

STATISTICAL LITERACY UNM MATH 1300: FIRST YEAR RESULTS

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Abstract:

In fall 2021, Statistical Literacy (Math 1300), was first offered by the Mathematics and Statistics Department at the University of New Mexico (UNM). This course is designed for students in non-quantitative majors: majors that do not require a particular mathematics course. Math1300 is different; it is confounder-based. Students do multivariate analysis involving three variables without a computer. They use ordinary English to describe and compare rates and percentages in tables and graphs. Math 1300 has less than a 30% overlap with a traditional statistical inference course.

This paper presents all the student responses received during the first year of Math1300 at UNM. Included are student written responses when asked to say what the students liked and disliked about the course, to describe the course, and to give advice to future students. The student responses are summarized for these three questions. Did this course help your critical thinking? Would you recommend this course to a friend? Should this course should be required by all college students for graduation? Student grades are reported. The topics that students and teachers found most important (and most difficult) are reported. Finally the question of whether statistical literacy is really statistics is addressed.

1. Introduction:

Statistical Literacy (Math 1300) is one of three introductory courses offered by the Department of Mathematics and Statistics that satisfies a mathematics requirement in the New Mexico General Education Curriculum. The other two are Survey of Mathematics (Math 1130) and Introduction to Statistics (Math 1350).

Statistical Literacy (Math 1300) was offered for the first time at UNM in fall 2021. Introduction to Statistics is recommended for students in most STEM majors and those in Economics and Psychology. Statistical Literacy is recommended for students in *non-quantitative majors*: majors that don't require a particular mathematics course such as art, music, etc. Either is suitable for other majors.

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Highlights: Fall, 2021

The fall startup was very rough. There were no funds for teacher training. Faculty did not know until mid-July whether their sections would 'go'. Students and faculty had to deal with three web platforms. The material had to be adjusted since almost all the students were first year after high school. 88% of the fall students in one section were in non-quantitative majors such as film, archeology, history, music, etc.

Fall students (58% response) found this course helpful and valuable.

- Q5. Helpful in reading everyday statistics? 95% some value (45%highly valuable
- Q6. Helped developing critical thinking skills? 95% somewhat helpful (32% extremely helpful)
- Q7. Would recommend this course to a friend? 79% probably would (38% definitely would).
- Q8. This course should be required of all college students? 32% agree with 42% neutral.

What did students like about this course? Here are some of the brief comments: "I like the critical thinking aspect of the class." "I liked that the things we learned were applicable to life - I caught myself several times using information I learned from this class in daily conversation." "I like the critical thinking. I feel like I haven't been able to have some critical thinking in my other classes." "I like reading tables and graphs and I like questions that require critical thinking because I feel like these things are beneficial to know in the real world outside of school." "This is the first time I feel like I'd actually use a math class outside of the classroom regularly." "I enjoyed critical thinking and the news stories. Both provide beneficial knowledge I will take with me into my everyday life." "The critical thinking. I don't have many chances in other classes to be a critical thinker."

Here are some of their more in-depth comments:

"This class is very challenging yet, fun for me and I am doing my very best... I feel confident in this course and just appreciate all of what you instructors have done. I didn't do well in my statistics course last semester. So, to be able to feel like I am understanding and am engaged in this course as an option, is very rewarding."

"I like the content and critical thinking aspect of the class. As someone who had to drop the regular stats class I was very happy to have this class as an option. I feel like the content has the overall goal of helping me with critical thinking. There are many times now where I am looking out for parts and whole in people's statements and critically thinking about what people are saying more often. So I would say that the content is also more applicable for life goals. I would have to say that the regular

stats class is very not useful to me because the content will not matter later in my life. Taking that class back in the spring I just was so confounded on why I was needing that class for general ed. But like I said I really appreciate having this class as an option."

"The set up and idea behind the class as a whole are my favorite part, tackling statistics from a different angle that is much more engaging for those who find math subjects to be typically challenging is a brand new approach and one that I think would be beneficial for a broader group of students. Attempting to explain the workings behind statistics has personally allowed me to understand the material much better than I had previously."

"This course is an answer to my prayers, I am a music major and horrible at math so fulfilling my math requirement has been hard. This is the first math class I actually liked. I loved the format and the material is about things I can apply to everyday life. The textbook is fantastic and helped me a lot accompanied by the instruction. I would recommend this class for anyone."

"Definitely not a repeat of AP statistics. The math problems make way more sense than a regular statistics class. It really helped me begin to think critically about ALL of the statistics I hear on the news."

3. Highlights: Spring, 2022

As in the fall, spring students (86% response rate) wrote about what they liked and disliked, and what they would advise future students. Their comments were similar to those in the fall. Here are some of their short answers: "Course is in-depth; requires thinking", "relates to real-world events", "Course for non-STEM majors", "Liked it a lot; wish I'd taken it sooner", and "makes math approachable".

These student impressions are interesting. But what about the content? What ideas did students find important? What topics did they find most difficult.

When selecting from a list of 25 topics, half the students picked "Take CARE" as the most important idea in the entire course. CARE was used to indicate the four categories used to classify all the influences on any statistic: Confounding, Assembly or assumptions, Randomness and Error/bias. Take CARE is good advice in general, it is most appropriate when dealing with statistics, and it helps students recall the four kinds of influence that may be involved with any statistic. If students remember just one thing from Math1300, "Take CARE" may be the most useful.

As far as difficulty, student choices for the top three were more dispersed. The most common (11%) was distinguishing part and whole (numerator and denominator) in analyzing percentages. A close second (9%) was "standardizing averages using mix matching" and using ordinary English to describe ratios "using percent and percentage grammar".

Teacher responses to the same list of 25 topics were similar to those of the students. As for what was most important, two of the UNM teachers selected "Take CARE: Confounding, Assembly, Randomness and Error/bias" One selected "Statistical literacy studies the influences on a statistic". The author selected "Statistics are different from numbers: numbers in context." The difference between these three topics is very small indicating there was good agreement among the teachers on what was most important.

Which topics were the three most-difficult? All four teachers agreed on this one "Standardizing averages controls for confounders: Mix matching." .

4. Grades: fall 2021 and spring 2022

The distribution of grades for fall and spring is presented. Spring grades are a better predictor of future grades than fall grades since fall was a startup semester. Spring grades indicated this pattern: 20% A, 40% B, 20% C, 20% D or F among those who do not withdraw. Thus, this course is not an 'easy' course. In viewing the gradebook, almost all those who got an F failed to take the final. Almost all of those who got a D failed to do assignments or take tests. Of course grades by themselves are almost irrelevant in assessing the skills obtained without knowing the objectives, the criteria and the measurements involved.

5. Higher-Level Mathematical Content

Moore (1998) distinguished statistical literacy from statistical competence as follows:

In this setting, what is statistical literacy? What every educated person should know [about statistics].

What is statistical competence? Roughly the content of a first course for those who must deal with data in their work. One might define competence as what we hope a business statistics student will retain five years later.

Moore (1997) asked some key questions (some "hesitations") about Statistical Literacy: "Is this a stat course?" "Does statistics retain a core?" "Is quantitative literacy really our turf?" These questions are extremely relevant to Math1300 where symbolic mathematics is all but absent. Here is a partial answer.

Every student is exposed to these higher-level mathematical ideas:

- The difference between a crude comparison (apples and oranges) and an adjusted comparison
- What it means to "take into account" (control for) the influence of a related factor
- How to work problems that "control for" the influence of a related factor on a comparison.
- How to calculate the percentage (cases) of an outcome that are attributable to a related factor.
- How to work problems that "control for" the influence of a confounder on statistical significance

Students arguably will not encounter any of these concepts in any other introductory course in mathematics or statistics. These mathematical ideas are extremely important in order for college educated consumers to be statistically literate: to be able to analyze and evaluate the statistics they encounter in the everyday media. These topics form the mathematical foundation of this confounder-based statistical literacy course.

UNM Math 1300 may be the only introductory college course in the world in 2021 that is GAISE 2016 compliant. The 2016 Update to the ASA GAISE guidelines called for more emphasis on multivariate thinking, confounding, simple ways to untangle confounding, and the use of real data. This course does all four. This course goes beyond GAISE 2016 by introducing standardization as a simple way of 'taking into account' the influence of a confounder.

6. Conclusion

This course is not an easy course. Less than 20% of the students get an A.

But, UNM students see value in taking statistical literacy. Most of those responding said it was "very helpful" in developing their critical thinking skill (79% in fall; 74% in spring) as opposed to "somewhat helpful" or neutral. Most would recommend this course to a friend (79% in fall; 83% in spring). Almost a third in both semesters agree that this course should be required by all students for graduation. These are outstanding achievements for any college mathematics course that satisfies a general education requirement.

