
# The Effects of Instructional and Administrative Text Messages on Academic Achievement and Student Perception of Learning in a High School Food, Nutrition, and Wellness Classroom

**Sarah Moore**
University of North Georgia, USA

**Joshua Cuevas**
University of North Georgia, USA

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# The Effects of Instructional and Administrative Text Messages on Academic Achievement and Student Perception of Learning in a High School Food, Nutrition, and Wellness Classroom

**Sarah Moore, Joshua Cuevas**

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## Abstract

This study investigated the effects of instructional and administrative text messages on student academic achievement and sense of learning. Ninety-eight Food, Nutrition, and Wellness students in grades 9th through 12th were involved in this study. In this quasi-experimental study, there was an experimental group and a comparison group. Students in the experimental group received instructional and administrative text messages three times a week for a total of nine weeks. A one-way ANCOVA and independent samples t-test were used for data analyses. The study found a statistically significant difference in academic achievement and sense of learning with students in the experimental group scoring higher as compared to students in the control group. In addition, there was a statistically significant difference with females in the treatment group scoring higher than males in the treatment group.

## Introduction

Many schools throughout the United States have begun the inevitable task of integrating the use of cell phones into the classroom. Recent utilization of cell phone technology in schools has become an integral part of students' engagement and learning. One reason for this happening is because cell phones are beginning to be perceived as less of a disruption to learning and more of an educational tool that can possibly contribute to students' academic success (Gikas & Grant, 2013). According to Lenhart (2015), over 90% of teens will go online every day, with more than 20% being online regularly. One estimate suggests that, on average, the typical teenager today sends and responds to more than 100 text messages a day, with females using text messaging as a means of communication more so than their male counterparts (Smith, 2015). This study examines the effects of using text messaging as an instructional and administrative tool on student academic achievement and student perception of learning in the classroom.

## Cell Phone Technology in the Classroom

Due to the universal and versatile nature of cell phones, teachers of all age groups are beginning to incorporate them in the learning process. Wang and Shen (2012) recognized that smartphones are innovative educational

tools that, when mixed with different learning philosophies, have the capability to hasten deep learning. Integrating smartphone technology in the classroom can serve as an instructional tool because it provides opportunities for students to access the internet to research valuable and pertinent information for their classes. Ciampa (2013) asserted that students associate their mobile phone with elevated levels of motivation, self-respect, self-determination, and self-reliance, all of which can be powerful variables in the learning process, signifying that the use of cell phones in the classroom can enhance student learning.

Lu (2008) maintained that students enjoy learning from mobile devices due to their convenience and proximity, and Miller and Cuevas (2017) found that mobile phone use benefitted middle grades student motivation. Gasaymeh and Aldalalah stated that students feel comfortable and familiar using text messages as an educational tool in the classroom (2013). Moreover, Yang (2013) expressed that students had a positive experience learning and interacting with their mobile devices because they allowed for easy communication and collaboration with others. However, Hu (2013) argued the time frame for text message instruction should only last 30 seconds to no more than 10 minutes because of youths' limited attention spans. Gasaymeh and Aldalalah, however, suggested that the restricted number of characters the text messaging feature allows hinders certain aspects in the learning process and insisted that if text messaging is being used as an educational tool, then 2-way communication between teacher and student should be implemented (2013).

**Teenagers and Text Messaging**

Among teenagers today, 88% own a cell phone and use it to send text messages (Lenhart, 2015). According to Lenhart, the average number of text messages sent per day is 30, but females will average 40 text messages sent per day and females between the ages of 15 and 17 will average 50 text messages sent per day. Smith (2015) found that number to be much higher, reporting that adolescents on average send and receive over 110 text messages a day, which is about 3200 text messages per month. The Pew Research Center found that adolescents used the text messaging feature on their smart devices more than any other application (Smith, 2015). Indeed, teenagers have become highly dependent on their cell phones to communicate with their peers. Skierkowski and Wood (2012) examined how reliant adolescent peer groups have become on text messaging as a form of communication. Their study suggests a high degree of student anxiety during periods of text messaging restriction, indicating that this phenomenon has become a normal way of life among adolescents.

Cell phones and the text messaging that accompany them also have the ability to increase communication between teacher and student. Educational text messaging can be used as an anytime, anywhere mode of communication, even helping students to take advantage of free time when they are not in school (Gasaymeh & Aldalalah, 2013; Zhang, et al., 2011). Furthermore, adolescents see text messaging as their most reliable, comfortable, and preferred method of communication (Smith, 2015).

**Text Messaging and Student Perception of Learning**

Student perception of learning can be defined as feelings and beliefs about a learner's education in the

classroom (Rovai, 2002). Shea et al. reported a clear connection between teaching presence, which is defined as a genuine connection between teacher and student, and student perception of learning in the classroom (2006). Students reported increased sense of learning from teachers who exhibited teaching presence behaviors such as creating an environment with higher levels of explicit goals, instruction, directions, communication, engagement, positive climate, trust, collaboration, and support. Students may be more willing to learn content and become engaged in the classroom when text messages are used to communicate valuable information and increase support and collaboration. Text messages that are seen as instructionally relevant and conveying important knowledge can ultimately increase students' perception of learning (Rahamat et al., 2013).

Text messaging also aids in student-to-student interaction, student-to-teacher interaction, and student-to-content interaction (Faure & Orthober, 2011). In Faure and Orthober's study, the researchers focused on high school students' cell phone usage and more specifically whether students would use text messages as an effective instructional tool in and out of the classroom. Their results indicated that students will text each other about school-related material regardless of whether they received text messages from teachers, and 92% of the students who did receive text messages from their teachers found the information to be valuable.

In Cheon, et al.'s research (2012), students reported they valued the use of text messaging to support their learning and aid in the retention and understanding of key concepts. Students also favored the use of cell phones as instructional tools due to their ability for individualized learning opportunities outside the classroom. In another study, administrative text messages were used to improve overall communication between teachers and students (Naismith, 2007). The researcher found that students feel administrative text messages sent from staff members are relevant, time-sensitive, trustworthy, unambiguous, and selective.

