

Lesson Plan SEMS 498 (Math)

Grade/ Grade Band: 10-11 th grade (50 minute period)		Topic/Title: Intro to Statistics	
Brief Class Description (contextual information including number of students, subject, level, IEP/ELL/GT or other special considerations): This class has an ADHD student along with an ELL student. The class is 50 minutes long. There are 25 students, and there are a few with higher math skills and some with lower math skills. There are also several shy students that do not like to talk in front of the class, but in small groups they are fine.			
Brief Lesson Description (Overview/Abstract): In this lesson, students will learn about how statistics is all around them in real life and in situations they care about. They will use an article about segregation in Maryland Public Schools to learn about experiments and other types of statistical studies.			
Objective(s): SWBAT analyze statistics in a text and make observations and conclusions about experiments and studies			
Prior Student Knowledge: Students may have some prior knowledge about types of statistical studies, along with outside contextual knowledge about bias, experiments, and data. General statistics is usually learned in middle school.		Possible Preconceptions/Misconceptions: Surveys are easy to do Experiments only happen in science	
Common Core Standards: CCSS.Math.Content.HSS.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.		Standards for Mathematical Practices: Construct viable arguments and critique the reasoning of others.	
Required materials: The article on large sheets of paper, crossword handout, projector/smart board, warm up sheet (loose leaf paper), handout for group discussion, exit ticket	Safety considerations: N/A		Technology Integration/Needs: projector for warm up question, and to display the article during discussion time.
ENGAGE: Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions. Include timing/pacing, adaptations (IEP, ELL, culture, other) and transitions. (8 minutes)(42 minutes left) Setup: I will need a powerpoint to project the warm up question and instructions to Think Pair Share. The students will come into the classroom, and on the board there will be a question with instructions to Think-Pair-Share with their table and write down their answer on a warm-up sheet: <ul style="list-style-type: none">• <i>“Is there still segregation in public schools, why or why not?”</i>• <i>What about in Maryland specifically?</i>• <i>What percent do you think it is?”</i> They will have 39 seconds to think, and 1 min 27 seconds to talk to their table. This will be timed using a timer. During this time, I will be walking around and eavesdropping on students in order to sequence answers. Then after the timer beeps I will call on two or three students based on what I heard/observed. <ul style="list-style-type: none">• <i>“For a Warm up, I want you to think about the questions I have here on the board. What do you</i>			

Comment [CT1]: Students in Maryland Schools are interested in this topic due to the political climate and increase of movements in the country. Although some students may not see it, they are all directly affected by segregation. Students in high school are also more likely to be aware of how segregation affects the education of children in certain areas. This topic is incredibly relevant in our society at this time in the country.

think, what is your honest opinion?

- You'll have 39 seconds to think to yourself, then talk to your neighbors and write your answers down on your warm up sheets.
- I'll give you 1 minute and 27 seconds for that. Go ahead and start!"

Student answers:

"I think there is still segregation, because there are some schools with a lot of people of one race, in Maryland and in the US, and I think that Maryland has 30 percent segregation"

"There isn't because segregation is illegal."

"I think southern states would be more segregated than northern states because they seem to be more racist and stuff. Maryland is probably like 20%."

Now students will think about how to find out if states have segregation in public schools, and then they will share with the class and have a discussion.

- "Now that we've shared our opinions about this topic, how would you go about determining if it does exist? Meaning, how would you truly find out that there is segregation in public schools?"

Most students will immediately think "survey".

Student answers

"Ask a bunch of people if they think public schools are segregated"

"Do a survey of schools around the nation and see if they're segregated"

Teacher: "What constitutes a survey? What schools would you use?"

Students:

"A lot of people answering questions"

"We need to use a bunch of schools from all around the country"

Teacher: "Is there anything else we could do?"

Students:

"A different type of experiment"

I will also go through student definitions of Experiment, Observational Study, and Sample Survey to prepare students for their discussions.

Teacher: "There are three vocab words we are learning today: Experiment, Observational Study, and Sample Survey. Can anyone take a whack at what one of them might be?"

Students: "An Observational Study might be an experiment where you only observe something."

"A survey is where you take answers from people like online."

"An experiment in science is where to test something."

Teacher: "We'll come back to these definitions later!"

Differentiation: This is a discussion piece, but for students that do not participate as much the Think-Pair-Share is a good way for them to ease into conversation. For a class with many shy students, the "Pair" part of the activity can be longer; or they can talk at their table and each table can be required to have a person to share what they were talking about. ELL students may not be familiar with segregation in schools, but I can pair them with someone or another pair of students that are familiar with it for explanation and context. For ELL students as well, I can come to their group and ask "Is there anything similar to this that you are familiar with?"

