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| **Rock Studies Learning Objective 3a:** *Demonstrate knowledge of diverse experiences, cultures, and identities from a systemic perspective. Learning about diversity means learning to apply multiple perspectives to address local, regional, global, and cultural issues. It also asks students to discover ways that systems of power contribute to inequalities and interactions that affect individuals and communities* | | | | | |
| ***Indicate alignment between the course outcomes and learning objective 3a:*** | | | | | |
| **Course-Level Outcomes:**  CO 1) Students will distinguish between multiple methods of data collection and distinguish between the different analysis techniques required for different data collection methods.  CO 2) Students will create and critically analyze and interpret data displays and will be able to identify manipulative practices in data displays.  CO 3) Students will calculate and interpret the meaning of the different descriptive measures of data, including measures of central tendency, dispersion, position, and correlation.  CO 4) Students will distinguish between classical, empirical, and subjective probability, identify independent or mutually exclusive events, and determine probabilities of events through use of the fundamental counting principle and rules of probability.  CO 5) Students will define a probability distribution, distinguish between discrete and continuous probability distributions, construct discrete distributions, and calculate probabilities and moments (expected value, variance, standard deviation) for discrete distribution tables and the binomial and normal probability distribution functions.  CO 6) Students will define the distribution of a sample mean, calculate probabilities for the sample mean of a normal distribution, and calculate probabilities for sample means not derived from a normal distribution through the Central Limit Theorem.  CO 7) Students will apply the Central Limit Theorem to calculate confidence intervals of means and proportions, correctly interpret the meaning of a confidence interval in relation to a population mean or proportion, and distinguish between scenarios in which a z-statistic based confidence interval or a t-statistic based confidence interval is appropriate.  CO 8) Students will be able to complete the hypothesis test for a sample mean or proportion appropriately, by:  a. Determining which hypothesis should be the null hypothesis and which the alternative;  b. Choosing the appropriate reference probability distribution;  c. Accurately determining a test statistic and p-value; and  d. Appropriately interpreting the results of the hypothesis test, including the meaning of the p-value.  Students will additionally:  a. Identify and interpret Type I and Type II error;  b. Describe the purpose of an alpha level/significance level and appropriately choose an alpha level for a particular scenario.  CO 9) Students will have intermediate proficiency in Microsoft Excel, and will complete basic spreadsheet construction, sorting, function use, and descriptive data analysis through the Excel software package.  **CO 10) Students will articulate the connection between the statistical concepts of demographics, independence, assumptions, bias, causation, correlation, data visualization, and hypothesis testing and the DEI concepts of social identity, diversity, intersectionality, marginalization, discrimination, implicit bias, structural privilege,**  **structural oppression, cultural competence, and social justice.**  **CO 11) Students will cite examples of how an individual's social and cultural identity can lead to biased scientific conclusions that exacerbate structural oppression.**  **CO 12) Students will analyze examples of poorly-designed/unethical and well-designed/ethical methods for data collection and analysis in the context of structural oppression and/or privilege.**  **CO 13) Students will articulate the connections between demographic data collection and human diversity and how statistics can create or exacerbate structural oppression of demographic groups.** | | | | | |
| **Units** | **Objectives** | **Instructional Materials** | **Instructional Activities** | **Assessment Method** | **Alignment** |