**Text Messaging and Student Academic Achievement**

According to Gasaymeh and Aldalalah, text messaging as a learning tool can significantly increase students' academic achievement in the classroom (2013). McKnight et al. (2016) conducted a study that examined the use of text messaging as a vehicle for communicating with students to enhance student learning. The study took place at seven school sites where technology initiatives were already in place and where 90 percent of the teachers already felt comfortable using technology in their classroom. The five themes that emerged from this study about the use of cell phones and text messaging to communicate with students were that it

- enhances communication, collaboration, and provides instant feedback between teacher and student;
- improves access to resources anytime and anywhere, making it easier for students to be held accountable for their learning;
- provides teachers with an avenue to spend less time on mundane tasks and more time supporting and instructing their students individually;
- gives students value and purpose as well as promotes critical thinking and questioning skills;
- shifts traditional teacher and student roles requiring new skills to continuously be built upon by both teacher and student.

Hu (2013) asserted that text messaging has the ability to engage students in acquiring educational knowledge, making this feature of cell phones a useful intermediary device between teacher and student in the learning process. In Lu's (2008) study, researchers used text messaging as an instructional tool to measure its effectiveness on English vocabulary gain among Taiwanese high school students. Lu found that students who received text messages had greater vocabulary gains compared to students who used paper materials. Similarly, Basoglu and Akdemir (2010) investigated whether mobile learning improved vocabulary acquisition among college students. Their research found the mean score from the posttest of the experimental group was statistically higher than the mean score of the control group, thus indicating that learning vocabulary through mobile devices increased student academic achievement.

Idrus (2013) examined reading comprehension instruction through the use of text messages with college students enrolled in an English proficiency course. The results from the study suggested that students who participated performed better on their reading comprehension in comparison to students who did not participate, demonstrating that due to the flexibility of mobile technology, students can take ownership of their learning needs to achieve higher academic standing in the classroom. Overall, Idrus found that integrating mobile technology into the classroom can improve overall student success.

One study used instructional and administrative text messages to support teaching and learning in the classroom (So, 2016). Administrative text messages such as reminders about due dates for projects were sent to one group, and instructional text messages such as videos and imagery of content were sent to the other group. Even though administrative text messages were found to be helpful, results indicated that students who received instructional text messages scored better than students only receiving administrative text messages. This is consistent with other research suggesting that the use of visuals and images can greatly benefit learning (Cuevas, 2016; Cuevas & Dawson, 2018), and text messages allow for such tools to be shared with students. Regardless, after the text messaging intervention took place (So, 2016), students in both groups scored significantly better than they had before receiving the intervention, suggesting that sending students instructional as well as administrative text messages is beneficial for student learning.

However, when not used for academic purposes, text messaging has been shown to be detrimental to student learning. Clayson and Haley (2013) examined the effects of text messaging and multitasking on classroom performance and found that students who received and sent more text messages in class made lower grades. Their results indicated that students will text in class out of boredom or to communicate with their friends and that 94% of students received text messages in class, while 86% of students sent text messages in class. Their study also suggested that even when students are in classes where texting is not allowed, they text anyway. Likewise, students who receive numerous text messages a day are less likely to participate and read the text messages their teachers send them (Zhang, et al., 2011). Lister-Landmad et al. similarly found teenagers' compulsive texting was significantly related to low grades, low school bonding, and low perceived scholastic competence (2017). In addition, females' level of compulsive texting was significantly higher than males'. In another study, researchers used a large sample size and found that texting and cell phone use in the classroom were negatively linked to GPA and positively linked to anxiety, therefore suggesting that student mobile phone

use can negatively influence academic achievement and mental health (Lepp, et al., 2014).

**Summary of Literature**

Cell phones and text messaging have become an integral part of most teenagers' lives today. Adolescents have made it clear that text messaging is their preferred method of communication due to cell phone convenience, portability, and ease of use. Indeed, the use of cell phones and text messaging have become a customary part of everyday life for teenagers, even to the point of increased levels of anxiety when students are separated from their cell devices. Researchers have argued for increased integration of cell phone technology and text messaging into the classroom. Some studies have shown that text messaging can increase academic achievement and perception of learning when implemented in meaningful ways, though some suggest it has been detrimental in some circumstances. Even though these findings suggest positive outlooks for the use of cell phone technology and text messaging in the classroom, it provides more of a challenge in school districts where cell phone technology is limited. In education, text messaging has the potential to become an essential educational tool in and out of the classroom because of its ubiquitousness, permitting for all kinds of different learning to occur anytime and anywhere. However, what remains unclear is the *best* way to incorporate the use of cell phones and text messaging technology into the learning environment.

**Research Questions**

The use of cellphones as communication devices in today's society is manifest. According to the Pew Research Center, 46% of smartphone owners reported that they could not imagine living their life without their smartphone (Smith, 2015). This is especially notable among high school students, who use their phones to search for information, perform mathematical computations, and maintain communication with others. Further, some researchers suggest that female students text more than their male counterparts and are at a higher risk for smartphone addiction (Leung, 2008). Even though research has shown that females text more than males, little research has been done to understand if reliable effects on academic achievement in the classroom exist.

Teenagers see text messaging as a preferred method for communicating. Instead of passing notes in class, students are sending text messages. Indeed, cellphone use and the text messaging that accompanies their use are considered normal behaviors among teenagers in today's high school classroom. All high school educators have to do is look around their classroom to see that the majority, if not all, of their students possess a cellphone. Moreover, as educational institutions begin to accept the normalcy of cellphone use in the classroom as well as realize their potential for learning, more and more teachers are being asked to incorporate cellphone technology as an instructional tool to support academic learning (Thomas, et al., 2013). Because of their societal acceptance for communicating with others as well as their potential use as a practical tool to support learning, it is important that research be conducted in order to understand the effects cellphone technology has on academic achievement and student perception of learning.

RQ1. Is there a difference in academic achievement between students who receive instructional and

administrative text messages and students who do not receive instructional and administrative text messages enrolled in a high school Food, Nutrition, and Wellness class?

