recently given birth to a calf
- **Heifer**- female dairy animal that has not given birth to a calf
- **Herd**- grouping of cows
- **Sire**- father or male parent in a pedigree
- **Springer**- cow or heifer showing signs of pregnancy

Click Here when you're ready to moo-ve on.





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APPENDIX B: ONLINE MODULE B6

Lesson Two Main Page

Lesson Two






1. Milk Flow

This unit explains in simple terms how milk gets from the cow to the table.


[Click Here](#) to get started.



2. Dairy Product Terminology

This unit presents simple dairy product terminology.


[Click Here](#) to get started.



3. How Cheese is Made

In this unit you will find a quick explanation of how cheese is made.


[Click Here](#) to get started.



4. A Dairy Economy

This unit demonstrates the importance of the dairy industry to the United States economy.

[Click Here](#) to get started.

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Lesson Two Unit-1

From farm to table.

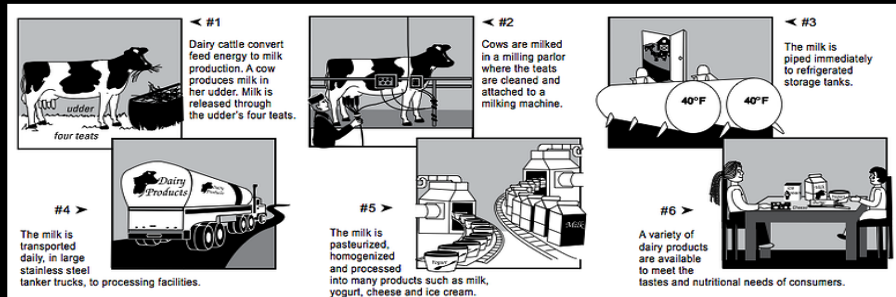
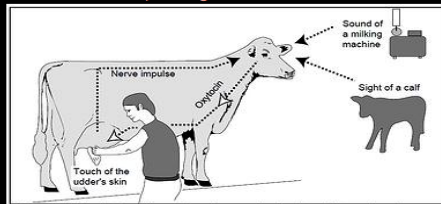


Photo courtesy of the Dairy Council of California.

- After the birth of her calf, a cow continues producing milk for about ten months.
- By chewing cud the cow digests food that is utilized to make milk in the udder.
- The udder is divided into four sections, each with its own teat.
- Oxytocin travels to the mammary gland via blood vessels, allowing for milk to be made.
- Milk is released through the streak canal.
- In modern times, the streak canal is stimulated by milking machines.



- Milking machines contain four cups, one for each teat.
- The machine rhythmically, and of course gently, pumps milk from the cow's udder.
- But first, a few sanitary procedures must be followed.
- First, the teats are dipped in a disinfectant solution, and then they are dried and stripped.
- Now the teats are ready for the milking machine.



- By using milking machines, milking time is significantly cut down, with time spent on each cow reported to be less than five minutes.
- Most cows on a dairy farm are consistently milked twice a day.
- The cups on the milking machine collect the milk and send it through stainless steel pipes to a large refrigerated bulk tank or milk vat located elsewhere.



- This tank or vat keeps the milk cooled at about 39 degrees Fahrenheit for no more than 48 hours.
- From the tank or vat, milk is collected via the milk tank truck.
- Before the milk can begin processing, a sample must be collected in order to test for milkfat, protein, and somatic cell count. This testing is important because most farmers are paid on the quality and composition of their milk.
- After testing, the milk, which is still raw, is pumped into storage silos. It is here where pasteurization, homogenization, separation, and some further processing is conducted.
- During pasteurization the milk is heated to a minimum of 145 degrees Fahrenheit for 30 minutes or 161 or higher degrees Fahrenheit for 15 seconds, and then it is cooled again.
- The next step is homogenization. Homogenization is a process where the fat in milk is broken into very small parts so that it will not float to the top.
- The milk then goes through separation, which is where the cream is separated from the milk. This part allows for processors to distribute milk with different fat contents (whole milk, low fat milk, non-fat milk, skim milk).