| 1 | **U011:** Through readings, group discussion and reflection, students will state definitions for DEI concepts including  Diversity, equity, inclusion, structural oppression, implicit bias, microaggressions, privilege, power, and marginalization.  **U012:** Through readings, group discussion and reflection, students will determine ways in which the field of statistics contributes to inequities or equity in society. | 1. Blair, D. (May 6 2016) Structural Oppression: 5 Concepts, 1 Theory.  anemoiadotxyz.wordpress.com/2016/05/06/structural-oppression-5-concepts-1-theory/ (accessed 2022-01-08).  2. Sellers, K. F. (2021). How to Help Advocate for Justice, Equity, Diversity, and Inclusion. Amstat News, 532, 9.  3. Sellers, K. F., Benn, E. K., Garcia, M., & Kellam, M. (2017). Addressing Implicit Bias Among Women Statisticians and Data Scientists. CHANCE, 30(2), 38-41.  4. Golbeck, A. L., Ash, A., Gray, M., Gumpertz, M., Jewell, N. P., Kettenring, J. R., ... & Gel, Y. R. (2016). A conversation about implicit bias. Statistical Journal of the IAOS, 32(4), 739-755.  5. Benn, E. (2021). Power and Privilege: Reshaping the Opportunity Structure for Equitable Leadership in Statistics and Data Science. Leadership in Statistics and Data Science: Planning for Inclusive Excellence, 19.  6. Liao, S-M. (2022). At the Rise of JEDI: Lessons Learned from Fall of the Jedi Order in Star Wars. Amstat News, 535, 12-13 | Reading, Group Discussion using the following prompts:  1. Several concepts related to diversity, equity, and inclusion are introduced through these readings, including structural oppression, implicit bias, microaggressions, privilege, power, and marginalization. From the readings, what do these terms mean?  2. In these readings, the relationship between the field of statistics and DEI concepts are presented mostly through the lens of female statisticians that have experienced inequities in their careers. Can you think of other ways that DEI concepts are relevant to the field of statistics? | Grade for group discussion participation over course of semester and written reflection on the following prompts:  1. Think about the DEI concepts discussed this week and how they relate to your own life. Can you think of a time when you felt marginalized? Do you feel like you are in a position of privilege or of marginalization in your own life? Why?  2. Have you ever had someone obtain data from or about you that you didn’t want to share? Where did that happen, and for what purpose? What type of power did that information give to the person that had it? | U011, U012: CO10 |
| 2 | U021: Through readings, group discussion and reflection, students will explain through specific real-life examples how individual racism and discrimination can lead scientists to make unethical decisions around data that contribute to structural oppression of marginalized groups.  UO22: Through readings, group discussion and reflection, students will analyze how power that scientists hold in society interacts with societal stereotypes about marginalized groups. | 1. Brandt, A. M. (1978). Racism and research: the case of the Tuskegee Syphilis Study. Hastings center report, 21-29.  2. Henry, B. V., Chen, H., Edwards, M. A., Faber, L., & Freischlag, J. A. (2021). A New Look at an Old Problem: Improving Diversity, Equity, and Inclusion in Scientific Research. The American Surgeon, 00031348211029853.  3. Lewis, J. E., DeGusta, D., Meyer, M. R., Monge, J. M., Mann, A. E., & Holloway, R. L. (2011). The mismeasure of science: Stephen Jay Gould versus Samuel George Morton on skulls and bias. PLoS Biology, 9(6), e1001071.  4. Antrosio, J. (2011). “Mismeasuring Gould in ‘The Mismeasure of Sceince.'”  Living Anthropologically website, https://www.livinganthropologically.com/  mismeasuring-gould/. First posted 14 June 2011. Revised 7 September 2017.  5. Anderson, M., & Fienberg, S. E. (1999). Who counts?: The politics of census taking in contemporary America. Russell Sage Foundation, 11-34.  6. Anderson, M. (2020). The Census and the Japanese" Internment": Apology and Policy in Statistical Practice. Social Research: An International Quarterly, 87(4), 789-812. | Reading, Group Discussion using the following prompts:  1. What are some examples of structural violence against African-Americans and Japanese-Americans from these readings? How are these examples related to the field of statistics?  2. The fifth reading, from the book Who Counts? The politics of census-taking  in contemporary American, introduces the idea of the differential undercount. What is a differential undercount, and how is it related to the DEI concept of structural oppression? | Grade for group discussion participation over course of semester and written reflection on the following prompts:  1. In this reflection we will be exploring our social identities as we consider how society is structured. Complete the following chart about your own identity. You do not have to share this identity in your written reflection.\*  After mapping your social identity, think about the readings and the experiences of the people that were or are discriminated against. How are their social identities similar or different than yours?  2. How did the readings make you feel about the structural inequities in society that result from flawed data collection processes?  3. What responsibility do you feel toward making sure scientific and governmental data collection efforts are equitable? | U021, U022: CO11 |