Appendix A: Advertising Handout: Math 1300-versus Math 1350:*Figure 1: Advertising Handout: Math 1300 versus 1350*

2022	<h1 style="margin: 0;">MATH 1300 vs. 1350</h1> <h2 style="margin: 0;">Statistical Literacy vs. Traditional Statistics</h2>	UNM
<p>The UNM Mathematics department offers two introductory statistics courses. Both are good courses. They have different audiences.</p>		
<ul style="list-style-type: none"> <p>• Math 1350: INTRODUCTION TO STATISTICS. A traditional introductory statistics course. <i>This course is designed for producers of statistics or those who will deal with research results based on clinical trials. It focuses on randomness: random sampling and random assignment. Data from these sources will be used to infer and test claims about the properties of the population. This course provides a more rigorous foundation for those in quantitative majors, taking additional statistics courses, or going to graduate school. See https://math.unm.edu/courses/materials/math-1350-introduction-statistics</i></p> <p>• Math 1300: STATISTICAL LITERACY. A new non-traditional introductory statistics course. <i>This course is designed for the consumers of statistics. This literacy course focuses on reading and interpreting the statistics in the everyday media. It critically evaluates these statistics and all of the influences on a statistic: confounders, assembly, randomness and error/bias. The focus is on observational studies and quasi-experiments both of which involve confounding and assembly more often than randomness and bias. This literacy course uses ordinary English to distinguish association from causation, and to describe and compare percentages and rates in statements, tables and graphs. This course basic arithmetic techniques to control for the influence of confounders and see of a statistically-significant result will become statistically insignificant or vice versa.. http://catalog.unm.edu/catalogs/2021-2022/courses/MATH/1300.html</i></p> 		
<p>These courses are different (only a 30% overlap). So which majors should take which course?</p>		
<ul style="list-style-type: none"> <p>• Students strongly recommended to take MATH 1350: Traditional Statistics. <i>All students majoring in STEM, Economics and Psychology who are required to take a statistics course. These students will need this more-focused and rigorous foundation for subsequent courses or for graduate school.</i></p> <p>• Students strongly recommended to take MATH 1300: Statistical Literacy <i>All students in non-quantitative majors: majors that don't require a math class. E.g., English, history, political science, art, music, philosophy, film, archeology, etc.</i></p> <p>• Students free to choose <i>Everyone else who is required to take a statistics course or who needs to take a math course to satisfy their general education requirement.</i></p> 		
<p>Math 1300 has been approved by the UNM Faculty Senate Curriculum Committee as a core course. It has been approved by the New Mexico Higher Education Department as satisfying a mathematics requirement in the General Education Curriculum.</p>		
<p>Faculty in non-quantitative majors need to recommend this new course to their advisees.</p>		
2022-UNM-Math1300-Advertising-Handout-V2.pdf		Page 1

Figure 1: Advertising Handout: Math 1300 versus 1350 (Page 2)

2022	<h1>Statistical Literacy</h1> <h2>MATH 1300</h2>	UNM
<p>Statistical Literacy, is a <i>new course</i> offered for the first time at UNM in fall 2021. Statistical Literacy involves critical thinking about everyday statistics as evidence in arguments.</p> <p>Statistical Literacy has been <i>approved</i> as satisfying a mathematics course in the <i>UNM core curriculum</i> and in the <i>General Education curriculum</i> for the state of New Mexico.</p> <p>Statistical Literacy is a <i>different course</i> with less than a 30% overlap with Math 1350.</p> <p>Statistical Literacy is a <i>challenging course</i>. It uses ordinary English in a very precise ways. Students will write two short essays each week on various social statistics.</p> <p>Statistical Literacy <i>uses middle-school mathematics</i> (weighted averages) to do complex math.</p> <p>Statistical Literacy focuses on <i>social statistics</i>: statistics involving health, births and deaths, income, assets, education, marriage, single-parent families, crime, etc. These are the kind of statistics that are used in everyday arguments involving social policies.</p> <p>Statistical Literacy has a <i>unique audience: statistical consumers</i>. Students in non-quantitative majors (journalism, political science, history, etc.). Optional for management/marketing majors.</p>		
<h3>Catalog description:</h3> <p>Description: Participants will study social statistics encountered by consumers. Study statistics as numbers in context and as evidence in arguments. Study influences on statistics and techniques to mitigate these influences. Strong focus on confounding. http://catalog.unm.edu/catalogs/2021-2022/courses/MATH/1300.html</p> <p>Goals: To help students think critically about statistics as evidence in arguments: to see the story behind the story. To help students see value in becoming statistically literate.</p> <p>Objectives:</p> <ul style="list-style-type: none"> • Can use ordinary English to distinguish association from causation and to form arithmetic associations of numbers and ratios. • Can identify and evaluate influences (confounding, assembly, randomness and error/bias) on a statistic. • Can identify, evaluate and use various techniques to control these influences. • Can use ordinary English to describe and compare statistics as presented in statements, tables and graphs. • Can evaluate the strength of evidence provided by statistics in the everyday media, press releases and journal articles. 		
2022-UNM-Math1300-Advertising-Handout-V2.pdf		Page 2

Source: www.StatLit.org/pdf/2022-UNM-Math1300-Advising-Handout.pdf

Appendix B: Chronicle of Events for Math 1300 during the first academic year

Fall 2021: Rough Start for Faculty

Getting a new course approved in a large public university is a major undertaking. Getting it approved as satisfying a mathematics requirement in the New Mexico General Education Curriculum is an even bigger task. Both were undertaken and accomplished in 2019-20. See Schield (2021) for details. The plan was to start the new course in the fall of 2020. However, the Covid epidemic intervened and the Registrar was unable to insert the new course in the fall catalog until mid-June, so the startup was delayed until the fall of 2021.

In fall 2022 at UNM Albuquerque, there were six sections of Survey of Mathematics (one of these online), four sections of Statistical Literacy two of these online), and 19 sections of Introduction to Statistics (five of these online). Survey of Mathematics and Statistical Literacy have maximums of 30 per section; Introduction to Statistics has a maximum of 50 per section.

Getting the 2021 edition of the textbook was delayed. Originally scheduled for July 15, the teachers did not receive their copies until August first. In addition, there were no funds for new course development.

Even worse, there was no assurance the course would go. As of June 18, just seven students were enrolled: just two more than those enrolled as of April 16. With just seven students enrolled, the faculty had no professional incentive to spend their personal time preparing for a course that might not meet the minimum enrollment of 15 per section. Schield had not finalized plans to relocate from Florida to New Mexico given the low enrollment. The new Dean was unwilling to guarantee offering the course. The faculty were quite pessimistic about the success of Math1300.

Nevertheless, Advising still maintained that they would enroll enough students for all four section to be offered.

On June 25, the faculty had the first evidence that their sections might actually get more students. Advising enrolled 11 new students. Still, the faculty had little incentive to prepare for something they might not be teaching.

Table 1: Students Enrolled in Math 1300: by Section and by Date during summer 2021

REGISTRATIONS: MATH 1300 STATISTICAL LITERACY					35 Max/class		
Teacher	Schild	Giebitz	Schild	Mason	15 Min/class		
Date	MWF 10	T/TH 11	MWF 11	T/Th 5	TOTAL	Change	Go?
9/10	34	35	30	33	132	0	FINAL
9/3	34	35	30	32	131	6	All 4
8/27	31	35	25	34	125	0	All 4
8/20	30	35	25	35	125	22	All 4
8/13	24	35	20	24	103	17	All 4
8/6	19	35	16	16	86	13	All 4
7/30	17	29	15	12	73	9	3 of 4
7/23	16	22	15	11	64	11	2 of 4
7/16	14	17	14	8	53	13	1 of 4
7/9	10	13	9	8	40	7	None
7/2	9	10	8	6	33	12	None
6/25	4	7	7	3	21	11	None
6/18	1	2	2	2	7	0	None
5/27	1	2	2	2	7	0	None
5/20	1	2	2	2	7	2	None
4/23	1	1	1	2	5	0	None
4/20	1	1	1	2	5	0	None
4/16	1	1	1	2	5	0	None

Source: <https://schedule.unm.edu/>

It wasn't until July 16, that the faculty had some hope that their sections would not be cancelled. It was at this point that the faculty began preparing to teach Math1300 in the fall. So the two new faculty had just five weeks of "training" before teaching a brand new course. It wasn't until August 6, that all four sections had at least 15 students. Advising continued exceeding expectations and finished by filling 94% of the available seats.

For fall 2021, four sections were scheduled. In March 2020, one was assigned to Khalid Ifzarene, one to Tamra Mason and two to Dr. Milo Schield. Ifzarene withdrew and was replaced by Dr. Robert Giebitz. Figure 2 shows the three teaching Math 1300 in fall 2021: Dr. Robert Giebitz (left), Tamra Mason (center), and Milo Schield (right).

Figure 2: Math 1300 Instructors for fall 2021



Giebitz taught Math 1300 face-to-face on Tues-Thurs. Mason taught a hybrid section with half face-to-face (Tues.) and half online (Thurs.). Schield taught two sections face-to-face: one on MWF, the other on TTH. Jared, DiDiomemico, a statistics graduate student, observed Schield's section as a teaching assistant.

Fall 2021: Rough Start for Students with Multiple Platforms

Statistical Literacy had been taught using a Moodle course management system. There was no payment for converting the course to the UNM Learn system based on Blackboard. And there was no incentive since UNM planned to transition to Canvas by the next academic year. Thus Schield moved the course to a Moodle-friendly server run by Computer Revolution. This meant that student logged into their section of Math1300 in UNM Learn (Blackboard) and then logged into a separate website for their course management system (Moodle) for their homework, exercises, tests and final.

The writing platform, Odyssey, had always been a separate platform. As a result, students logged into three different web-based systems: their course in the UNM Learn (Blackboard) platform, the Math1300 course management system (Moodle) and the Odyssey platform for their writing assignments. Asking first-year students, new to the University of New Mexico, to deal with three different web platforms was asking a lot. As a result, none of their assignments showed up in the Learn/Blackboard calendar.

The Registrar added and removed students to the UNM Learn (Blackboard system). Adding and removing students to the Odyssey forum and to the Moodle platform had to be done manually. This caused major problems for those students adding late. And it caused problems for all students who didn't have the technical background or dexterity to deal with three platforms within one course.

The second biggest adjustment the first semester was the level of the students. Schield had taught this course for years to students who were mainly seniors in business management and marketing who were

mainly seniors. In fall 2021, almost all the students were 1st year in non-quantitative majors: archaeology, film, etc.

The biggest difference between teaching mathematically fluent seniors and teaching mathematically-challenged first year students seemed to be the amount of homework they could handle.

In teaching seniors, Schield assigned two Odyssey challenges per week plus five-to-ten multiple choice exercises with 10 questions each. In teaching first year students, the course was changed.

Tamra Mason had taught students at this level at both UNM and at Central New Mexico Community college. She led the initiative to reduce the amount of homework for these students. The new norm was one Odyssey challenge per week, two multiple-choice exercises with 10 questions each and two one-line writing exercises. In fall 2022, Odyssey was reduced even further to one challenge every other week. This did not reflect a lack of commitment to writing by the mathematically trained faculty. It reflected the problem of getting the students onto a non-UNM platform in addition to getting them used to grading each other.