RQ2. Is there a difference in academic achievement between students who receive instructional and administrative text messages and students who do not receive instructional and administrative text messages enrolled in a high school Food, Nutrition, and Wellness class based on gender?

RQ3. Is there a difference in student perception of learning between students who receive instructional and administrative text messages and students who do not receive instructional and administrative text messages enrolled in a high school Food, Nutrition, and Wellness class?

## Method

### Contextual Factors

The study took place in a public high school located north of Atlanta, Georgia. In 2017, the district had 46,574 students with a demographic makeup comprised of 62.11% White, 17.56% Asian, 13.30% Hispanic, 3.64% Black, 2.92% Multi-race, .42% American Indian/Alaskan, and .06% Pacific Islander. Deviating slightly from the district, the school population consisted of 2,312 students with a demographic makeup consisting of 66.22% White, 23.88% Hispanic, 3.46% Black, 3.16% Asian, 2.81% Multi-race, .39% American Indian/ Alaskan, and .09% Pacific Islander.

The participants in this study included 9$^{th}$ through 12$^{th}$ grade high school students enrolled in a food, nutrition, and wellness class and ranged in ages from fourteen to eighteen years old. Participants in the study represented differing groups of students including special education, English language learners, gifted, and on-level. Four food, nutrition, and wellness classes were involved in this study. There were two classes in the experimental group and two classes in the comparison group. One morning class and one afternoon class were selected to be in the comparison group and one morning class and one afternoon class to be in the experimental group. There were 98 students involved in this study with 51 being male and 47 being female. Participants included 28 freshmen, 43 sophomores, 26 juniors, and 1 senior. The food, nutrition, and wellness course is the first of three courses in the nutrition and food science pathway and focuses on teaching healthy eating habits and lifestyles by investigating the interrelationships of food and nutrition. Although this is not a required course, students can sign up out of interest in the content and skills.

### Materials and Measures

*Materials*

This study used text messages as the intervention which was sent to participants using an application called Remind. Remind is a Short Messaging Service (SMS) application that allows for one-way communication from teacher to student using cellphone technology. Students received text messages on Mondays, Tuesdays, and Fridays. Two types of text messages were sent: instructional and administrative. Instructional text messages included text, videos and imagery of relevant in-class information that reviewed content covered in the unit such as a vocabulary word, the definition of the word, and a picture that helped to explain the word. Other

instructional text messages included videos linked to YouTube that demonstrated baking and cooking techniques as well as how to successfully complete recipes. Administrative text messages served to help students remember due dates for classroom assignments and materials they needed to bring to class on lab days such as a list of their group's special ingredients for the annual high school Grilled Cheese Throw-Down. Another example of an administrative text is an attachment of a diagram of cuts of meat to study for an upcoming quiz (For further examples of how the text messages appeared, please see Appendix A).

The unit was broken down into three sections: quick breads, yeast breads, and meat and meat products. The unit followed Standard 10 taken from the Georgia Standards of Excellence for Family and Consumer Sciences Education. The specific standard for this unit was: *Demonstrate the selection, storage, and cooking techniques for grains, starches, meat and meat products*. All lesson plans included notes, videos, imagery, hands-on activities, projects, and cooking labs about the specific content in the standard.

*Measures*

There was one academic assessment involved in this study: a pretest and posttest. Both the pretest and posttest contained 40 items prepared by the teacher and was given to the participants to assess knowledge before and after treatment. This pre and post teacher-made assessment was used to measure academic achievement. The teacher-made pre and post assessment was created to follow standard 10 from the Georgia Standards of Excellence for Family and Consumer Sciences Education and contained 40 multiple choice questions covering information over quick breads, yeast breads, and meat and meat products. Students took their test online via itsLearning, a district instructional and assessment management program, using a school Chromebook (Please see Appendix B for a copy of the unit test.) Assessment scores of students in the gifted, special education, and English to Speakers of Other Languages (ESOL) programs were included in the statistical analyses. However, students with very limited English abilities in the ESOL program were excluded from the analyses. Students in this category are normally students who have been in the country for less than one year and have very limited understanding of the English language. Students who had severe physical and mental disabilities that would impact their ability to complete the assessment materials were also excluded from this study.

A classroom community scale developed by Rovai (2002) was given to participants in both groups as a pre and post assessment to measure student perception of learning in the course. The questionnaire was created to measure for sense of connectedness and sense of learning in a school setting. In this study, the questionnaire was abridged so that only questions pertaining to sense of learning were used in the pre and post assessment. The sense of learning subscale uses a 5-point Likert-type scale consisting of 10 questions with the choices of strongly agree, agree, neutral, disagree, and strongly disagree. Questions 1, 3, and 8 are positively worded and were scored using the following scale: Strongly Agree = 4, Agree = 3, Neutral = 2, Disagree = 1, and Strongly Disagree = 0. Questions 2, 4, 5, 6, 7, 9, and 10 are negatively worded and were scored using the following scale: Strongly Agree = 0, Agree = 1, Neutral = 2, Disagree = 3, and Strongly Disagree = 4. Scores range from 0 to 40 with a higher score indicating a stronger sense of classroom community for the construct of sense of learning. The classroom community scale has a Cronbach's Alpha of .87 for the sense of learning subscale,

indicating it is a reliable measure (To view the survey items and scoring guide, please see Appendices C and D).

**Procedures**

*Group Assignment*

This quasi-experimental study was conducted with participants being drawn from the Food, Nutrition, and Wellness classes at one high school. A quasi-experimental design is the preferred research method when the researcher has no control in creating the groups because students have been preassigned to classes before school starts. In this study, there was an experimental group and a comparison group. The experimental group was comprised of students in two classes and the comparison group was comprised of students in two different classes. Students in the experimental group were asked to download the REMIND application to their smartphone. The REMIND app is a free and safe messaging tool for educators to use to send students information about class while keeping personal contact information private. Smartphones were not necessary in this study as long as the student had the text messaging feature.