| 3 | UO31: Through readings, group discussion and reflection, students will analyze how a statistician’s social identity translates into biased understanding of the history of statistical thought.  UO32: Through readings, group discussion and reflection, students will critique the dominant narrative about the history of data visualization by comparing and contrasting euro-centric analysis of the history of statistical thought and more diverse understandings of the history of statistical thought. | 1. Friendly, M. (2008). A brief history of data visualization. In Handbook of data visualization (pp. 15-56). Springer, Berlin, Heidelberg.  2. Lundeen, P. (July 22 2021). REVIEW: Data + Diversity-Exploring the Data Visualizatons of W.E.B. Du Bois. https://nightingaledvs.com/review-datadiversity-exploring-the-data-visualizations-of-w-e-b-du-bois/ (accessed 2022-01-08)).  3. Evergreen, S. (July 19 2019). Beyond Nightingale: Being a Woman in Data Visualization. https://nightingaledvs.com/beyond-nightingale-being-awoman-in-data-visualization/ (accessed 2022-01-08).  4. Ying, L. P. (August 25 2021). Asia’s data scene deserves greater attention. That’s why we are startng a movement. https://nightingaledvs.com/  asias-data-scene-deserves-greater-attention/ (accessed 2022-01-08). | Reading, Group Discussion using the following prompts:  1. In the first reading, the history of data visualization is given. How much of the history of data visualization is centered in Western Europe and the United States?  2. The last three readings explore experiences of scientists that are not white and male. How does each of these scientists experience tokenism or structural violence in their career? How are they resisting the cultural norm? | Grade for group discussion participation over course of semester and written reflection on the following prompts:  1. What are some of the ways that a Euro-centric focus on the history of data visualization affects and distorts our conceptualization of data visualization today?  2. What are some of the ways that modern statisticians are working to rewrite the history of data visualization and make it more inclusive? | U031, U032: CO11 |
| 4 | UO41: Through readings, group discussion and reflection, students will evaluate misleading graphical summaries of data with an equity lens to explore how graphical summaries can exacerbate structural oppression.  UO42: Through readings, group discussion and reflection, students will identify best practices for promoting equity through appropriate data visualization techniques. | 1. Crick, S. (December 14 2019). Be Mindful of Misrepresenting Data in Visualization. https://shelleycrick.com/be-mindful-ofmisrepresenting-data-in-visualization/ (accessed 2022-01-08).  2. Schwabish, J., & Feng, A. (2021). Do No Harm Guide: Applying Equity Awareness in Data Visualization. https://www. urban. org/research/publication/do-no-harm-guide-applying-equityawareness-data-visualization. | Reading, Group Discussion using the following prompts:  1. In the examples given in the first reading, how do the graphical mistakes made reflect the implicit biases of the creators? How does the author equate the creation of misleading graphics to power and privilege?  2. What techniques do the researchers at The Urban Institute recommend to  create equity within and through data visualization? Do you agree with their assessments? | Grade for group discussion participation over course of semester and written reflection on the following prompts:  1. Thinking in terms of your major and your future career, which types of data misrepresentations in statistical graphics do you think you will be most likely to encounter?  2. What steps can you take in your future career to ensure that any statistical graphics you create contribute to a more equitable society? | U041, U042: CO12 |
| 5 | UO51: Through readings, group discussion and reflection, students will analyze how unintentional and intentional misinterpretation of descriptive statistics can influence public debate about DEI-related issues. | 1. Spirer, H., & Spirer, L. (1998). Misused statistics. CRC Press, 129-146.  2. Simon, R. (July 19 2016). 7 Statistics That Will Change How You View Racism. https://www.theodysseyonline.com/7-statistics-that-willchange-view-racism (accessed 2022-01-08).  3. Moore, S. (September 24 2020). No, the United States is not systemically racist. https://www.washingtonexaminer.com/opinion/no-the-unitedstates-is-not-systemically-racist (accessed 2022-01-08). | Reading, Group Discussion using the following prompts:  1. What are some of the misuses of statistics listed in the first reading? Are they all conscious misuses? Could implicit bias make these misuses more likely?  2. In the last two readings, the authors use descriptive statistics to argue opposing viewpoints as to whether the U.S. is racist or not. Can you find any of the misuses listed in the first article? Which author makes the best argument and why? | Grade for group discussion participation over course of semester and written reflection on the following prompts:  1. You have had a chance to read and discuss differing viewpoints on whether the U.S., as a country, is racist. What do you now think, and why?  2a. If you think that the U.S. is racist, what do you think your personal responsibility is as a citizen of the country?  2b. If you think that the U.S. is not racist, how do you explain the existing socioeconomic and educational divide between different racial groups? | U051: CO12 |