Transition: "When I say you can, if you do not have a marker or colored pencil you should get one. I am passing out this large sheet of paper with an article on it."

Comment [CT2]: Using irregular timing makes the students pay more attention to the time they have left to do something.

Comment [CT3]: This is how I relate segregation to the statistics lesson students will be doing. Students will be interested in trying to prove or disprove if there is segregation in Maryland Public Schools.

Comment [CT4]: Students may also try to immediately relate what their peers say back to segregation in public schools and how each one could be used to prove it exists.

Comment [CT5]: Segregation doesn't just happen in America. Students that are classified as ELL may have experience with something similar, so that will add a new perspective to the discussion later.

EXPLORE/EXPLAIN Cycle(s)

EXPLORE: Include description of student centered tasks with information on timing/pacing, differentiation, material management, grouping, adaptations (IEP, ELL, culture, other), probing or clarifying questions with answers, and transitions.

(15 minutes)(27 minutes left)

Setup: To prepare for the class, I will need to print the article about segregation in Maryland Schools onto anchor chart or otherwise large paper. Instructions should be both verbal and on the projected powerpoint. There must also be markers, gel pens, or colored pencils available for students that don't have any other their own.

Article: https://www.washingtonpost.com/local/education/report-half-of-black-students-in-maryland-attend-segregated-schools/2013/04/18/9097c29a-a83e-11e2-8302-3c7e0ea97057_story.html?utm_term=.90c5be11a4a0

Students will read the article on large sheets of paper as a table, and after reading or during reading students will annotate the article with their thoughts and replies to other people's annotations. Each student will annotate in a different color so the teacher knows which students have done a lot of annotating and which haven't. The annotations do not have to be specifically about statistics, but some should be. Students are at tables of no more than 4 people, so it will not be difficult to read the article. If a student asks to move to a table with less people then they can.

Before they read, I will go around to each table and put the article on the desks so that I am walking around while instructing. This way students are more likely to pay attention as I am not just standing in front of the classroom, I am walking around and will be coming by all tables. Students will be instructed to get a marker if they need one.

- *"When I say you can, if you do not have a marker or colored pencil you should get one. I am passing out this large sheet of paper with an article on it.*
- *Read the article, silently, with the rest of your table. You can crowd around it.*
- *While you read, I want you to write down everything and anything you think of that is related to the article, or statistics. Once you write down at least two original thoughts, you can read other group members annotations and reply to them with your own thoughts or opinions.*
- *Maybe Sam agrees with something Annika wrote, so he can underline it or draw an explanation point if he'd like. Have at it!"*

Differentiation: Article in bigger font, also more time to read and annotate, and the large sheet of paper can have lines on it in different places so the students have an easier time organizing and writing down their thoughts. For Advanced students, they will have a requirement of a minimum of 3 original annotations as well as 4-5 reply annotations, 3 of which must be words/sentences, not symbols. ELL students have the option of annotating in their home language, which can then be translated by me or a co-teacher (if there is one). ADHD students can be given 2 markers instead of 1, and can also be given the option of drawing a picture instead of outright annotating, although at least one of those student's annotations must be in words.

Transition: "Now that everyone is finished annotating, you will be given a stickie note."

EXPLAIN (STUDENT CENTERED): Include description of cognitive outcome (concepts and vocabulary), student centered explanation (tasks) with information on timing/pacing, grouping, adaptations (IEP, ELL, culture, other), probing or clarifying questions with answers, and transitions. Also include "look fors" and how this part helps students "bring the pieces together".

(15 minutes)(12 minutes left)

Setup: On the powerpoint will be the instructions I will give verbally as well as sample discussion questions for students to keep on the right track while discussing, as well as the required questions. I also need to have enough stickie notes for everyone in the class.

Comment [CT6]: Reading an article on a huge piece of paper is not something students usually encounter, so they will be more engaged in reading.

Comment [CT7]: This allows students to really think about the article and what it is saying.

Comment [CT8]: This also is literacy in a math classroom, which is important to many schools. It also makes students realize that they read everywhere, not just in English class.

Students will be instructed to do a gallery walk of all the annotations around the classroom, then write on a stickie note an annotation that they found interesting or agreed/disagreed with.