*Experiment*

This study took place for nine weeks and covered information from one unit of the Food, Nutrition, and Wellness course that covers quick breads, yeast breads, and meat and meat products. In week one, students in the experimental group signed up for the REMIND app to receive the text messages and all students in the comparison and experimental groups took the unit pretest and classroom community subscale survey for sense of learning. During weeks two and three, the instruction covered quick breads with a lab for this section. For weeks four and five, the teacher covered yeast breads with a lab for this section. For weeks six, seven, and eight, the teacher covered meat and meat products with a lab for this section. During week nine, all students in the experimental and comparison groups took the unit posttest and the classroom community subscale for sense of learning.

Students in both the comparison and experimental groups received the same curriculum, lesson plans, activities, projects, and tests with the exception of the experimental group receiving the text messaging intervention. Text messages were sent using the REMIND application three times a week beginning week two and ending week eight. The text messages consisted of instructional and administrative in-class information. Instructional text messages such as videos, imagery, and text were sent twice a week and administrative text messages like reminders about classroom materials for lab days were sent once a week. Students were not able to respond back to the text messages.

## Results

Out of 128 students, 102 returned the consent form signed by their parents. In the experimental group, 50 signed up for the REMIND application and took the pre and post unit 5 achievement test and sense of learning survey, $n = 50$. In the control group, 48 students took the pre and post unit 5 achievement test and sense of learning

survey, $n$ = 48. The total number of participants involved in the study was $N$ = 98. An ANCOVA and independent samples t-test were used to measure if a difference occurred in academic achievement and sense of learning.

Research question one asked, "Is there a difference in academic achievement between students who receive instructional and administrative text messages and students who do not receive instructional and administrative text messages enrolled in a high school Food, Nutrition, and Wellness class?" A one-way ANCOVA was run to determine if there was a statistically significant difference in academic achievement between the treatment group who received instructional and administrative text messages for 7 weeks and the control group who did not receive instructional and administrative text messages. The post test was used as the dependent variable and the pretest was used as the covariate. The posttest scores for the treatment group were greater ($M$ = 87.70, $SD$ = 8.21) than the comparison group ($M$ = 82.35, $SD$ = 10.03) (see Table 1). After controlling for unit 5 pretest scores, there was a statistically significant difference in unit 5 posttest scores between the groups, $F(1, 95)$ = 10.037, $p$ = .002, partial η2 = .096 with the experimental group significantly outperforming the control group.

Table 1. Descriptive Statistics for Unit 5 Academic Achievement Posttest (N = 98)

| | Experimental ($n$ = 50) | | Control ($n$ = 48) | |
|---|---|---|---|---|
| Variable | *M* | *SD* | *M* | *SD* |
| Unit 5 Posttest | 87.70 | 8.21 | 82.35 | 10.03 |

Research question two asked, "Is there a difference in academic achievement between students who receive instructional and administrative text messages and students who do not receive instructional and administrative text messages enrolled in a high school Food, Nutrition, and Wellness class based on gender?" An independent samples t-test was run to determine if there was a statistically significant difference between females and males in the treatment group on the pretest and posttest. Females' pretest scores were higher ($M$ = 57.42, $SD$ = 9.70) compared to male pretest scores ($M$ = 53.31, $SD$ = 13.28) but were not significantly different, $t(48)$ = 1.241, $p$ = .221 (see Table 2). In regards to the posttest, female scores showed a statistically significant difference ($M$ = 90.33, SD = 6.70) compared to male posttest scores ($M$ = 85.27, SD = 8.83), $t(48)$ = 2.270, $p$ < .028 (see Table 3). Thus, females in the experimental group showed significantly greater academic growth than males in the experimental group who received the same mobile intervention.

Table 2. Descriptive Statistics for Unit 5 Academic Achievement Pretest (N = 50)

| | Female ($n$ = 24) | | Male ($n$ = 26) | |
|---|---|---|---|---|
| Variable | *M* | *SD* | *M* | *SD* |
| Unit 5 Pretest | 57.42 | 9.70 | 53.31 | 13.28 |

Table 3. Descriptive Statistics for Unit 5 Academic Achievement Posttest (N = 50)

| | Female ($n$ = 24) | | Male ($n$ = 26) | |
|---|---|---|---|---|
| Variable | *M* | *SD* | *M* | *SD* |
| Unit 5 Posttest | 90.33 | 6.70 | 85.27 | 8.83 |

Research question three asked, "Is there a difference in student perception of learning between students who receive instructional and administrative text messages and students who do not receive instructional and administrative text messages enrolled in a high school Food, Nutrition, and Wellness class?" The data were analyzed using ANCOVA with the comparison and treatment groups as the grouping variable, the post survey score was the dependent variable, and the pre-survey score was the covariate. The posttest scores for the treatment group ($M$ = 31.32, $SD$ = 4.11) and the posttest scores for the comparison group ($M$ = 28.52, $SD$ = 3.63) can be found on Table 4. After controlling for sense of learning pretest scores, there was a statistically significant difference in sense of learning posttest scores between the groups, $F(1, 95) = 4.658$, $p = .033$, partial $\eta 2 = .047$. Again, the students in the experimental group showed a significantly greater increase in their sense of learning.

Table 4. Descriptive Statistics for Post Sense of Learning Survey (N = 98)

| | Experimental ($n$ = 50) | | Control ($n$ = 48) | |
|---|---|---|---|---|
| Variable | *M* | *SD* | *M* | *SD* |
| Post Sense of Learning | 31.32 | 4.11 | 28.52 | 3.63 |

## Discussion

The purpose of this quasi-experimental study was to determine if instructional and administrative text messages enhanced student academic achievement and sense of learning in a high school food, nutrition, and wellness course. Participants attended a public high school located in north Georgia and included 9th through 12th grade students. All ability levels such as gifted, on-level, SPED, and ESOL were involved in this study. Students who had severe mental and physical disabilities along with ESOL students who had been in the country for less than one year were excluded from data analyses.

In this study, the independent variables were the instructional and administrative text messages, and the dependent variables were student academic achievement and sense of learning. The overall goal of this experiment was to determine if instructional and administrative text messages can be used as an effective learning tool in the classroom. Another primary goal of this experiment was to determine if instructional and administrative text messages enhance student perception of learning. This study is relevant to current educational practice due to the increasingly popular demand and ubiquitous nature of text messaging and cell phone technology being used in mainstream classrooms today.