| 6 | UO61: Through readings, group discussion and reflection, students will critique causal arguments related to race in the United States by analyzing the relationship between the author’s social identity and the appropriateness of the use of statistical concepts within the argument.  UO62: Through readings, group discussion and reflection, students will connect cross-classification and Simpson’s Paradox to concepts of intersectionality. | 1. Axel-Lute, M. (August 28, 2020). Policing, Segregation, and Causation vs. Correlation. https://shelterforce.org/2020/08/28/policing-segregationand-causation-vs-correlation/ (accessed 2022-01-08).  2. Donnella, L. and Wilkes, R. (July 16 2019). Race in America: A Conversation. https://dividedwefall.com/a-conversation-on-race-inamerica/ (accessed 2022-01-08).  3. Crenshaw, K. (1989). Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. u. Chi. Legal f., 139.  4. Dobreva, S. (July 7 2017). Simpson's Paradox Explained, or when Facts aren't really Facts. https://365datascience.com/trending/simpsonsparadox/ (accessed 2022-01-08). | Reading, Group Discussion using the following prompts:  1. In the first reading, the correlation between racial segregation and police violence is interpreted as causal in both directions by different scholars: Schecter believes segregation leads to police violence, and Axel-Lute believes that police violence is necessary for racial segregation to be maintained. Can either of these points of view be proved with the statistics collected? Does Axel-Lute make a convincing argument? Why/why not?  2. In the second reading, Wilkes challenges the "popular" narrative about race in the U.S. and asserts that causality and correlation are being confused when exploring negative experiences of African Americans. What is Leah's response? How does her response demonstrate the power of combining qualitative information with quantitative data to make causal arguments?  3. What is intersectionality? What is Simpson's paradox? How do you think Simpson's paradox is related to intersectionality? | Grade for group discussion participation over course of semester and written reflection on the following prompts:  1. What arguments do the authors of the readings make about the reasons for inequities between races in United States society? Do you agree with one of the authors? Why/why not?  2. Simpson’s paradox shows us that we can see evidence of discrimination at one level of data disaggregation and have that evidence reverse at another level of data disaggregation. For example, we might note that there is no evidence of discrimination against a particular racial group across an entire college, but there is evidence within certain college majors, or vice versa. How does this fact reflect the concept of intersectionality? | U061: CO11  U062: CO13 |
| 7 | UO71: Through readings, group discussion and reflection, students will identify, through describing real examples, how statistical knowledge can be a source of power.  UO72: Through readings, group discussion and reflection, students will examine how current statistical methods are not sufficient to describe the complexities of intersectionality. | 1. Su, F. (2020). Mathematics for human flourishing. Yale University Press,  138-145.  2. Cook, S. H., Thornton, S., Robinson, S. E., Cochran, J., & Yung, G. (2021).  The JEDI Corner: Statistics for Equity: Capturing, Not Masking, Intersectional Dynamics in Data. Amstat News, 533, 14-15.  3. Bauer, G. R., Churchill, S. M., Mahendran, M., Walwyn, C., Lizotte, D., & Villa-Rueda, A. A. (2021). Intersectionality in quantitative research: A systematic review of its emergence and applications of theory and methods. SSM-population health, 100798. | Reading, Group Discussion using the following prompts:  1. In the first reading, Su explains the power of mathematics through a probability example. What type of power does Su believe mathematicians yield? How does she contrast that power with coercive power? Which type of power is associated with equity? With structural oppression?  2. What is the main argument about the ability of statisticians to use data to model intersectionality? How is this argument related to the addition rule and the multiplication rule we learned in class?  3. What issues are current researchers encountering when attempting to understand intersectionality using quantitative methods? | Grade for group discussion participation over course of semester and written reflection on the following prompts:  1. Think about your own experiences both in the classroom and outside of it with statistics. What causes statisticians, or people that understand statistics well, to yield greater power than those that don’t understand those methods?  2. Think about your social identity as you defined it in the intersectionality map you created during Unit 2 of these reading assignments. Do you think your identities have an additive effect, a multiplicative effect, or a more complex effect on your status of privilege or marginalization in society? Why? | U071: CO13 U072: CO10 |