Material Covered or Skipped and Adjustments

One way to get better student evaluations is to reduce the mathematical level of the material. One sign of this might be the skipping of material in the textbook. The biggest adjustment the first semester dealt with the lack of teacher training for this new course. Schield recommended that the first semester skip three of the eight chapters in his textbook. Here are the eight chapters along with those skipped in each of the first three semesters. .

Figure 3: Material Covered for the First Three Semesters

UNM Math 1300: Statistical Literacy. Material Skipped		SKIP ALL OR PART OF THE CHAPTER		
Chapter	Description	Fall 2021	Spring 2022	Fall 2022
1	The story behind the statistics			
2	Comparisons and CARE solutions			
3	Understanding Measurements (Standardizing)			
4	Describing Ratios: Percent and Percentage Grammar			Skip Percentage
5	Describing Ratios: Rate, Chance and Ratio Grammar	Skip	Skip	Skip
6	Comparing Ratios Using Named-Ratios or Likely	Skip	Skip	Skip
7	Interpreting Confusing Ratios (Standardizing)		Skip	
8	Randomness (Sampling, Statistical Significance)	Skip		Skip
	# chapters covered	5	5	5

Textbook: *Statistical Literacy: Seeing the Story Behind the Statistics* by Milo Schield

Edition used by semester. Fall 2021: 2021 edition. Spring 2022: 2021B edition. Fall 2022: 2022 edition.

The second semester, spring 2022, Schield recommended replacing chapter 7 with chapter 8. This allowed the teachers to become familiar with more of the content in the textbook. It also allowed teachers who had taught statistics to utilize their sampling/inference background in teaching statistical literacy.

For the third semester (fall 2022), Schield recommended returning to chapter 7 and dropping the teaching of percentage grammar in chapter four. The UNM students seemed to be overloaded in handling both percent and percentage grammar so that they lost track of the more important distinction: the distinction between part and whole in reading 100% tables. The next goal is to teach both chapters 7 and 8. These are the two 'payoff' chapters.

First Semester Adjustments in Textbook Material

The main feedback from faculty teaching fall 2021 was that there were too many ideas, too many distinctions. The students (and the teachers) got over-whelmed. The textbook needed to reduce the material being covered. Based on this feedback, Schield created Optional sections at the end of each chapter and moved sections of the chapter from the body of the chapter to the Optional section.

Spring (Second) Semester Teachers: spring 2022

Three sections of Math 1300 were scheduled for spring 2022. Dr. Robert Giebitz continued teaching (his second semester). Tamra Mason was replaced by Jared DiDomenico, a statistics graduate student who had been a teaching assistant for Schield in the fall. Jared taught the second of the two face-to-face courses. Daniel Kowalczyk, a new statistics graduate student, worked as a Teaching assistant. He attended the classes taught by Giebitz and made several presentations. Schield taught entirely online since he was now located at his home in Fort Myers, Florida. Here are the pictures of these people:

Figure 4: Math 1300 Instructors and T/A for spring 2022



From left to right: Instructors Robert Giebitz, Jared DiDomenico and Milo Schield; teaching assistant Daniel Kowalczyk. The spring class went much smoother than the fall class. The teachers understood all three web platforms: Learn (Blackboard), Moodle and Odyssey. The startup went smoother; the exercises and tests were in better shape. Non-participating students were dropped in the first two weeks so they didn't impact the class failure rates. UNM considers any students who withdraws after the second week to be a failure for the course.

There were some differences in teaching. Randomness (chapter 8) was taught in place of "Interpreting Confusing Ratios" (Chapter 7). The teachers seemed OK with chapter 8 – which is quite different. It starts by showing how statistical significance can be impacted by confounding, assembly and bias.

The mix of students was quite different in the spring as compared to that in the fall. In the fall, most of the students were beginning freshmen in their first semester. In the spring, there were more transfers, more Business majors and more students who had been at UNM for at least a year or more. This made the students more dispersed by year in college and by major than in the fall.

Appendix C: First Semester (fall 2021) Results from Student Surveys

A numerical summary of student responses to eight multiple-choice questions is shown in Table 2.

Table 2: Numerical Summary of Student Evaluations for fall 2021

Q1 What is the highest level math course you had taken previously?			
Response	Count	Distribution	
High school Algebra	19	25%	
Developmental Algebra	16	21%	
College Algebra	16	21%	
Discrete/Finite math	7	9%	
Statistics	18	24%	
TOTAL	76	100%	

Q2 What is your attitude toward symbolic math (algebra)?			
Response	Count	Distribution	Distribution
Strongly dislike	8	11%	
Dislike	18	24%	34%
Neutral	28	37%	37%
Like	19	25%	29%
Strongly like	3	4%	
TOTAL	76	100%	100%

Q3 What is your attitude toward expository writing?			
Response	Count	Distribution	Distribution
Strongly dislike	4	5%	
Dislike	14	18%	24%
Neutral	22	29%	29%
Like	22	29%	47%
Strongly like	14	18%	
TOTAL	76	100%	100%

Q4 In this class, which would you prefer more of?		
Response	Count	Distribution
News stories	19	25%
Tables and graphs	18	24%
Group activities	20	26%
Exercises & Odyssey	19	25%
TOTAL	76	100%

Q5 How valuable is this course in helping you read and interpret everyday statistics?		
Response	Count	Distribution
Negative value	1	1%
Neutral	3	4%
Some value	9	12%
Fair value	29	38%
Highly valuable	34	45%
TOTAL	76	100%

Q6 How helpful was this course in developing your critical thinking skills?			
Response	Count	Distribution	Distribution
Not helpful			0%
Neutral	4	5%	5%
Somewhat helpful	16	21%	95%
Very helpful	32	42%	
Extremely helpful	24	32%	
TOTAL	76	100%	100%

Q7 Would you recommend this course to a friend?			
Response	Count	Distribution	Distribution
Definitely not	4	5%	
Probably not	2	3%	8%
Can't say	10	13%	13%
Probably would	31	41%	79%
Definitely would	29	38%	
TOTAL	76	100%	100%

Q8 Statistical Literacy should be required of all college students for graduation.			
Response	Count	Distribution	Distribution
Strongly disagree	5	7%	
Disagree	15	20%	26%
Neutral	32	42%	42%
Agree	14	18%	32%
Strongly agree	10	13%	
TOTAL	76	100%	100%

This anonymous survey was completed by 76 of the 132 students (58% response rate) in the four sections.

Source: <http://www.statlit.org/pdf/2021-Fall-UNM-MATH1300-S2-All.pdf>

Here are student comments on what they liked about Math 1300 in fall 2021:

Figure 5: Student comments on what they liked about this course from fall 2021

12/6/2021	<p>Student Anonymous Comments Math 1300 Statistical Literacy (Nov '21)</p>
<p>STUDENT COMMENTS:</p> <p>Email from a student: <i>"This class is very challenging yet, fun for me and I am doing my very best... I feel confident in this course and just appreciate all of what you instructors have done. I didn't do well in my statistics course last semester. So, to be able to feel like I am understanding and am engaged in this course as an option, is very rewarding."</i></p>	
<p>WHAT DO YOU LIKE ABOUT THIS COURSE? Anonymous Survey: Fall Semester 12/5/2021</p> <p>Note: 'Odyssey' is the name of the writing forum: 25% of the course grade.</p>	
<p>Section 1: 11 responses. 100% took high school AP. Grades: 64% pass; 18% C- or D; 18% No answer.</p> <ol style="list-style-type: none"> 1. I do like how this class recognizes that a lot of the math that a person is taught will have no bearing on the rest of their life. Critical thinking is more important overall than memorization of equations. 2. Odyssey & thinking about what causes biases in statistics 3. I like new stories the best. 4. What I like best about the Statistical Literacy is emphasis on critical thinking and its connection to a logistic [logical] outcome. 5. I like reading tables and graphs! I think it's also cool that we can apply this to statistics we see every day. 6. I highly enjoy the new stories and emphasis on critical thinking because it allows students to have a different approach to statistic related life occurrences. 7. The textbook is my favorite it is a really good resource correlates amazing with the class. 8. I like the critical thinking aspect of the class. 9. Critical thinking. The textbooks templates. Examples in textbooks 10. I liked the Odyssey challenges most of all, probably. 11. Odyssey is nice as well as the news stories, but for the textbook at time I feel like it's difficult to read a lot of times 	
<p>Section 2: 16 responses. 88% took AP in high school. Grades: 69% pass; 5% C- or D; 25% Don't know.</p> <ol style="list-style-type: none"> 1. Topics were interesting, and critical and counter intuitive thinking were needed, which I enjoyed. 2. I liked reading the tables and graphs because it gave me an understanding of what they meant and they made me aware that not all information given is the same. 3. I enjoy how we can relate the things we learn in class to real life scenarios and learn about the importance of learning about statistics. 4. I liked that the things we learned were applicable to life - I caught myself several times using information I learned from this class in daily conversation. I also liked how straightforward the regular assignments were. 5. we can work with other people 6. I like the critical thinking aspect of the course and understanding the roles of confounders and bias. I also think rob was a great and very laid back professor which made it more comfortable to ask questions. 7. <i>I like the critical thinking. I feel like I haven't been able to have some critical thinking in my other classes.</i> 8. I like when we look at models or real life problems that we could break down and figure out if the statistics are telling the truth. 	

Figure 5: Student comments on what they liked about this course from fall 2021 (page 2)

9. I enjoy the critical thinking aspect of this course. The most helpful thing to me was reviewing and working out problems in class. I like the Odyssey exercises too because it gives you a chance to see peers' thought processes.
10. I like reading tables and graphs, as well as bringing in today's current information into the course to help us understand how we can use this course in real life
11. I like reading tables and graphs!! i also like the actual homework when I remember to do it
12. I liked the quizzes, because they gave me practice over the materials.
13. i liked the critical thinking of class along with the smaller amount of a math going on.
14. I don't really like anything in this course.
15. I like the Statistical Literacy book, I think it is very helpful. I also like having group discussions in class, playing with blocks, doing 2x2 tables, and professor Giebitz lectures.
16. I like reading tables and graphs and I like questions that require critical thinking because I feel like these things are beneficial to know in the real world outside of school.

Section 3: 18 responses. 67% took AP in high school. Grades: 56% pass; 39% C- or D; 6% Don't know.