The results from the study showed a statistically significant difference in academic achievement between groups, with students in the treatment group scoring higher than students in the comparison group on the posttest. Based on the design of the study, we can infer that the intervention had a beneficial effect on students' learning and that the enhanced performance of the experimental group was due to the use of the technology. This is a promising outcome considering that according to the Pew Internet and American Life Project, 70% of high school students will use their cellphone to text regarding school work (Lenhart, et al., 2010).

In addition, texting is the most used and is viewed as the most valuable application on their smart device (Abas, et al., 2009). Using text messages in a school setting allows teachers and students to reach each other quickly. The findings from this study support students' use of instructional and administrative text messaging to communicate, collaborate, and engage in class content with their teachers. Teachers can use this effective method of communication to remind students about upcoming due dates, share useful resources, announce that grades have been posted, and make any necessary announcements or changes about class.

As for gender and academic achievement, the findings showed a statistically significant difference in that female students in the treatment group scored higher than male students in the treatment group on the posttest. The Pew Research Center found that female students want to be in contact more frequently with peers and strive to nurture relationships through text messages more than male students who in general use their cellphones to exchange information (Lenhart, et al., 2010). Similarly, the results in this study showed that female students used their cellphones to better effect than did male students for academic purposes.

This study also showed a statistically significant difference in sense of learning between the comparison and experimental group, indicating that text messages did impact sense of learning for these students. These findings support other studies that suggest when students are actively interacting, communicating, and putting forth effort within a course, their overall sense of learning increases (Sadera, et al., 2009). In addition, Rovai (2002) asserts when teachers promote positive learning environments, students earn better grades and score higher on assessments.

## Limitations

This study had several limitations. Of the 50 students who signed up for the REMIND application, 47 students regularly read the text messages. A lack of student desire to read the text messages, even if the number is small, could have contributed to the small effect size that resulted in academic achievement and sense of learning. One student did not have a phone for the experiment and provided an email address instead. Even though the text messages were sent to the email address, there was no way to check if the student read the messages. Thus, as widespread as mobile technology currently is, there were still some inequities in the delivery of the treatment. Another limitation is the novelty effect where students in the experimental group scored higher on the posttest because they *felt* they were given a special advantage by receiving the treatment over the students in the control group who were not receiving the treatment.

## Implications and Future Research

This study used a teacher-made pre and post assessment to measure for academic achievement and the Classroom Community Scale to measure for sense of learning. The findings for academic achievement were shown to be statistically significant in that the treatment group scored higher on the posttest than the comparison group, thus indicating that sending instructional and administrative text messages about food, nutrition, and wellness increased their academic achievement. The findings for sense of learning were shown to be statistically significant in that the treatment group scored higher on the post survey than the comparison group, thus indicating that the instructional and administrative text messages did increase perception of learning. The results from this study support research that claimed most high school students will use instructional and administrative text messaging to support their learning of key concepts, interaction, and communication (Motiwalla, 2007).

Cellphone technology and the use of instructional and administrative text messaging need to be researched and studied further. A similar experiment lasting longer than a 9-week time frame is recommended to better understand the effects of text messaging on academic achievement and sense of learning. A second recommendation is replicating a similar study in a core or mandatory course to determine if academic achievement and sense of learning increase in a required environment. This study had an overwhelming underclassmen population. With that said, a third recommendation would be to implement a similar experiment in the elementary and middle grades levels to determine if instructional and administrative text messaging is successful with younger populations in school systems. Lastly, conducting a similar experiment that measures and incorporates sense of learning and sense of connectedness is recommended to explore and better comprehend classroom community.

## Conclusion

Considering that recent research has increasingly shown educational benefits of technological interventions (Asigigan & Samur, 2021; Doster & Cuevas, 2021; Talan, 2021), it is worthwhile to continue to explore the possibilities, and mobile devices may be among the most practical and accessible options. This study used text messages to increase student academic achievement and perception of learning in a high school food, nutrition, and wellness course. The results from the study showed that instructional and administrative text messages did increase academic achievement and females did score higher than their male counterparts. These findings demonstrate that text messages can be useful and effective learning tools in the classroom and that females use their cellphones for academic purposes more than males. The results also showed a statistically significant difference in sense of learning, indicating that sending text messages to students did increase student perception of learning. These findings demonstrate that when students feel their teachers are presenting them with text messages about relevant in-class information, their knowledge and overall sense of learning increases. Further research needs to be conducted to fully explore the effects of instructional and administrative text messaging on academic achievement and perception of learning.

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## Author Information

**Sarah Moore**

https://orcid.org/0000-0002-1423-7397

University of North Georgia

3820 Mundy Mill Rd. Oakwood, GA 30566

USA

**Joshua A. Cuevas**

https://orcid.org/0000-0003-3237-6670

University of North Georgia

3820 Mundy Mill Rd.

Oakwood, GA 30566

USA

Contact e-mail: *josh.cuevas@ung.edu*

# Appendix A. Text Messages

## Week 2 & 3 Text Messages

**LEAVENING**

- There are two types of leavening agents- chemical leaveners (baking soda & baking powder) and yeast

**QUICK BREADS**

- Quick breads are baked products that are leavened chemically.
- Quick breads may begin in the form of either a dough or batter.

**Quick Bread Characteristics**

- Overmixing results in too much gluten making the finished product tough or chewy.
- Products that are overmixed are also likely to form holes or tunnels inside and be poorly shaped.

**The Biscuit Method**

- Combines dry ingredients first
- Then solid shortening is "cut in" or mixed with dry ingredients until it breaks into small pieces.

- Finally, the liquid ingredients are added and mixed in only long enough to combine with other ingredients.

**Muffins**

- The biggest difference in preparing muffins from biscuits, is the fat used in the recipe is usually in liquid form- either liquid shortening (like oil) or solid shortening that is melted (like melted butter)

**Fritters**

- Are small individual fried pastries (beignets).