- *"Now that everyone is finished annotating, you will be given a stickie note. When I say you can, I want you to walk around to all the other tables and read the annotations you see."*
- *"When you have read these annotations, I want you to write one down on your stickie. It cannot be yours! It should be an annotation that you found interesting, or one you agreed or disagreed with."*
- *"When you are done your gallery walk you should go back to your seats."*

After students are finished with the gallery walk and writing down their annotation, they will be instructed to walk around the classroom, talking to peers, and find someone with the same annotation as them (or something similar). When they have found a partner or group, they will be given a handout (one per student), and I will explain what kind of discussion students should have. This discussion will also include the vocabulary words we discussed in the engagement; the words will be on the handout along with formal definitions so students can discuss them and how they relate to the article. I may also have a sample discussion with myself using different voices (to keep students attention).

- *"Now you will walk around the classroom and find someone who chose the same or a similar annotation as you. After you have found someone(s), sit down somewhere and you will have a discussion about your annotations and the article in general. Discussions should be inquisitive! For example"*
- *"Hey Bathilda, why did you choose insert quote here?"*
- *"Well Wayne, I chose it because... why did you choose it?"*
- *"Well I chose it because... but can we go back to what you said? I find it interesting that you think... because..."*
- *"You have a required starting question, and a required ending question, along with others that are presented on the board. I will time the discussions for 8 minutes!"*

Students will discuss why they picked that annotation. Students will be encouraged to ask their peers questions that delve into deeper thinking.

Student 1: "I chose this annotation because..."

Student 2: "Why do you think...?"

Student 3: "I disagree because..."

Student 4: "How does this relate to statistics?" (Required!)

Student 5: "What could be done to make the data more accurate, or the argument stronger?" (Also required)

I will be walking around eavesdropping on different conversations, making sure students are not attacking each other (i.e. having a discussion, not a debate). There will also be sample questions on the board so that students can use them and/or know what kind of questions to ask. These are questions such as

"Why did you choose that particular annotation?" (starter question)

"Why do you think that?"

"How does this relate to the vocabulary at the top of our page?"

"How does this relate to your life in particular?"

"How does this relate to statistics?" (Required!)

"What could be done to make the data more accurate, or the argument stronger?" (Also required)

"Why might people have a different opinion than you?" (Required ending question)

Every student must give their reason to why they chose an annotation, and students will fill out a handout with the reasons of their group members. They must also write down their group answer to the required ending question.

- *"The timer is at 1.5 minutes left, now is the time to move on to the required ending question"*
- *"Your time is up!"*

Comment [CT9]: This allows students to get up out of their seats and move around, which expels energy and makes the students more engaged in the lesson. It will also be interesting for the students to observe annotations that were similar or very different from their own.

Comment [CT10]: Forming groups this way is not something students usually encounter. It takes time, but when groups of 2-3 are formed students will be able to have an engaging discussion since they were just up and moving around the classroom. They can also have their discussion anywhere in the classroom, not necessarily at a table of desks.

Comment [CT11]: This is an instructional strategy to keep students engaged and focused on the directions.

Comment [CT12]: Also an instructional strategy. This name is not common today, so using it will be funny and keep the students attention.

Comment [CT13]: This ensures that students are having meaningful discussions.

Comment [CT14]: This makes students try to think about someone else's perspective, which is an important life skill.

Comment [CT15]: This also ensures students are focused and doing what they were instructed to.

Differentiation: The discussion is chunked by the teacher announcing near the end of the discussion to answer the required ending question. An adaptation for the handout could be for students to only write down one or two group member answers instead of all, and also a more organized handout with boxes or lines so that students may write their answers easier. Another adaptation could be partners or groups of three only. ELL students can be paired together if they have the same home language, so that their discussion is easier for them, and if the ADHD student is being overly hyper, can be given a stress ball or something else to squeeze with his hands so that he has an easier time sitting and talking with his group, as long as they complete the handout as well.

Transition: “Now that every group is finished discussing, I can tell from the conversations I’m hearing, go back to you assigned seats with the huge article at your table.”

Comment [CT16]: This is also a classroom management strategy, to keep students focused on the task at hand.

ELABORATE: Include description of applications and extensions tasks with information on timing/pacing, differentiation, grouping, adaptations (IEP, ELL, culture, other), probing or clarifying questions with answers, and transitions.

(5 minutes)(7 minutes left)

Students will be completing a RAFT: Role-Student, Audience- the world/twitter, Format-tweet, and Topic-statistics and segregation in public schools.