1. News stories, reading tables, and critical thinking.
2. I like Dr. Schield and the news stories. I like his enthusiasm and the hope he has for his students, even if they aren't doing well in the class.
3. I enjoyed the critical thinking and logic that this course seemed to base itself around.
4. I really enjoy learning how to read graphs and things like survey results constructively. This is the first time I feel like I'd actually use a math class outside of the classroom regularly.
5. What I like best is the pacing of the class, as well as the fact that the class is taught by the author. The assignments are easy to understand, and are easy to find.
6. page 162 and 173 helped me the most. [Templates for percent and percentage grammar]
7. I really Like Milo Schield. He makes the class really fun and interesting. I have to say that I've despised every other math class I've ever taken but this one is actually enjoyable. It also seems more useful than any math course I've ever taken.
8. I like the critical thinking aspects about it.
9. I really like the way Doctor Schield teaches and gets us all involved. I like Odyssey too, the textbook is super helpful when completing homework and I like how it uses statistics that are based around real-life.
10. I enjoyed critical thinking and the news stories. Both provide beneficial knowledge I will take with me into my everyday life.
11. I think Odyssey is a great way for us to think critically about certain topics. I also think the textbook is pretty well made and easy to understand and read.
12. The critical thinking. I don't have many chances in other classes to be a critical thinker.
13. The first topics seemed very useful for everyday life.
14. *I like the content and critical thinking aspect of the class. As someone who had to drop the regular stats class I was very happy to have this class as an option. I feel like the content has the overall goal of helping me with critical thinking. There are many times now where I am looking out for parts and whole in people's statements and critically thinking about what people are saying more often. So I would say that the content is also more applicable for life goals. I would have to say that the regular stats class is very not useful to me because the content will not matter later in my life. Taking that class back in the spring I just was so confounded on why I was needing that class for general ed. But like I said I really appreciate having this class as an option.*

I would also like to say I really appreciate all the work you've put into the course. Every class

Figure 5: Student comments on what they liked about this course from fall 2021 (page 3)

period I see just how tired you are. It sometimes looks like you have slept in days. So the fact you are putting in this much work makes me appreciate the course even more. I thank you for that a lot.

15. Reading tables is nice.
16. The in class critical thinking.
17. I liked the Odysseys, it was a good way to practically apply the ideas we were learning in class. I also liked the practice assignments, and especially the topics going over words choice and manipulation in the media.
18. I enjoyed the critical thinking aspect and the percent grammar section in chapter 4 but I'm more of an equations type of person so this course has been challenging personally.

Section 4: 17 responses. 53% took high school AP. Grade: 65% passing; 12% C- or D; 6% F; 18% Other

1. The set up and idea behind the class as a whole are my favorite part, tackling statistics from a different angle that is much more engaging for those who find math subjects to be typically challenging is a brand new approach and one that I think would be beneficial for a broader group of students. Attempting to explain the workings behind statistics has personally allowed me to understand the material much better than I had previously
2. I like how there is very little calculation and I can defend my answers.
3. I like the tables and graphs because I am a visual learner and I like my answers to odyssey.
4. I liked odyssey a lot once I got the hang of it.
5. I liked looking at news stories and learning to read them more critically. I also liked that we covered graphs quite a bit.
6. I liked statlit
7. I really like how we can always relate the topics back to real life, and how we can actually apply these concepts to real life ideas and situations.
8. critical thinking.
9. I think the Odyssey was an interesting way to boost the grades of students, and the teaching incorporated the materials in the textbook which I found to be very useful. This course has taught me how to improve my critical thinking overall.
10. I liked how much critical thinking was used throughout the course. The Odyssey discussion post were also very insightful. Overall, it an excellent course that doesn't contain any overly complex math, but still includes the calculating aspect without it being too difficult.
11. The amount of attempts per each quiz is helpful. [two tries per exercise]
12. I enjoy the news stories. I like that this course applies our math lessons to real world situations.
13. I think the textbook is very comprehensive.
14. *This course is an answer to my prayers, I am a music major and horrible at math so fulfilling my math requirement has been hard. This is the first math class I actually liked. I loved the format and the material is about things I can apply to everyday life. The textbook is fantastic and helped me a lot accompanied by the instruction. I would recommend this class for anyone.*
15. I liked the quizzes the most and it really helped when the professor brought in practice sheets so we could follow along with her.
16. I enjoy the critical thinking that comes with the course. My instructor was very willing to work with the class and converse through disagreements regarding statistical analysis in class, coming to a common understanding effectively.
17. I enjoy the way Tamra teaches, the book is extremely helpful and the topics were interesting.

Yes, these anonymous student comments are very positive. But the question asked students to comment on just the things they liked about the course. These positive comments could be influenced by measurement (researcher) bias.

Here is how students said they would describe this course to a friend (fall 2021).

Figure 6: How students would describe Math 1300 to a friend: fall 2021.

Math 1300	Student Evaluations Part 2: Describe this course to a friend	Fall 2021
S2A-Q09 How would you describe this class to a friend that would give them some idea of what the class is and isn't -- and why it is valuable.		
Section 1		
<ol style="list-style-type: none"> 1. It's not a normal boring math class you dread going to this class talks about real world situations and how to use this tool to analyze statistics in your life, I loved this course! 2. This is a great class but it's definitely not a class you jump in on your first semester of college. 3. Make sure to keep yourself on top of the work. 4. I would say, "If you want to take this class, do it if you like the more critical thinking side of math rather than abundant calculations because in here it was more of analyzing with a sprinkle of calculating". 5. I would tell them that it's a math class with as little math as possible, which is great, but you have to have some skill at/affinity for reading charts and graphs before going into it. 6. This class consists of learning how to read multiple tables and graphs in order to better understand what it means. You will learn how to use percentage grammar and how to do math involving tables. 7. It's math for people who aren't (inherently) stem majors, which means it's more useful day to day. 8. A class that gives you an idea on how graphs and tables work as well as understanding some of the language jargon with in it 9. This class is not about math, in this class we learn how to interpret graphs and read them in order to use them in our real life 10. I would say it is a writing style of math. It is used to help us understand math in word form. 11. This class allows you to better interpret statistics of all kinds, in a nonbiased and objective way. 12. This class doesn't talk about the numbers, it talks about how you interpret the numbers and what they actually mean. By taking this course you will develop an actual understanding of what the numbers of statistics mean and also when a study is a good study or not. 13. This is a class that focus more on describing math, rather than the math itself. 14. Statistical Literacy teaches how to read and analyze statistical figures. There is little numerical math involved, so it is advantageous for people who struggle with traditional math. It assists with critical thinking and interpreting everyday statistics. It's a fun, lecture-based class with just the right amount of homework. 15. You don't have to do very much "actual" math and it focuses more on logic and interpretation. It helps with overall comprehension of statistics and has made me look at statistics and graphs that I see in my everyday life more critically. 16. I would say it's not like a normal math course because more emphasis is put on understanding the graphs, tables, and, statistics rather than the actual math. 17. This class is kind of like a statistics class mixed with an English class. You just have to interpret the math and write about it. 		

Figure 6: How students would describe Math 1300 to a friend: fall 2021 (page 2).

S2A-Q09 How would you describe this class to a friend that would give them some idea of what the class is and isn't -- and why it is valuable.

Section 2

1. This class really helps develop your critical thinking skills. While the course is a statistics course, the literacy component is big. I learned a lot about interpreting graphs, tables, and everyday statistics.
2. I feel this course is helpful and is a greater start to statistics. I am using much of this language in my current biology class.
3. That this class is valuable in discerning the most popular information used to persuade all people, statistics. The class will help you to read what ISENT being shown on the graphs or talked about during the studies. The class will help you to question what is being presented on its face and how to think creatively to identify confounders not originally taken accountability of. This class truly teaches you specifics in HOW to think and not what to think.
4. I find myself thinking through random statistics given to me in daily life much more critically now. There's a lot that I hadn't even thought of or questioned before taking this class. We figure out problems that are applicable to life in class so that you can immediately see the benefit and you can make use of it, and the math itself isn't overwhelming at all, as long as you have the basic concepts down.
5. I would describe this class to a friend by telling them, this class teaches you how to read and breakdown tables, graphs, and statistics. Because in the world of statistics there is actually a lot of manipulation and this class will teach you how to not get persuaded into believing false claims.
6. This class teaches you how to analyze statistic-based evidence and how the conclusions were made. The class doesn't involve much math at all. The class is valuable because we go over real-life situations at times.
7. It's good for people who like literacy and less geared towards people who like straight forward problems to solve.
8. This class is great for people who like the critical thinking side of math and statistics rather than the raw numbers and data. This class is valuable for helping you understand if a statistic is fair and useful or not.
9. It's probably the easiest math course offered, but it's also very informative
10. I would mention to my friends that this class prepares you for statistics that aren't always true. It will definitely shake your brain a bit but once you get used to it, it will make you feel great knowing you can understand graphs and tables.
11. This class is very valuable because it allows you to further develop your critical thinking skills. It requires you to analyze data closer than just the numbers. You have to look at the information given and make sense of this data in that situation.
12. "Statistics is a fun math class because it deals with lots of real world stuff. I think the class has developed my ability to read statistics and I actively feel smarter now especially when looking at graphs. The class isn't a lot of complex or difficult math; most of it can be done in your head if you think about it hard enough, but I think that's a positive because it's a good mixture between math, literacy, and critical thinking or philosophy.
13. The class does not involve a lot of math equations, but rather interpreting the data shown. This class is extremely valuable because it provides you with knowledge about how to read statistics and real world data.
14. This class is a precursor to statistics its more valuable and applicable to real life
15. It helps you understand and look at statistics in real life
16. i would say this is a great class that gives a chance to see things in a different light, it allowed me to be able to get a math credit without a ton of harder math, lots of group work and giving you skills to look into seeing statistics in a new light

Figure 6: How students would describe Math 1300 to a friend: fall 2021 (page 3).