**CREPES**

- Is a very thin pancake.
- It can be used a savory item, dessert item or at breakfast.

**PATE A CHOUX**

- Is the paste or thick batter used to make cream puffs and eclairs.

**Week 4 & 5 Text Messages**

## Liquid Temperature

- Liquids at temperatures over 138°F may kill the yeast organism rendering it ineffective.

## Mixing & Kneading Dough

- Kneading, or repeatedly folding and pressing the dough after it is mixes, is done to develop gluten.

## GLUTEN

- Protein that gives dough its structure and elasticity.
- The more the dough is kneaded, the more gluten is developed.

## FERMENTATION

- The "first rise"
- Considered complete when the dough doubles in size.

## Proofing

- Yeast dough is allowed to rise after it is shaped and before it is baked, which is called proofing (2nd rise).

## WASH

- The most common wash is beaten eggs, which gives the finished bread a deep brown color and glossy finish.

## Baking

- During baking, Yeast is killed, moisture evaporates, and the starches and gluten in the dough become firm.

## Baking

- Most bread is best stored at room temperature.
- Baked breads can be frozen for long-term storage.

## QUICK BREADS & YEAST BREADS

- Click on the link to watch a short clip about the History of Bread.
- https://www.youtube.com/watch?v=qylxpwNhFYI

**Week 6, 7, & 8 Text Messages**

GRILLED CHEESE THROW-DOWN

- **Don't forget to bring your ingredients for your grilled cheese throw-down this week!**

MEAT COMPOSITION

- Cuts of meat are a combination of:
  - Muscle
  - Connective tissue
  - Fat
  - Sometimes bone

MUSCLE- 75% WATER

- The lost of water during the cooking process is called shrinkage.

muscle= Protein

- Protein gives cooked meats much of their texture, nutrients and flavor.

Connective Tissue

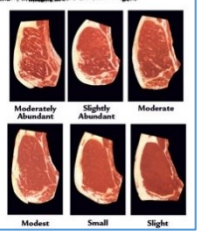
- There are two types of connective tissue that are important to chefs—elastin and collagen.

Fat

- Fat provides the moisture, tenderness and flavor to meats.

MARBLING

- Makes certain cuts more tender, juicy and flavorful.




Aging

- Is the time meat is allowed to rest after slaughter.

Rigor Mortis

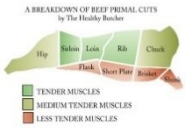
- Is when **muscle tissue temporarily becomes extremely hard and stiff.**

Inspection & Grading

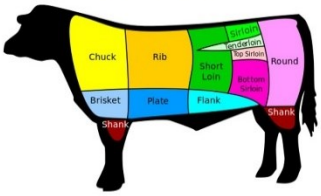
- Inspection is mandatory and grading is voluntary.


Determining Cooking Method

- Cuts of meat are categorized as tough or tender. Tough cuts have more connective tissue than tender cuts.



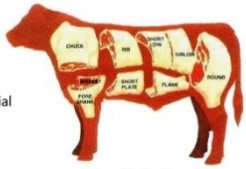

Beef




Beef grading

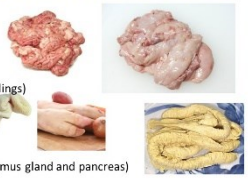
- Prime*
- Choice*
- Select*
- Standard
- Commercial
- Utility
- Cutter
- Canner

*Grades most commonly used in foodservice



OFFAL MEATS

- Brains
- ears
- feet (trotters)
- hearts
- intestines (chitterlings)
- kidneys
- liver
- marrow
- stomach (tripe)
- sweet breads (thymus gland and pancreas)
- tails



TEST!

- **Quick Breads, Yeast Breads, Meat and Meat products Test this week! Look over your study guide.**

# Appendix B. Unit Test

**Quick Breads, Yeast Breads and Meat and Meat Products Test**

**Multiple Choice:**

1. The following are all examples of quick breads except….
    a. Pizza Dough
    b. Pancakes
    c. Biscuits
    d. Muffins

2. Yeast dough needs to be punched in order to…
    a. Make it taste better
    b. Release some of the carbon dioxide
    c. So the dough will be extra chewy
    d. To help make the dough rise quicker

3. All of the following are true about fermentation except:
    a. Is best done in a warm place with no drafts.
    b. Called the 1st rise.
    c. Called the 2nd rise.
    d. Considered complete when the dough doubles in size.

4. An example of a common yeast dough shape is:
    a. Cloverleaf
    b. Crescent
    c. Baguette
    d. All of the following are examples of common yeast dough shapes.

5. Meat is made up of all the following except:
    a. Sometimes bone
    b. connective tissue
    c. fat
    d. muscle
    e. All of the following are correct

6. Aging is defined as…
    a. Time meat is allowed to rest after slaughter.
    b. When muscle tissue temporarily becomes extremely hard and stiff.
    c. Inspection and grading performed by the USDA.
    d. Strands of muscle tissue that tend to run in the same direction giving each muscle a grain.

7. Active Muscles are:

a. Tender

b. Usually found on the belly

c. Usually found on the back

c. Tough

8. Grading of meats are based on what 3 factors?

a. Marbling, Maturity, Muscle Conformation

b. Marbling, Collagen, Aging

c. Connective Tissue, Fat, Aging

d. Rigor Mortis, Elastin, Bone

9. Liquids at temperatures over _____ F may kill the yeast organism rendering it ineffective.

a. 110

b. 128

c. 130

d. 138

10. The most common wash (for yeast breads) is _____.

a. milk

b. water

c. egg

d. butter

11. Yeast is killed in…

a. cold temperatures

b. warm temperatures

c. hot temperatures

12. During fermentation, yeast produces…

a. Carbon Dioxide

b. Hydrogen

c. Oxygen

d. Helium

13. What is the main difference between a quick bread and a yeast bread?

a. The type of flour that is used

b. The type of liquids that are used

c. The type of leavening agents that are used

d. The type of fat that is used

14. What is gluten?

    a. The fat found in flour

    b. The protein found in flour

    c. The carbohydrate found in flour

    d. The connective strand found in an egg

15. How many times does a yeast bread rise?

    a. 1

    b. 2

    c. 3

    d. 4

16. Which of the following provides leavening to quick breads?

    a. Baking soda

    b. Creaming and Mixing

    c. Baking Powder

    d. A and C

17. Which of the following indicates over mixing muffin batter?

    a. Muffins with tunnels or big holes

    b. Muffins that peak at the top rather than rounded

    c. Muffins with an even crumb

    d. B and C

18. Which one is true about the muffin method?

    a. the fat used in the recipe is usually in liquid form

    b. mixing should be kept to a minimum

    c. solid shortening is “cut in” or mixed with dry ingredients until it breaks into small pieces