Lesson Two Unit-1 Continued

- Some milk goes through more processing to increase storage life, include flavors, or make yogurt products.
- When these processes are finished the milk is finally ready to be packaged for delivery.

Finally! The milk is ready for you to pick it up in stores!



[Click Here when you're ready to moo-ve on.](#)



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Lesson Two Unit-2

What are you talking about?

Dairy product terminology

- **Acid Rinse**- equipment cleaning process for stainless steel and rubber parts that removes fat, protein and minerals and reduces bacteria
- **Bulk tank**- refrigerated, stainless steel vessel where milk is cooled quickly to 35-39 degrees Fahrenheit and stored until it is sent to the processing plant
- **Cheese curd**- clumps of casein and other milk components that are formed during the cheese making process. Curds are then pressed into blocks or barrels for proper aging and curing of the cheese
- **Churning**- process of stirring and agitating cream to make butter, causes fat globules in cream to clump together and separate from the liquid
- **Forestripping**- stimulating milk letdown by collecting a stream of milk by hand from the teat prior to attaching milking machine
- **Handlers**- processors or dealers of milk who commonly purchase raw milk and sell pasteurized milk and milk products
- **Holding pen**- area where cows hang out before entering a milking parlor to be milked
- **Lactate**- to secrete or produce milk
- **Letdown**- process in a cow where physical stimulation causes a release of oxytocin and the contraction of muscles surround the milk alveoli resulting in milk flow
- **Liner**- flexible sleeve in the milking teat cup, massages teat end during milking
- **Milk house**- area near milking parlor where bulk milk tank, cleaning units, and other equipment are located
- **Oxytocin**- naturally secreted hormone that is important in milk letdown and during the birthing process
- **Parlor**- area on the dairy farm where milking is performed, several different designs
- **Somatic cell count (SCC)**- the number of white blood cells per milliliter of milk or the number of somatic cells present in a sample of milk.
- **Streak canal**- small canal located at the end of each teat, where milk passes through on its way out of the teat
- **Strip cup**- a small cup or device to collect forestrippings, allowing for abnormal milk to be easily observed
- **Teat**- attached to the udder, area where milk from the udder flows
- **Teat dip**- pre and post-milking, contains a disinfectant that kills bacteria and helps seal teat end to prevent entry of bacteria into udder between milkings
- **Udder**- the mammary gland, baglike organ with teats attached

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Lesson Two Unit-3

Feeling cheesy!

What is cheese?

A dairy product produced after water, lactose, and some minerals from milk are removed.

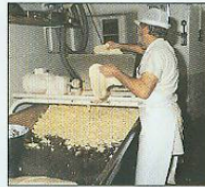
1. Milk is pretreated, lactose sugar is fermented into lactic acid
2. Curds are formed by adding rennet which contains rennin. This causes milk protein to bind together in clusters leaving the whey behind.
3. Separation occurs next. This is where the whey is removed from curds, and the curds are left to dry.
4. After the curds have achieved the perfect level of dryness and acidity they can be flavored.
5. Flavoring means salt is added. Fresh cheese is left alone, while other cheeses are treated with bacteria and fungal spores, or other additives for distinct flavor.
6. The cheese is then ripened based on which type is to be made. Some cheeses only require two weeks while others several years. While ripening it is important to keep cheese at steady temperature and low humidity.

Because there are so many different varieties of cheeses around the world, it is important to note that each cheese may be processed differently.

Below you can see step to step images for cheddar and gouda cheese making as demonstrated in the Cheese Bible.

How Cheddar is made

After the approximately pea-sized curd has been prepared and has been drawn together into a cake, "cheddaring," a step specific to the Cheddar-making process begins. The cake is cut into slabs, which are repeatedly stacked and restacked on top of one another. At the same time as the whey is expelled, more lactic acid forms. When this acidification is far enough advanced, the curd, which has become fibrous, is cut into pieces. The rest of the production process is illustrated in the photo sequence.