Math 1300	Student Evaluations Part 2: Describe this course to a friend	Fall 2021
<p>17. It's like an English class, but with numbers.</p> <p>18. This is what I would tell a friend: If you are looking for an easy class and don't need a lot of math for your major I would say take this class. There is little to no math involved and all the content is pretty straight forward, common sense like. If you are in a pretty math heavy major or are considering one I would say skip this class and take a proper math class.""</p> <p>19. This class is a great alternative for those who don't like math all that much, it is still challenging but I enjoyed getting to look at real statistics and numbers in this class. It was a lot of lecturing, but the group work that we did was fun. I got a better idea of analyzing data and it helped me with my other classes when I had to collect data</p> <p>20. This class is interesting, but not too challenging. It is perfect for someone who doesn't like math, yet loves grammar/English. Professor is super understanding and nice.</p> <p>21. I would say it's not a lot of math and it will help if you need to understand how to read and interpret data.</p> <p>22. This class is less focused on the formulas for coming up with your own statistics, and more about how to look at and interpret graphs in a fair way.</p>		

Table 3: Number of Students by Major in Section 1: fall 2021

#	Major	Department
6	Pre-FDMA	Film & Digital Arts
5	Pre- Anthropology	Archaeology/Anthro/sp
2	Pre History	History
2	Pre- Music Education	Music
1	Art Studio	Art Art History
1	Pre - Psychology	Psychology
1	Pre- Art History	Art Art History
1	Pre- Art Studio	Art Art History
1	Pre- Business Admin	Business Admin
1	Pre- Criminology	Sociology
1	Pre Dance	Theater & Dance Flamenco
1	Pre History Religion	History
1	Pre- Political Science	Political Science
1	Pre- Inter Arts	Fine Arts Interdisc
25	Total in Section 1 as of 8/20/2021	

Source: Detailed class list dated 8/20/2021 for Schield's section 1 with student names omitted.

Three of these 25 students are in quantitative majors: Business Administration, Sociology and Psychology. All the rest are in majors that are arguably non-quantitative. So, 12% are in quantitative majors; 88% are in non-quantitative majors.

Figure 6: How students would describe Math 1300 to a friend: fall 2021 (page 4).

Math 1300

Student Evaluations Part 2:
Describe this course to a friend

Fall 2021

S2A-Q09 How would you describe this class to a friend that would give them some idea of what the class is and isn't -- and why it is valuable.**Section 3**

1. I would describe this class as a course that makes you think in a more out of the box environment compared to traditional math courses.
2. I would inform them that the class is not strictly about mathematical problems and it relies heavily on how to interpret statistics with an involvement on writing. The class can bring an understanding of the inner workings of statistics and how important it is to know how the studies are formed to get a grasp on how the "statistic builders" can manipulate its audience.
3. more literal class than numbers
4. I would say is a word problem class with how to use arithmetic and stats
5. It shows how statistics can be influenced and the wording you use behind the numbers can change the meaning of a statistic. This is very valuable to depict numbers that you come across in everyday life.
6. I would describe it as a necessary stat class. Although we don't use a lot of math we talk about a lot of real world studies and this can show you how to read them and understand them without people spreading misinformation about the study.
7. You gain critical thinking skills and learn to interpret numbers and read tables.
8. Don't go in thinking it'll be an easy grade because you actually have to use your brain for this whole course. It helps enhance your critical thinking skills.
9. Helps you learn math in words, but it is pretty difficult.
10. This class teaches the essential skill of being able to determine how statistics can be influenced.
11. It is not a regular math class. Doing the work could be somewhat easier and too much emphasis is put on too many tests.
12. It's a math class without numbers. It's important because it forces you to think critically instead of just memorize equations like in other math courses.
13. I would just tell them that it is very word-based it has some graphs in there. Generally, though the arithmetic used is very simple. If they are looking for a typical statistics class, this is not it.
14. I would tell them that it is very low on math and calculating equations. Instead it works with news stories and written work to address mathematical problems. It is a very good course to take if you are going to be dealing with material were you must examine the value/limitations of it (a lot of the humanities, for example). Its a very good course for fulfilling the math requirement for graduation if you are not the strongest in math.
15. This class helps students be more sophisticated, more thoughtful, and more careful about their understanding of claims presented with statistics, and with claims in general. It makes students aware that something else may be going on, maybe something important, and that they should be on the lookout even if they can't be sure. So they not get get misled as much.
16. Statistical literacy isn't really a class to prepare you for more math classes. It better prepares you for real life math, like statistics that people use every day for everything. It shows you the secrets that statisticians use to bend the numbers towards their point and what they mean.
17. I would say that this course is a different type of statistics class where there is more writing and critical thinking involved.
18. A critical thinking statistics class.
19. This class doesn't have algebra but it helps your critical thinking.

Figure 6: How students would describe Math 1300 to a friend: fall 2021 (page 5).

Math 1300	Student Evaluations Part 2: Describe this course to a friend	Fall 2021
<p>S2A-Q09 How would you describe this class to a friend that would give them some idea of what the class is and isn't -- and why it is valuable.</p> <p>Section 4</p> <ol style="list-style-type: none"> 1. It was interesting, helps expand your critical thinking skills. 2. While it does delve into some heavy topics, it's arguably easier to understand and get through than most other college level math classes. It feels a little easier than even high school algebra, and it can actually be quite fun to study. 3. This class helps you make sense of how statistics really work. It shows how to look at them critically and better understand them as well as judge if they seem reliable or significant. It is definitely not a repeat of AP Statistics and there is way less math. The math problems also make much more sense than a regular Statistics class. It really helped me begin to think critically about ALL of the statistics I hear on the news. 4. Statistical literacy is a class set up for those who typically encounter themselves being more proficient or having less comprehension issues with geometry-based mathematics rather than algebra based math classes. The traditional route of any college student, regardless of degree path, includes at least one college level algebra class they have to pass in order to graduate... having a statistics class that is based off of teaching the inner workings of stats with detailed explanations, rather than the typical teaching method of diving straight into the work and assigning multiple types of work prob 5. I would say that there is some serious real world application here. It goes beyond just learning something for the course only to forget it later. It actually can be applied to things like articles and future debates or assignments that include statistics. 6. The class is more of a, well, statistics based class. It's not like algebra where there is a finite answer to the problems. It's more of a probable question based off of the information we are given. 7. Not exactly a math class but more real world statistics put in riddles 8. It focuses more on being skeptical of statics but can be annoyingly semantic. 9. Deals with probability, comparisons, graphs, and averages. Has no overly complex math equations, but still gives you a few challenges so you aren't too bored. 10. if you don't have the time to keep up then don't take this class. You get lost really quick if you can't stay on top of it. 11. It is a math class in which you rely more on the analyzing of data verbally than through complex equations. It's not a traditional math class that requires using complicated formulas and calculations. As long as you read closely all the Information you need to answer the question is typically right in front of you. 12. There is not as much difficult calculating as a normal statistics class, it is more straight-forward. 13. Math but not math very different way of thinking 14. How to understand Statistical fallacies and how to write and understand statistics better 15. Working together and asynchronously to understand statistics 16. I would say that is a statistics class that teaches the English behind statistics rather than focusing on the math side of statistics. Almost like understanding math sentences with in statistics. 17. I would say that it is a more practically useful version of a regular statistics class. 18. This class allows you to spot missing data within many graphs that are shown in social media or the news, and drives me personally to look for an entire data set. 		

Source: <http://www.statlit.org/pdf/2021-Fall-UNM-Math1300-S1.pdf>

Figure 7: Current student's advice to future students: fall 2021

Math 1300

Student Evaluations Part 2:
Advice to Other Students

Fall 2021

S2A-Q10 What advice would you give someone about how to do well in this class?**Section 1**

1. Pay attention to the lectures and the textbook because they correlate well and everything you need to know about this class is in the textbook.
2. Look at things from a different perspective than what's right in front of you.
3. Make sure to study.
4. tAkE NoTeS! Even if you have the textbook-and especially if you don't, write down the problems he goes over and what is displayed on the projector, and also pay attention to the wording he uses.
5. Take notes!! Be able to explain the concepts back to yourself.
6. I would suggest to not fall behind on Odyssey or the quizzes every week.
7. Use the sentence templates in the textbook and review the material on your own, or when doing statlit exercises.
8. Do the Odysseys and the textbook is your best friend
9. Bring the book to all of your classes and go over the exercise with the teacher in class, and ask all the questions you have, do all of the Odyssey challenges as well as the activities
10. Go to class.
11. Just check the website for announcements, and keep up with the Oddyssey assignments.
12. Find a good way on how to tell the difference between whole and part because it is very easy to mix up the two.
13. I would tell them to stay on top of all the StatLit & Odyssey challenges and they should be line [fine?]
14. Attend the in-person sessions and bring your textbook with you to follow along.
15. Do not skip class, pay attention to due dates closely, and review CARE, percent grammar, and standardization most. Also complete all Odysseys, they are fairly easy and worth a significant portion of your grade.
16. Make sure you use the book to your advantage. Come to class and pay attention. Make sure to do all of the assignments as this is what helped me understand the concepts the most.
17. Do the weekly odyssey challenges as well as the Moodle challenges, they will help your grade.