    d. A and B

19. The kitchen utensil you use to “cut in” is called a _____.

    a. sifter

    b. sieve

    c. strainer

    d. pastry blender

20. A _____ is a paste or thick batter used to make scones and fritters.

a. Pate a choux

b. Crepe

c. Muffin

d. Biscuit

21. The main ingredient in muscle is _____.

a. protein

b. water

c. bone

d. connective tissue

22. Yeast is a

a. Chemical

b. Animal

c. Poison

d. Microorganism

23. Which one is **not** true about fermentation:

a. Fermentation is generally considered complete when the dough doubles in size.

b. When carbohydrates are consumed by yeast, alcohol and carbon dioxide are released.

c. Is best done in a warm place with no drafts.

d. When yeast dough is allowed to rise after it is shaped and before it is baked.

24. Which about proofing is **not** true:

a. When carbohydrates are consumed by yeast, alcohol and carbon dioxide are released.

b. When yeast dough is allowed to rise after it is shaped and before it is baked.

c. Dough can also be proofed in a warm place covered with a clean towel.

d. Creates volume and texture of the finished bread.

25. Define “Punch Down” when working with yeast bread:

a. The production of carbon dioxide by yeast.

b. Manipulating the dough with the palm of your hand.

c. Putting your fist in to the dough to allow the carbon dioxide to escape.

d. Quick rise of bread the first 10-12 minutes in the oven.

26. Define Kneading:
    a. Quick rise of bread the first 10-12 minutes in the oven.
    b. Putting your fist in to the dough to allow the carbon dioxide to escape.
    c. Manipulating the dough with the palm of your hand.
    d. Allowing the dough to rise.

27. Yeast is _____.
    a. A living microorganism
    b. An alkaline powder
    c. A type of quick bread
    d. A type of chemical leavener

28. A crepe is…
    a. A thick batter used to make cream puffs
    b. A think pancake
    c. A type of fried pastry
    d. Individual pastries similar to cupcakes

29. Meat is defined as…
    a. Small white visible flecks of fat
    b. A flexible but tough connective tissue found in ligaments and around tendons (Sometimes called silver skin)
    c. Beef, Veal, Lamb, Pork
    d. The loss of water during the cooking process

30. Marbling is defined as…
    a. Brain, kidney, tongue, heart, stomach, etc.
    b. Beef, Veal, Lamb, Pork
    c. Small white visible flecks of fat throughout meat
    d. A flexible but tough connective tissue found in ligaments and around tendons (Sometimes called silver skin)

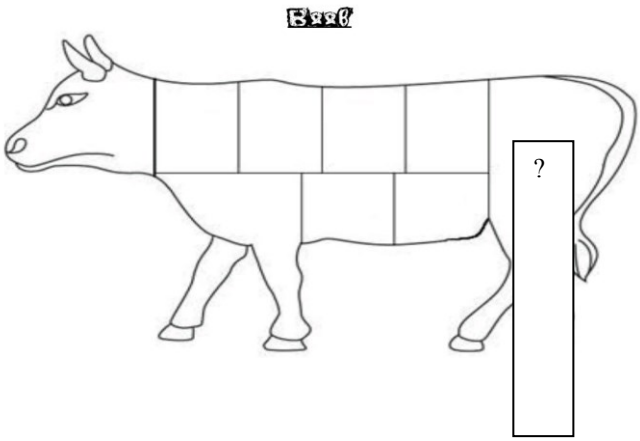
31. Offal Meats are defined as…
    a. The loss of water during the cooking process
    b. Brain, kidney, tongue, heart, stomach
    c. Small white visible flecks of fat throughout meat
    d. A flexible but tough connective tissue found in ligaments and around tendons (Sometimes called silver skin)

32. Shrinkage is defined as…
    a. Small white visible flecks of fat throughout meat.
    b. The loss of water during the cooking process.
    c. A flexible but tough connective tissue found in ligaments and around tendons. (Sometimes called silver skin)
    d. Beef, Veal, Lamb, Pork

33. Elastin is defined as…
    a. Brain, kidney, tongue, heart, stomach, etc.
    b. A flexible but tough connective tissue found in ligaments and around tendons. (Sometimes called silver skin)
    c. The loss of water during the cooking process
    d. Small white visible flecks of fat throughout meat

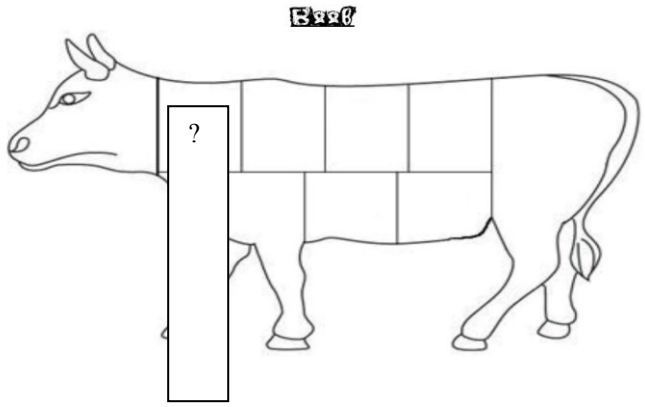
34. The two type of chemical leaveners are:
    a. Chemical and Yeast
    b. Baking Soda and Yeast
    c. Baking Powder and Yeast
    d. Baking Soda and Baking Powder