1 Manageable-sized pieces are cut from the acidified curd and milled.



2 Salt is sprinkled into the small curd and distributed evenly by relayering.



3 The salted curd is transferred to cylindrical molds, which are lined with cloths.



4 Cheddar is pressed in two stages, here in the horizontal press, for 12-16 hours each time.



5 Each young cheese is very carefully turned out of its mold after the first pressing.



6 The cloth is carefully removed. The surface is slightly uneven, with furrows and troughs.



7 Dipping the cheese in hot water encourages the rind to contract, or close, and smoothes the surface.



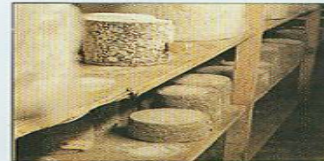
8 Greasing the cheese, a labor-intensive procedure, reduces the adhesion of the cloth to the cheese.



9 Before the second, very hard pressing, the cheese is wrapped in cloth — first, the top and bottom.



10 The cheese is precisely wrapped all around. After the second pressing, the cloths are removed.



11 The finished cheeses are stored together at 43°F, or, for faster ripening, at 50°F.

Consistently good: Dutch Gouda

Modern, standardized production methods in the large cheese factories guarantee the constant quality of Gouda from Holland, which is exported throughout the world. In order to illustrate the principles of Gouda production, however, the photographs on this page were taken in a relatively small cheese dairy; the production process would be difficult to depict in a large mechanized factory.



1 A cheese harp is used to cut the coagulated milk into curds the size of corn kernels.



2 Hot water is added, and the curd-whey mixture is scalded and lightly "washed."



Lesson Two Unit-3 Continued

- 3 The curds are pressed and the whey, which has separated, drains out through a pipe at the bottom of the vat.
- 4 Rectangles are cut from the curd, which has already drained together slightly.
- 5 The blocks of cheese are placed in plastic molds, which are lined with cloth or Gas Hene's strainer.
- 6 The cheeses are pressed for 1 1/2 hours, turned, and pressed again for 1-2 hours.
- 7 The strainer is removed, the cheeses are taken out of the molds, and then placed back inside them.
- 8 The cheeses remain in their molds until the following morning. During this period they are turned several times.
- 9 The cheeses sit in a salt bath for a few days. Their flavor develops, their body becomes firmer, and their rind hardens.
- 10 As soon as the cheeses are sufficiently dried, the protective layer is applied with a sponge.
- 11 The cheeses are stored in the ripening room, carefully sealed, for one month to one year or more.

Click Here when you're ready to moo-ve on.

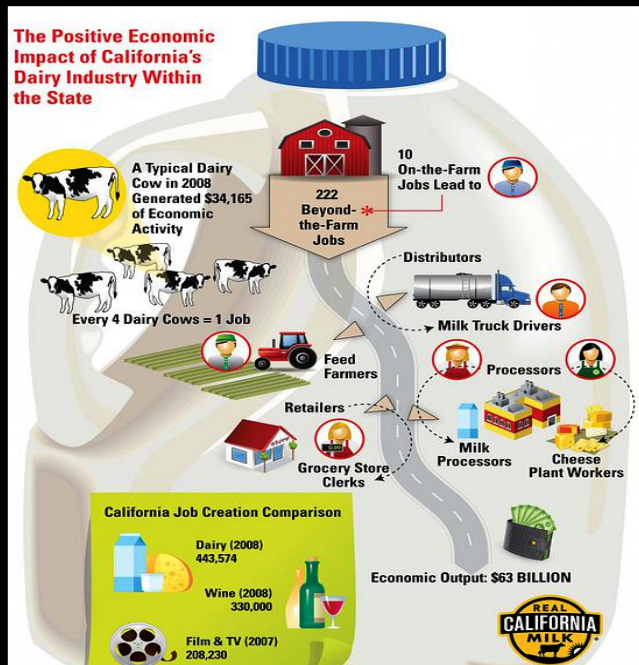
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Lesson Two Unit-4

The moo-ney makers!

The dairy industry is the largest sector of the California farm economy. In fact, because of such a large amount of milk being produced, the industry has to export dairy products worldwide. The dairy industry provides as much as 435,000 full-time jobs and contributes approximately 20 million dollars to California's economy every day. That's a lot of money! Imagine what would happen if the dairy industry went away for a single day. It would be catastrophic.