Figure 7: What students would advise to future students: fall 2021 (page 2)

S2A-Q10 What advice would you give someone about how to do well in this class?**Section 2**

1. Stay on top of the Moodle assignments. It might be hard to remember them because they aren't on Learn like most other classes, so make sure to write down any homework and quizzes that are coming up. Also, don't be afraid to ask questions and answer questions in class.
2. Complete the course work before class so you can get your questions answered, don't get behind, and read the material.
3. Read the assigned reading before class, write down questions you have to bring to class. ENAGAGE in class while you have the subject matter experts (professors) available, take full advantage of their expertise while you have the time on campus. When doing homework make sure you have a couple hours to just focus on this class alone.
4. Keep up with the work, make sure to do your best to pay attention during lectures, and keep your textbook on you. That's going to be very helpful.
5. I would tell them to pay attention and to make sure they understand what they are reading.
6. Make sure you read the book chapters and use the book chapters to answer homework questions. This will help you memorize important parts of the course.
7. I would recommend completing the quiz practices and using the book as a reference.
8. Just stay updated on what assignments are due because you don't get much notification on when something is posted.
9. Do all the work and study
10. Some advice would be to show up, participate and do the challenges. Odyssey and attendance are easy points and if you show up, the work will just flow to you.
11. You should definitely try to stay engaged in class because this will help you grasp the key concepts.
12. as long as you go to class and pay attention (and write down formulas from the book; keep up with school work) you will be fine. Its very easy as long as you do the bare minimum required for any other intro college course. I loved this class.
13. Do not procrastinate, read the chapters, take notes in class, look over the Powerpoints, complete odyssey, and first try on quizzes a day before the due date.
14. Just read the text book teach yourself the material
15. Make sure you keep up on your assignments
16. stay on top of your assignments, ask tons of questions, and stay positive
17. Read each question carefully.
18. To do well in this class I would tell them to do as many odyssey challenges as they can and to take the tests on time.
19. Get your work done on time
20. Do Odyssey, attend class every week, and use the textbook for every exam or quiz.
21. I would say that it can get quite tedious so just pace yourself well and try to actively engage in the lectures.
22. the few times we work with numbers over critical thinking, pay extra attention there, because many people seemed to slip up when it came to working with the numbers.

Figure 7: What students would advise to future students: fall 2021 (page 3)

S2A-Q10 What advice would you give someone about how to do well in this class?**Section 3**

1. I would tell them to take notes, study and read the textbook on their own time and ask for help or understanding when lost.
2. I would tell them to read the textbook before class as everything makes more sense when the instructor goes over the material with examples and answers to any confusion you may have. Also, the writing homework assignments are super helpful and gives you some critical thinking.
3. make sure you do well on the homework and odyssey
4. I would say keep up with the Odysseys and weekly challenges.
5. Show up to class. That is all I did and I didn't even take any notes this semester. However, just showing up gave me a clear understanding and this class has been a breeze for me.
6. I would tell them to take notes on what was discussed in class and to always check the StatLit website to make sure they finished all of the quizzes and tests.
7. Take a beginning or introduction class to statistics so you have some background. Also, don't be dyslexic. Reading in this class is very challenging.
8. Pay attention in class.
9. Show up to class and study hard because it's not so simple.
10. Just do your homework
11. Do all the assignments because the tests are not very clear.
12. Read the textbook and ask questions in class.
13. Take notes and apart from that everything is pretty easy and written out in the textbook.
14. I would say that turning in the assignments is the biggest way to gain points. I would also recommend talking to your instructor, mine was very helpful and willing to help even outside of their office hours. There are a lot of opportunities to make up works and have second chances and I would definitely take those.
15. Get your head out of your butt, pay attention, and think: this is good stuff.
16. Remember to do the Odyssey every week and take the tests when you need to. It's fairly simple to understand the curriculum. One thing is to remember all the little differences in everything.
17. Just make sure you do all your homework because your homework will help you with your exams. Also try your best to attend all classes.
18. Ask for help when you need it.
19. Pay attention during lecture and ask questions in class or via email. Attend office hours too if you can.

Figure 7: What students would advise to future students: fall 2021 (page 4)

S2A-Q10 What advice would you give someone about how to do well in this class?**Section 4**

1. Attend class and pay attention.
2. Do all of the work. There are useful chrome extensions that can help you get through the readings, so get them before it's too late. Pay attention in class, and even if you don't get all the notes, review the slides before the homework.
3. My biggest suggestion is to stay on top of Odyssey and Moodle assignments. They are not insanely difficult, but if you fall behind on them it can definitely hurt your grade. Another important thing is to go to class regularly, the lectures really clear up any questions from the readings or assignments. Other than that, just pay attention and you'll be alright.
4. Just to stay on top of the work and to make sure to not be afraid to ask any questions on the material.
5. Just stay on top of the weekly Moodles, and prep for the tests.
6. Pay attention, take notes and don't forget your Odyssey questions in addition to your stat lit questions.
7. Double check the book and try to follow along with the examples in class. Also more hands on worksheets to follow along with or posting the PowerPoint before class would have been helpful
8. use the book for quizzes you notes will never be specific enough.
9. Coming to class every day and taking as many notes as you think you need is key. More notes = more info to have at hand for any open-note tests.
10. You need to be available for every single class and stay on top of the book. Otherwise everything will start going over your head and once your lost that's it.
11. Focus, read, and ask questions. The work isn't overly difficult if you're willing to ask for support.
12. Study! Do the homework and READ!
13. Focus
14. Pay attention to the lectures they were very clear and understandable
15. Go to every class and reach out if confused.
16. Pay attention in class and ask questions if you don't know or understand. Also just do your homework on time.
17. I would say to make sure to review all of the lecture slides before completing assignments.
18. Participating in class led to a lot of growth that I wouldn't have been able to achieve if I never participated.

Appendix D: Second Semester (Spring 2022) Results from Student Surveys

Here are the Student Evaluations of Math 1300 (Statistical Literacy) from spring 2022. A numerical summary of student responses to an eight question multiple-choice survey are shown in Table 4

Table 4: Numerical Summary of Student Evaluations for spring 2022

UNM Spring 2022 Chapters 1-4 and 8		Math 1300 Statistical Literacy Anonymous survey (54 responses)					
Q01	Highest level of math taken previously. [Arithmetic was zero]						
Section	HS Algebra	Devel Algebra	College Algebra	Statistics	Calculus	Other	
All	6%	11%	31%	26%	26%	26%	
Q02	Attitude toward algebraic math						
Section	Strongly dislike	Dislike	Neutral	Like	strongly Like		
All	6%	11%	31%	26%	26%		
Q03	Attitude toward expository writing: writing to analyze, explain or persuade.						
Section	Strongly dislike	Dislike	Neutral	Like	strongly Like		
All	6%	11%	31%	26%	26%		
Q04	In this class, which of these do you prefer more of						
Section	News stories	Tables/graphs	Group activities	Review			
All	20%	24%	15%	41%			
Q05	How valuable is this course in helping you read everyday statistics?						
Section	negative	neutral	some value	fair value	high value		
All	2%	9%	15%	37%	37%		
Q06	This course was _____ helpful in developing my critical thinking skills.						
Section	not	neutral	somewhat	very	extremely		
All	2%	2%	31%	48%	17%		
Q07	I would recommend this course to a friend.						
Section	definitely not	probably not	Can't say	probably	definitely		
All	0%	4%	13%	43%	41%		
Q08	Statistical Literacy should be required of all college students for graduation.						
Section	strongly disagree	disagree	neutral	agree	strongly agree		
All	9%	15%	44%	19%	13%		

In Q01, 'Other' may include AP courses such as AP calculus and AP statistics. This survey was completed by 54 of the 63 (86%) students completing the course.

Source: Summary based on <http://www.statlit.org/pdf/2022-Spring-M1300-SE2-Results.pdf>

Figure 8: Students' Short Responses to Math 1300: spring 2022

Spring 2022 Two tests and final	Math 1300 Statistical Literacy Anonymous survey (25 characters max)	Univ. New Mexico Chapters 1-4 and 8
Online section		
<i>Describe for other students</i> Q9	<i>Advice to other students</i> Q10	<i>Odyssey: Like vs Dislike. Why?</i> Q11
1 teaches how to view stats	Do homework and study	Like, it was easy point
2 Develop real world skills	Be attentive, read book	Dislike, confusing site
3 Makes you think	Measure time	Like, easily to follow
4 Interesting	schedule	Like
5 A lot of critical thinking	Take your time, read book	dislike, separate website
6 Real world math application	Take your time	Like
7 Titivating [captivating??]	Just keep on work	Like
8 Different	Use the textbook	Like, I love writing, no
9 Clear deadlines	Attend the zoom	Like, everything is fine
10 learning how to read stats	Don't forget the Odyssey	Like, they helped apply
11 Numbers and the Matrix	All you can do is TRY	Dislike
12 study and remember vocabularly	study and ask questions	Like it I fun, no suggest
13 Easy to follow along	Read carefully	Like
14 Straight forward, useful	read the book! Highlight!	Like. 2sustainable load.
15 real world cases and eval	Take detailed notes	Dislike, review would hel
16 stats w less #s	Keep up with the hw	Dislike, tedious
17 analyzes statistics	do all the work	Like make you think
18 more critical thinking	mark important pages	like it 's anonymous
19 reading/interpreting data	read book/watch lecture	Like
20 it's about obfuscation	Turn in everything!	Like. No room for more
21 breaking down modern stt	Stay on top of lectures	Dislike. 1. the review
22 Very Effective	do the work	I like
23 Confusing	Read the book	Dislike, I don't like [to] read
F2F Section: Second semester teacher		
<i>Describe for other students</i> Q9: FSF 2nd semester	<i>Advice to other students</i> Q10: F2F 2nd semester	<i>Odyssey: Like vs Dislike. Why?</i> Q11: F2F 2nd semester
1 Literate in statistics	Read the book!	Like: Interesting. Less.
2 Learning to understand sttistics	Read your tetbook	Like: Good for learning material
3 well rounded	Ask questions	Like: making your argument
4 Theoreticl, not math	Listen to the professors	Dislike: confuing
5 Open-ended, interesting	Pay attention	Like! Allows for discussion
6 Can't respond	Attend and read	1. LikeVeryEasy 2More conten
7 class is descriptive	pay attention carefully	Like: Improve thinking
8 lots of critical thinking	Read the book please	Dislike: the format
9 Math course without math	do the work	Like: needs better webite
10 its like math but it has	Make sure to do the work	Neutral
11 Key to success but hard	Use resources and textbook	Like: Give word limit
12 critical thinking	pay attention and ask question	Dislike: It's old
13 Deductions and analysis	Study, ask questions	[Like] See others' perspective
14 easy and hepful	a textbook	Like: It's easy

Figure 8: Student Short Responses to Math 1300: spring 2022 (page 2)

<i>Describe for other students</i> Q9: FSF 1st semester	F2F Section: First Semester Teacher	
	<i>Advice to other students</i> Q10: F2F 1st semester	<i>Odyssey: Like vs Dislike. Why?</i> Q11: F2F 1st semester
1 the word portion of stats	Go to class	Dislike: not useful
2 words based	Ask questions	Like: I think it was useful
3 its easy to understand	Pay attention	Like:
4 analyzing statistics	go to class lectures	Dislike: unnecessary
5 A lit class with math	do the Odyssey challenges	Like:
6 not too much like algebra	come 2 class, be open	Dislike: it' confusing
7 an easy math credit	turn in on time	Dislike. Extensive
8 It's a easy class per say	Study more than you think	Dislike. I don't like words
9 It's a writing math class	Stay on top of the Odyssey	Like, good thinking
10 Teachable	come to class	Okay - U can learn from it
11 A critical thinking class	Attend all sessions	Like: Easy, no suggestions
12 Critical thinking	Homework	Like: I feel like I really
13 Kind of an English class	Come to lecture	Dislike: Ugly website
14		
15 Easy math credit	do the hw	Like: easy points, but hard
16 Simple and good class	Pay attention	Dislike: Responding to other
17 A deep analysis on stats	Do work on time	Dislike: Hard to access

Source: <http://www.statlit.org/pdf/2022-Spring-M1300-SE1-Results.pdf>

Here are more details on what students like and dislike about certain parts of the course.