- “Back at your seats, go through the article quickly and find a quote. This quote could be something you found interesting, or related to an annotation you found interesting. Got your quote?”
- Think about what it means, how it makes you feel.
- Then, on your handout with discussion notes, come up with a tweet that relates your quote to the objective today or the vocab words on the handout, which were Experiment, Observational Study, and Sample Survey. Remember tweets are 140 characters, and make it something you would want to read! You have 4 minutes and 17 seconds. Yes we are doing the old 140 character tweet not the new 280 character.

Comment [CT17]: Students are still relating back to the article and the topic they were introduced to the lesson about, to keep them engaged.

Comment [CT18]: This relates everything they have done for this lesson to their personal lives and modern society.

Differentiation: Students can have a longer time to complete the activity, ELL students can use home language vocab in their tweets if they’d like, Advanced students (if they finish early) can write more than one tweet using different quotes.

Transition: “Remember your tweet has to include something about statistics! Once you have finished your tweet, put your papers in the middle of your table for me to collect.”

COGNITIVE CLOSURE (aligned with objective(s):

Reminder: A learning ticket is not considered a cognitive closure by itself.

(7 minutes)(0 minutes left)

Setup: I must have ready the half sheet of paper for the exit ticket.

Exit ticket: Students will be given a half-sheet of paper labeled “exit ticket”, with a question about $\frac{3}{4}$ of the way down “How does this relate to what you learned today?” While I am handing it out, I will instruct students.

- Now, on the sheet of paper that I am giving you, make your own statistical study.
- List what kind of study you would use, what the study would be about, how you can make it as unbiased as you can, along with what you think the outcome will be. Try to make this study realistic to your life, something you could do in the near future (wink wink). The class can do a project on a statistical study as a summative assessment
- Then, under that, write how this new study of yours relates to what you’ve learned in class today.

This exit ticket will be a precursor to a project they will do, in groups they will create their own study and

Comment [CT19]: Making students relate the lesson to other things in their lives, not just the article I gave them.

Comment [CT20]: They can relate it back to the definitions we covered, or what they learned about statistics from the article and their peers during the discussion.

conduct it around the school, and present their project to the class in a chosen form of essay, trifold, PowerPoint, or something else of their choosing (it needs to be run by me first). Students will have 6 minutes and 23 seconds to complete this slip. For IEP or struggling students, their exit ticket can be done in pairs as long as each student completes their own, but puts the partners name on it at the bottom. They should have more time, 10 minutes, and special instructions to *jot some ideas down for this study, and what type of study you would use. If you have time to make it more detailed and write what outcome you think it will have, great! But you **must** complete how it related to today's lesson, just a bullet point or two.* For advanced students, the more details about the study that they can come up with, the better.

EVALUATE:

Diagnostic Assessment(s): During the engagement, the students come up with ways to get information about a topic, which will gauge student understanding of statistics

Formative Assessment(s): The discussion notes are being collected as an assessment of what the students talked about and learned during the discussion period. This paper also has the RAFT on it to assess how students can creatively paraphrase what they learned.

Summative Assessment(s): N/A

Timing/Pacing Adjustments (Slinky Time): Include a plan for how to adjust instruction if tasks take longer/shorter than anticipated:

I time is running short, then the students do not have to do the RAFT and that will cut 5 minutes. We could also have the RAFT as the closure instead of writing a statistical study, and that would cut 7 minutes.

If the lesson is running short and we have more time, then the discussion time can run longer (5 minutes) or people can volunteer to share their RAFT (5 minutes) or we could Turn and Talk about the statistical study we made (5 minutes), and also go over the objectives again.

Comment [CT21]: Since they were introduced to general statistics in middle school, although this is the first unit of the class they should still be able to come up with certain details about the study they want to do.

Discussion Notes

Name:

Date:

Experiment: A situation with more than one chance outcome that can be predicted

Observational Study: An experiment where the researcher can only observe subjects

Sample Survey: Type of observational study where only a part of a population is surveyed

	Why did they pick that annotation?	How does this relate to your life?	What may be a differing perspective?	Other notes you want to have:
Group Member 1				
Group Member 2				
Group Member 3				

Group Member 4				
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Discussion Notes (Adaptation)

Name:

Date:

Experiment: A situation with more than one chance outcome that can be predicted

Observational Study: An experiment where the researcher can only observe subjects

Sample Survey: Type of observational study where only a part of a population is surveyed

	Why did they pick that annotation?	How does this relate to your life?	Other notes you want to have:
Group Member 1			

Group Member 2

Name:

Date:

Mod:

EXIT TICKET

List what kind of study you would use, what the study would be about, how you can make it as unbiased as you can, and what you think the outcome will be.

How does this relate to what you learned today?