35. Label the primal cut on the cow that has a question mark on it:



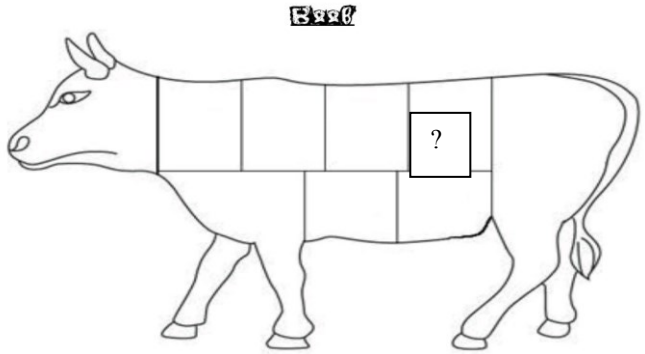

a. Shank
b. Sirloin
c. Plate
d. Round

36. Label the primal cut on the cow that has a question mark on it:



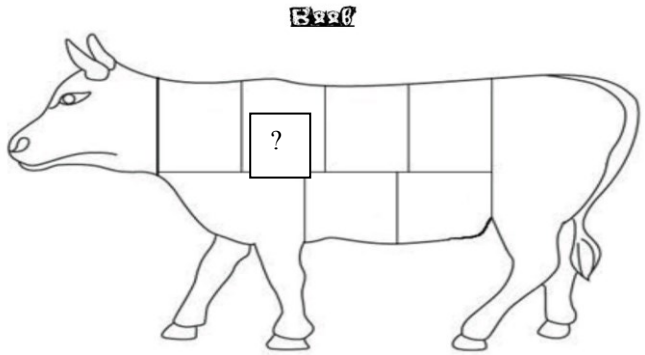

a. Rib
b. Chuck
c. Round
d. Loin

37. Label the primal cut on the cow that has a question mark on it:



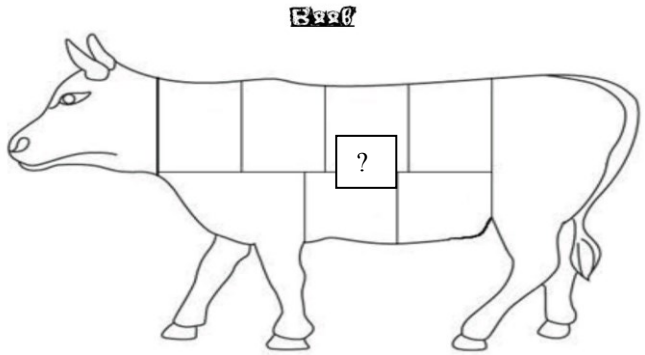

a. Rib
b. Sirloin
c. Plate
d. Flank

38. Label the primal cut on the cow that has a question mark on it:



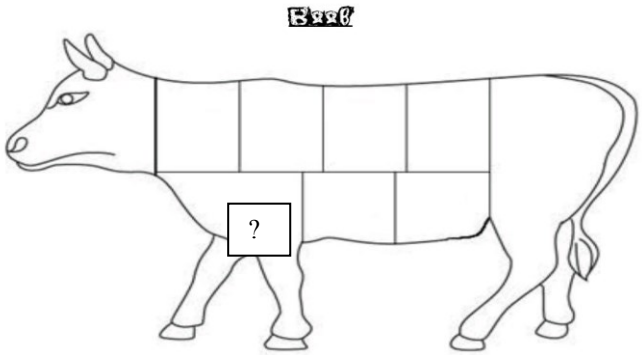

a. Round
b. Chuck
c. Rib
d. Loin

39. Label the primal cut on the cow that has a question mark on it:




a. Loin
b. Round
c. Brisket
d. Chuck

40. Label the primal cut on the cow that has a question mark on it:




a. Sirloin
b. Shank
c. Flank
d. Brisket

## Appendix C. Classroom Community Scale

Directions:

You will see a series of statements concerning the food, nutrition, and wellness course you are enrolled in. Read each statement carefully and select the response that comes closest to indicating how you feel about the course. (strongly agree, agree, neutral, disagree, strongly disagree). There are no correct or incorrect responses. If you neither agree nor disagree with a statement or are uncertain, select the neutral response. Do not spend too much time on any one statement, but give the response that seems to describe how you feel. Please respond to all items.

| **In the course…** | | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 1 | I feel that I am encouraged to ask questions. | **0** | **1** | **2** | **3** | **4** |
| 2 | I feel that it is hard to get help when I have a question. | **0** | **1** | **2** | **3** | **4** |
| 3 | I feel that I receive timely feedback. | **0** | **1** | **2** | **3** | **4** |
| 4 | I feel uneasy exposing gaps in my understanding. | **0** | **1** | **2** | **3** | **4** |
| 5 | I feel reluctant to speak openly. | **0** | **1** | **2** | **3** | **4** |
| 6 | I feel that this course results in only modest learning. | **0** | **1** | **2** | **3** | **4** |
| 7 | I feel that other students do not help me learn. | **0** | **1** | **2** | **3** | **4** |
| 8 | I feel that I am given ample opportunities to learn. | **0** | **1** | **2** | **3** | **4** |
| 9 | I feel that my educational needs are not being met. | **0** | **1** | **2** | **3** | **4** |
| 10 | I feel that this course does not promote a desire to learn. | **0** | **1** | **2** | **3** | **4** |

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## Appendix D. Classroom Community Scale Scoring Key

CCS raw scores vary from a maximum of 40 to a minimum of zero. Interpret higher CCS scores as a stronger sense of classroom community for the construct of learning. Score the test instrument items as follows:

- For items: 1, 3, 8; weights:
  Strongly Agree = 4, Agree = 3, Neutral = 2, Disagree = 1, Strongly Disagree = 0

- For items: 2, 4, 5, 6, 7, 9, 10; weights:
  Strongly Agree = 0, Agree = 1, Neutral = 2, Disagree = 3, Strongly Disagree = 4

- Add the weights of all 10 items to obtain the overall CCS score.