Figure 9: What students like and dislike about Odyssey and the exercises: spring 2022.

April 2022		Math 1300 Statistical Literacy		Anonymous	
Like-Dislike Survey: Student Responses					
F2F 1st	What do you LIKE about Odyssey?	What do you DISLIKE about Odyssey?	What do you LIKE about Exercises	What do you DISLIKE about Exercises	
1	Not much	There are no grades	I don't	ODYS: we have to responds to others	
2	real-world applications of CARE	Student grading is often unfair	Apply what we learned in class	wording is different from class	
3	Extra free points	Others don't like my answer	M/C: 2 tries. Writing: feedback	Wording of the questions	
4	Anonymous	Some options are too harsh	Variety among exercises	Discrepancy in language vs. class	
5	Read challenge; responding	Responding; Reading my reviews	Quick and effective	Some wording gets confusing	
6	independent thinking	Reviewing 3 people	Not much honestly	Not a fan of writing in math	
7	Fun and interesting	Not helpful to me	Nicely formatted. Lot of time	Strange wording	
1st First semester teaching this course face to face					
F2F 2nd	What do you LIKE about Odyssey?	What do you DISLIKE about Odyssey?	What do you LIKE about Exercises	What do you DISLIKE about Exercises	
1	Interactive with peers	website is outdated	Good way to understand material	Writing docked pts if not perfect	
2	Great tool for application	navigation; feedback difficult	M/C: 2 chances. Writing is good	Writing: difficult to understand	
3	Allows use of imagination	Replying to 4 instead of just 2	M/C: 2 chances. Essay feedback	Can't see right answer immediately	
4	Easy login	Online; confusing; navigation	Voice my opinions on stuff	Statlit is slow in responding	
5	See/review other responses	website is old	M/C: See/review answers	Not sure	
6	Website design; anonymous	Navigation; Stuck after submit.	Writing: I like; very nice	I don't know what to contribute	
7	Based on course material	Nothing	OD: Provide argument; not math	OD: Reply to 4 people	
8	Feedback; anonymous	Outdated; no autocorrect	Outside class; untimed.	No feedback on wrong answers	
9	Nice formatting on questions	Must respond b/f seeing others	M/C: stimulates memory	Writing makes my mind blank	
10	Feedback from classmates	Takes lots of time and energy	Takes less time	Not much fault	
11	Real-world applications; feedback	Responding to 4 others	Book correlated with exercises	Nothing really. Everything timed.	
12	Compare my answers with peers'	Scoring unrelated to effort	Requires thinking; open book/notes	Why just 1 attempt sometimes?	
13	Anonymous; see others' responses	Nothing I dislike	Help me better understand	No feedback on wrong answers	
2nd Second semester teaching this course face to face					

Figure 9: What students like and dislike about Odyssey and the exercises: spring 2022 (page 2).

April 2022		Math 1300 Statistical Literacy		Anonymous	
Like-Dislike Survey: Student Responses					
O/L 9th	What do you LIKE about Odyssey?	What do you DISLIKE about Odyssey?	What do you LIKE about Exercises	What do you DISLIKE about Exercises	
1	Thought-provoking	Sometimes confusing	Good way to practice	No feedback if I don't understand	
2	Anonymous	Navigation is difficult; very confusing	Simple and easy to understand	Hard to see when they are due	
3	Anonymous	Navigation difficult at first	M/C: Immediate feedback	Writing: Long wait time; confusing	
4	See grade when I submit	No reminder when due [in Learn?]	M/C: Gives right answer. Write: OK	M/C: Just one try on some	
5	Pretty good	Kind of confusing	M/C: Interesting to learn	Writing: Can be hard	
6	Apply concepts; Learn from others	Article wording different from class	Exercises deal with real-world	Writing: Sometimes I write backward	
7	Anonymous	Nothing	Helps me learn the ideas	Nothing	
8	Nothing to like	I have to elaborate my responses	M/C: quickest	Writing: I have to elaborate	
9	Different; easy to navigate/respond	Grades not always xfered to Moodle	M/C: multiple attempts	Writing: Didn't understand questions	
10	Promotes discussion on statistics	Separate platform; outdated	Straightforward way to learn stats	Projects are fun	
11	Real-life applications of statistics	Peer-review: useless/over-rated	Dynamic; challenges my thinking	Too untraditional/far out Bewildered	
12	Hard to know what was expected	How wide it was to answer question	Straightforward	Nothing (liked it the most)	
13	Anonymous	Having review 4 people; 2 is better	Good practice	Wish writing gave immediate answer	
14	Easy to use	Password feature is kinda busted	Identify what I need to work on.	Not enough instructions	
15	Keeps me engaged in questions	No dislikes	M/C build knowledge; writing tests	Writing: Wording sometimes weird	
16	Everything -- but I'm a writer	Not exactly a "conversation".	"Pcntg of X is y%" clunky unrealistic	Not enough practice exercises	
17	Love it; more teachers should use	Nothing I dislike	Requires thinking; easy to understand	Nothing that I dislike	
18	Like: Helps me understand the book	4 replies required; prefer two	M/C 2 chances; time to study	No feedback on wrong answers	
19			OK once I get the hang of them	Wording can be confusing	
20	Anonymous	I like everything about Odyssey	M/C: multiple attempts	Wording can be confusing	
21	Anonymous: More genuine	Nothing. Odysy is my favorite h/w	M/C: 2 attempts. Write: formulaic	Writing: so sensitive to small stuff	
22	Openness to answers	Dislike the interface	M/C: 2 attempts.	Nothing that I dislike	
23	Not really	Dislike open-end questions for math	M/C: 2 attempts.	No feedback on why I was wrong	
9th Ninth semester (or higher) teaching this course online					

Source: <http://www.statlit.org/pdf/2022-Spring-M1300-SE2-Results.pdf>

Figure 10: What students like and dislike about the course by section: spring 2022

F2F 1st	What do you LIKE about the course?	What do you DISLIKE about the course?	Don't know: 1/7 Grade
1	In class and sometimes StatLit	Class makes sense; online doesn't	Passing
2	Class lectures and group work	H/w doesn't reflect class learning	Passing
3	Easier math class	H/w grade lower than my understandi	Passing
4	Nice pace in in-class practice	It's a math class.	scared to check
5	Jared is a fantastic teacher	Student responses	Passing
6	2nd try on exercises	Just 1 try on quizzes	Passing
7	The professor	Mandatory attendance	Passing
1st	First semester teaching this course face to face		
F2F 2nd	What do you LIKE about the course?	What do you DISLIKE about the course?	Don't know = 6/13 Grade
1	Seeing real-world applications	Too much online; not enough in class	Passing
2	In-class activities	Like everything, but don't like math	Passing
3	Relates to real-world events	Nothing I dislike	Don't know
4	Instructor is accomodating	Some topics are confusing	Passing
5	In-class activities	Lectures get tedious	Passing hopefully
6	Giebitz is very good teacher	Anything involving math	Passing??
7	Understanding stats different light	Chaotic; no review in class	Pass
8	Course for non-STEM majors	Need mandatory office hours	Pass?
9	Tests are organized on when due	Finding grades is odd	Passing
10	In-class activities are very nice	Nothing comes to mind	Passing
11	Listen to others; teamwork	Hated distance from where I lived	Don't know
12	Lots of inclass help; lots of chances	Being called on inclass; humiliated	Passing
13	Course is in-depth; requires thinking	Do not dislike anything	Don't know
2nd	Second semester teaching this course face to face		
O/L 9th	What do you LIKE about the course?	What do you DISLIKE about the course?	Don't know: 5/23 Grade
1	I learned a lot	Sometimes its hard	Passing
2	Easy to understand	Long chapters; hard to find things	Don't know
3	Many ways to get points	Nothing	Passing
4	Reading statistics	Remembering due; indep learning	Don't know
5	More fun than most math classes	Multiple homeworks	Passing
6	I like feedback on what I need to learn	Start assign sooner (Wed).	Passing
7	Like it a lot; wish I'd taken it sooner	Nothing	Passing
8	What is there to like	Never asked for a Gen Ed course.	Not sure
9	Course routine stayed fixed	Dislike open Friday; due Tues. Like M-I	Pass B+
10	Makes math approachable	Put everything in Learn	Don't know
11	Different from other math courses	Sometimes inconsistent curriculum	Passing
12	Reading book; watching online lecture	Nothing; straight-forward course	Don't know
13	Like the question setup and review	Not on Learn. Not in Learn calendar	Passing?
14	Easy to navigate	Nothing really	Passing
15	Good amount work; easy accessible	Don't dislike anything	Passing
16	Teacher: helpful; admits mistakes	Class is online. No interaction.	Passing
17	Course well organized; teacher helpful	Nothing that I dislike	Passing
18	Feedback on wrong answers	Confusing web page; Ody not updated	Passing B
19	Not excessive work; Doable	Forget assign. Not in Learn/Blackboard	Passing
20	Moodle is user friendly; Dates clear	Nothing I dislike about this course	Passing
21	I like the book: casual tone; repetition	Dislike nothing about the course	Passing
22	Like the pace; not over-whelming	Dislike interfaces of websites	Passing
23	Lenient/understanding w deadlines	Book: slighty hard to follow	Passing C+
9th	Ninth semester (or higher) teaching this course online		

Appendix E: Second Semester Student-Teacher Evaluations of Course Topics

Surveying student likes and dislikes is interesting. But for teachers, the question is which topics are important and which are most difficult. This survey presented students and teachers with a list of 25 topics. Both groups were asked to select the 10 most important, the top 6, the top 3 and the top one. Both groups were asked to select the three that they considered the most difficult. Table 5 presents the results for the students. Table 6 presents the results for the teachers.