As you can see in the image on the right, the dairy industry provides jobs for people you may interact with every day. According to the California Milk Advisory Board, for 10 on-the-farm jobs there are 22 beyond-the-farm jobs. With such a high unemployment rate today, this is very critical to sustaining our society.



Lesson Two Unit-4 Continued

Make sure when you're out in the stores buying milk, or your parents are grocery shopping, to look out for the Real California Milk seal in order to continue supporting the California dairy industry!



Look for the Seals

RealCaliforniaMilk.com

[Click Here](#) when you're ready to moo-ve on.



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APPENDIX B: ONLINE MODULE
B7

Completion Page

Congratulations!

You have completed this dairy moo-dule!

Hopefully you learned something new by taking this moo-dule.

Thank you for your participation!

Don't forget to check out the [Additional Resources](#) page for links to more information about dairy as well as an informative video concerning dairy education at the college level!



APPENDIX B: ONLINE MODULE B8


Additional Resources Page

Additional Resources

The following video shows dairy education at the college level.
Courtesy of Real California Milk. Visit their website for more videos.

- [Ag in the Classroom](#)
- [Discover Dairy](#)
- [Dairy Council of California, Healthy Eating](#)
- [Learn About Agriculture](#)
- [Moo Milk](#)
- [Make Us Part of Your Family](#)

Dairy Students



0:00 / 5:17

YouTube

0 comments

Use the following form to ask any questions you may have.

Name

Email

Subject

Message

**APPENDIX C: QUIZLET
C1**

Lesson One Quizlet

Now that you have completed Lesson One, it is time to measure how much of the information you comprehended.

* Required

First and Last Name. *

Which of the following breeds originated in England? *

Select the best choice.

Mark only one oval.

- Brown Swiss
- Milking Shorthorn
- Ayrshire
- Holstein

_____ is the oldest of the pure dairy breeds. *

Fill in the blank

Mark only one oval.

- Brown Swiss
- Holstein
- Jersey
- Guernsey

Which dairy breed produces the most fluid milk? *

Select the best choice.

Mark only one oval.

- Jersey
- Holstein
- Brown Swiss
- Milking Shorthorn

Which dairy breed has the following characteristics: deep cherry red, mahogany, brown or a combination of any of these colors with white, or white alone. *

Select the best choice.

Mark only one oval.

- Ayrshire
- Milking Shorthorn
- Guernsey

- Jersey

The _____ breed produces milk with the highest milk fat content. *

Fill in the blank.

Mark only one oval.

- Holstein
- Guernsey
- Jersey
- Brown Swiss

After the cow swallows food, the food travels to what part of the stomach first? *

Select the best choice.

Mark only one oval.

- reticulum
- abomasum
- rumen
- omasum

Which of the following is the correct order in which food travels through the cows body during rumination? *

Select the best choice.

Mark only one oval.

- stomach, rumen, reticulum, abomasum
- rumen, abomasum, omasum, reticulum
- abomasum, omasum, reticulum, rumen
- rumen, reticulum, omasum, abomasum

The partially digest food that the cow regurgitates from the first compartment of the stomach into the mouth to be chewed again is called? *

Select the best choice.

Mark only one oval.

- forage
- cud
- hay
- springer

The pH levels in the _____ kill bacteria. *

Fill in the blank.

Mark only one oval.

- stomach
- abomasum
- rumen

- reticulum

The pH levels in the _____ promote bacterial growth. *

Fill in the blank.

Mark only one oval.

- abomasum
- reticulum
- rumen
- omasum

If a sire is the male parent in a pedigree, what is the female parent in a pedigree called? *

Select the best choice.

Mark only one oval.

- Heifer
- Dam
- Calf
- Fresh cow

How many gallons of water can a cow drink per day? *

Select the best choice.

Mark only one oval.

- 40-50
- 50-70
- 30-50
- 30-40

T/F After eating spicy food milk is better than water for cooling your mouth. *

Check all that apply.

- True
- False

According to the USDA, _____ percent of all U.S. dairy farms are family-owned and operated. *

Select the best choice.

Mark only one oval.

- 95
- 50
- 97
- 55

T/F Dairy cows are treated like nothing more than a milk machine. *

Check all that apply.

- True
- False

How many pounds can a newborn calf weigh? *

Select the best choice.

Mark only one oval.

- 90-110
- 70-100
- 60-90
- 80-120

A cow that is unable to stand up due to disease or injury is called? *

Select the best choice.

Mark only one oval.

- fresh cow
- cull
- downer cow
- dry cow

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**APPENDIX C: QUIZLET
C2**

Lesson Two Quizlet

Now that you have completed Lesson Two, lets see how much you learned.

*** Required**

First and Last Name *

After giving birth, a cow continues to produce milk for how many months? *

Select the best choice.

Mark only one oval.

- 7 months
- 8 months
- 9 months
- 10 months

How many cups does a milking machine contain? *

Select the best choice.

Mark only one oval.

- two
- four
- six
- eight

What steps must be performed before the milking machine can be attached to the teats? *

Select the correct order of steps.

Mark only one oval.

- dry, strip, dip
- strip, dry, dip
- dip, dry, strip
- dip, strip, dry

Where is milk stored after it is collected by the milking machines? *

Select the best choice.

Mark only one oval.

- separator
- milk tank
- bulk tank
- milk truck

After milking, milk can be stored for no more than how many hours? *

Select the best choice.

Mark only one oval.

- 24 hours
- 72 hours
- 48 hours
- 36 hours

T/F. Before milk can begin processing, a sample must be collected for testing. *

Check all that apply.

- True
- False

Which is the correct order for milk processing? *

Select the best choice

Mark only one oval.

- homogenization, pasteurization, separation
- pasteurization, homogenization, separation
- processing, separation, homogenization
- separation, processing, homogenization

T/F. To lactate is to secrete or produce milk. *

Check all that apply.

- True
- False

What is the last part of the teat where milk passes through called? *

Select the best choice.

Mark only one oval.

- udder
- streak canal
- teat
- oxytocin

What is the process of stirring and agitating cream to make butter called? *

Select the best choice.

Mark only one oval.

- forestripping
- churning
- separating
- pasteurizing

T/F. Most farmers are paid on the quality and composition of their milk. *

Check all that apply.

- True
- False

What two components separate in order to make cheese? *

Select the best choice.

Mark only one oval.

- lactose and sugar
- rennet and renin
- curds and whey
- curds and rennet

T/F. All cheese is processed the same. *

Check all that apply.

- True
- False

For every _____ on-the-farm jobs there are _____ beyond-the-farm jobs. *

Fill in the blanks.

Mark only one oval.

- 15, 22
- 22,10
- 10,15
- 10,22

Approximately how much money does the dairy industry contribute to California's economy every day? *

Select the best choice.

Mark only one oval.

- 10 million dollars
- 10 billion dollars
- 20 million dollars
- 20 billion dollars

Always look for the Real California Milk _____ when purchasing milk. *

Select the best choice.

Mark only one oval.

- carton
- seal
- sticker
- advertisement

T/F. Rennet is added to milk so curds can form to make cheese. *

Check all that apply.

- True
- False

The area on a dairy farm where milking is performed is called? *
Mark only one oval.

- parlor
- milk house
- holding pen
- streak canal

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APPENDIX C: QUIZLET C3

Google Form example of editing page, any updates made will automatically transfer to website

C4

Google Form example of response spreadsheet, displaying formula created to automatically grade quizlet.

	O	P	Q	R	S	T	U	V
1	For every _____ on-the-farm jobs there are _____ beyond-the-farm jobs.	Approximately how much money does the dairy industry contribute to California's economy every day?	Always look for the Real California Milk _____ when purchasing milk.	T/F. Rennet is added to milk so curds can form to make cheese.	The area on a dairy farm where milking is performed is called?	First and Last Name	Correct Points	Grade
2	10,22	20 million dollars	seal	TRUE	parlor			
3	10,22	20 million dollars	seal	TRUE	parlor	Perfect Student	18	100.00%
4							0	0.00%