Table 5: Student Evaluation of Most Important (most difficult) topics in spring 2022

April, 2022 Combined Results				M1300 Top Topics by Students Most Important; Most Difficult	
-- MOST IMPORTANT ---				HARDEST	ID Item
Top10	Top6	Top3	Top1	Top3	
5%	4%	6%	12%		1 Ch 1: Statistics are different from numbers: numbers in context
6%	6%	7%	2%		2 Ch 1: Association-causation: A-B-C grammar (comparison or covariation)
4%	5%	5%	2%		3 Ch 1: Statistical literacy studies the influences on a statistic
8%	12%	19%	50%	1%	4 Ch 1: Take CARE: Confounding, Assembly, Randomness and Error/bias
4%	6%	3%	6%	1%	5 Ch 1: Confounding: how a change in context can change an association
5%	4%	5%		3%	6 Ch 1: Assembly: Choose how things defined, measured, compared, presented.
3%	4%	3%		2%	7 Ch 1: Randomness: chance creates exceptions in big data; variation in small samples.
6%	7%	6%	6%	1%	8 Ch 1: Error/Bias. types of: Subject, Measurement (Researcher) and Sampling Bias
3%	4%	2%	2%	3%	9 Ch 2: Two-group comparisons of counts and amounts. Three types. Percentage points
5%	5%	4%	4%	2%	10 Ch 2: Confounding: Effect size, study design (Exp vs. Obs. Study), selection
4%	2%	4%	2%	4%	11 Ch 2: Assembly: Hypothetical thinking: plausible confounders, plausible definitions.
2%	1%	1%		3%	12 Ch 2: Random: Law of very large numbers. Statistical significance via confidence intervals
5%	3%	3%	2%	3%	13 Ch 2: Error/Bias solutions: Placebo, Single blind; double blind and random sampling
2%	2%	2%		7%	14 Ch 3: Ranks, percentiles, quintiles, quartiles
5%	5%	5%	2%	7%	15 Ch 3: Mean-Median-Mode: Order in skewed distributions (bias)
3%	2%	3%		5%	16 Ch 3: Comparing measures using ordinary English
2%	3%	1%		3%	17 Ch 3: Control of versus control for (to take into account)
2%	2%			8%	18 Ch 3. Converting amounts to ratios can change the size and direction of an association.
2%	2%	2%		9%	19 Ch 3: Standardizing averages controls for confounders: Mix matching
4%	3%	1%		11%	20 Ch 4: Part-whole ratios using ordinary prepositions or 'per'
4%	4%	3%		9%	21 Ch 4: Named Ratio grammar: Percent and percentage
5%	6%	6%	2%	6%	22 Ch 4: Read tables and graphs: 100%, half and no margin
5%	5%	5%	8%	4%	23 Ch 8: Influences on statistical significance
5%	3%	3%		3%	24 Ch 8: Surveys vs. polls
3%	3%	1%		3%	25 Ch 8: Random samples: Four types of
100%	103%	100%	100%	99%	

2022-Spring-M1300-SE9-Results.xlsx Students

Obviously the selection of the 25 possible choices (assembly) can influence the results.

Source: <http://www.statlit.org/pdf/2022-Spring-M1300-SE9-Results.pdf>

Table 6: Teacher Evaluation of Most Important (most difficult) topics in spring 2022

April 2022		M1300 Topics by Teachers										3 Teachers		
		Most Important; Most Difficult												
All current UNM teachers					Textbook Author					Chapters 1-4 and 8				
-- MOST IMPORTANT --					-- MOST IMPORTANT --					-----25 TOPICS-----				
Top10	Top6	Top3	Top1	Top3	Top10	Top6	Top3	Top1	Top3					
1					1	1	1	1		Ch 1: Statistics are different from numbers: numbers in context				
2	1	1			1	1				Ch 1: Association-causation: A-B-C grammar (comparison or covariation)				
1	1	1	1							Ch 1: Statistical literacy studies the influences on a statistic				
2	2	2	2		1	1	1			Ch 1: Take CARE: Confounding, Assembly, Randomness and Error/bias				
3	3	1								Ch 1: Confounding: how a change in context can change an association				
2	2	1								Ch 1: Assembly: Choose how things defined, measured, compared, presented.				
1	2									Ch 1: Randomness: chance creates exceptions in big data; variation in small samples.				
1	2									Ch 1: Error/Bias. types of: Subject, Measurement (Researcher) and Sampling Bias				
2										Ch 2: Two-group comparisons of counts and amounts. Three types. Percentage pts				
1					1	1				Ch 2: Confounding: Effect size, study design (Exp vs. Obs. Study), selection				
2	1	1								Ch 2: Assembly: Hypothetical thinking: plausible confounders, plausible definitions.				
1		1		1						Ch 2: Random: Law very large numbers. Statistical significance via confidence intervals				
1					1					Ch 2: Error/Bias solutions: Placebo, Single blind; double blind and random sampling				
1										Ch 3: Ranks, percentiles, quintiles, quartiles				
2	1									Ch 3: Mean-Median-Mode: Order in skewed distributions (bias)				
1	1				1					Ch 3: Comparing measures using ordinary English				
1										Ch 3: Control of versus control for (to take into account)				
1										Ch 3. Converting amounts to ratios can change size and direction of an association				
				3	1	1	1		1	Ch 3: Standardizing averages controls for confounders: Mix matching				
2	1									Ch 4: Part-whole ratios using ordinary prepositions or 'per'				
				2	1	1			1	Ch 4: Named Ratio grammar: Percent and percentage				
1				2	1				1	Ch 4: Read tables and graphs: 100%, half and no margin				
1	1	1		1	1					Ch 8: Influences on statistical significance				
										Ch 8: Surveys vs. polls				
										Ch 8: Random samples: Four types of				
10 6 3 1 3					10 6 3 1 3					TOTALS				

Note: the data for the textbook author (Schield) is separated from the data for the three spring 2021 UNM teachers.

Source: <http://www.statlit.org/pdf/2022-Spring-M1300-SE9-Results.pdf>

The level of importance as viewed by the teacher is not the standard by which material is selected for statistical literacy. The standard is how relevant the material is for educated citizens in understanding the statistics they encounter in everyday life: in the everyday news media in the form of statements, tables and graphs.

Statistical educators may want to talk about standard deviation, random variation, the central limit theorem, and p-values. But unless these statistical treasures can be related to statistics that educated adults will encounter in everyday life, these treasured topics need to be reserved for a statistical inference course.

Appendix F: Student Grades (First and Second semester)

Student grades are shown in Table 7. In computing failure rates, the University of New Mexico considers a Withdraw after the 2nd week or a final grade below a C as being a fail.

The fall 2021 grades have two major limitations. (1) These grades include just two of the four sections. Those two were taught by Schield. (2) As noted, some grade cutoffs were lowered in fall 2021 to minimize failures. This was done for three reasons. First, Math 1300 had a very rough start. No teacher training, multiple web platforms, and student enrollment problems. Second, the course needed to be repositioned from dealing with fourth-year students (prior to 2021) to dealing with first-year students (2021-22). This change involved course content, exercises and tests. Third, both UNM teachers were teaching this very-different material for the first time.

The spring 2022 grades are much better indicators of future grades.

Table 7: Student Grades for fall 2021 and spring 2022

Cutoff	Letter	Fall 2021	Spring 2022	Fall 2021	Spring 2022
Minimum	Grade	#Combined	#Combined	%Combined	%Combined
0	F	0	6	0%	9%
60	D	0	3	0%	5%
67	C-	0	0	0%	0%
70	C	11	10	17%	15%
73	C+	6	3	9%	5%
77	B-	7	9	11%	14%
80	B	8	11	13%	17%
83	B+	5	10	8%	15%
87	A-	6	6	9%	9%
90	A	7	2	11%	3%
93	A+	8	3	13%	5%
	W	6	3	9%	5%
	Total	64	66	100%	100%
	Fail: < C	0	9	0%	14%
	Pass: >C-	58	54	91%	82%
	Withdrew	6	3	9%	5%
	UNM Fail	6	12	9%	18%
Fall 2021 grades are from just two of the four sections.					
Fall 2021: Some grade cutoffs were lowered to minimize failures					
Grade		Fall 2021	Spring 2022	Fall 2021	Spring 2022
D or F		0	9	0%	14%
C-, C or C+		17	13	29%	21%
B-, B or B+		20	30	34%	48%
A-, A or A+		21	11	36%	17%
	Total	58	63	100%	100%
	Withdraw	6	3	Excluding Withdraws	

Bibliography

ASA Guidelines Update (2016). 2016 Update to the ASA GAISE Guidelines. Copy at https://www.amstat.org/docs/default-source/amstat-documents/gaisecollege_full.pdf

Moore, D. (1997). Statistical Literacy and Statistical Competence in the 21st Century. Slides only. Copy at www.statlit.org/pdf/1997MooreASAslides.pdf

Moore, D. (1998). Statistical Literacy and Statistical Competence in the 21st Century. Abstract only. Copy at www.statlit.org/pdf/1998MooreMSMESB.pdf

Schild, M. (2021). Statistical Literacy Approved for General Education at the University of New Mexico ASA Proceedings of the Section on Statistical and Data Science Education. P. 1192-1222. Copy at ResearchGate or www.StatLit.org/pdf/2021-Schild-ASA.pdf