| 8 | UO81: Through readings, group discussion and reflection, students will define different sexual orientations and gender identities and determine which orientations and identities are better represented in current data collection and analysis practice in the United States.  UO82: Through readings, group discussion and reflection, students will connect how data collection and analysis practice on gender expression and sexual orientation can lead to structural privilege or oppression in United States society. | 1. MacCarthy, S. and Elliott, M. (June 25 2021). Collect Data on Sexual Orientation and Gender Identity in Health Surveys. https://www.rand.org/  blog/2021/06/collect-data-on-sexual-orientation-and-gender-identity.html (accessed 2022-01-08).  2. Westbrook, L., & Saperstein, A. (2015). New categories are not enough: Rethinking the measurement of sex and gender in social surveys. Gender & Society, 29(4), 534-560.  3. Kress, A. C., Asberry, A., Taillepierre, J. D., Johns, M. M., Tucker, P., & Penman-Aguilar, A. (2021). Collection of Data on Sex, Sexual Orientation, and Gender Identity by US Public Health Data and Monitoring Systems, 2015–2018. International journal of environmental research and public health, 18(22), 12189. | Reading, Group Discussion using the following prompts:  1. In the first two readings, the authors explain barriers related to understanding marginalization of the LGBTQIA+ population. What are those barriers? Why would removing those barriers make equity for the LGBTQIA+ population more likely?  2. Why could problems in data collection, as described in all three readings, be considered a form of structural oppression? | Grade for group discussion participation over course of semester and written reflection on the following prompts:  1. Many individuals in the United States are uncomfortable thinking about or supporting individuals of different sexual orientations and gender identities. What do you think is the responsibility of individual people to support the rights of non-cis-gender and heteronormative individuals in United States society?  2. Think about your own beliefs about gender expression and sexual orientation. Are they different than your parents’ beliefs? Have your beliefs changed since you became a student at Slippery Rock University? If so, how have they changed? | U081, U082: CO13 |
| 9 | UO91: Through readings, group discussion and reflection, students will explain how the incorrect use or collection of statistics by governments can lead to structural oppression of marginalized groups.  UO92: Through readings, group discussion and reflection, students will explain how the incorrect application of hypothesis testing can exacerbate structural inequalities in society. | 1. Spirer, L. (1998). The Body Politic: Governments and Politicians. In Misused Statistics (pp. 241-256). CRC Press.  2. Ntentas, R. and Tsilingiris, N. (November 4 2020). How Misused Statistics can Harm Democracy. https://blogs.lse.ac.uk/socialpolicy/2020/11/04/how-misused-statistics-can-harm-democracy/ (accessed 2022-01-08).  3. Fitch, D. J., Wassenich, P., Fields, P., Scheuren, F., & Asher, J. (2008). Statistics and the Millennium Development Goals. In Statistical Methods for Human Rights (pp. 241-269). Springer, New York, NY. | Reading, Group Discussion using the following prompts:  1. In what ways are individual liberties curtailed and inequities preserved  when governments refuse to collect or misinterpret statistics?  2. The last reading outlines the process of Lot Quality Assurance Sampling  used by Valadez. How is Valadez's method flawed, and what does that mean in terms of global health inequities? What do the authors of the article suggest should be done instead? | Grade for group discussion participation over course of semester and written reflection on the following prompt:  1. Think of and write down an example of how a hypothesis test, if set up with the wrong null hypothesis, could exacerbate structural inequalities in society. Try to have your example not be about vaccinations or similar medical processes, or quality control of meat or similar processes. What is another area of society where an incorrectly set up hypothesis test could cause significant structural oppression? | U091, U092: CO10, CO12 |
| 10 | U101: Through readings, group discussion and reflection, students will analyze how the social identities of the originators of modern statistical inference led them to also be proponents of eugenics.  U102: Through readings, group discussion and reflection, students will describe how incorrect scientific assumptions led to the inappropriate application of statistical methods to make eugenics arguments. | 1. Cleather, D. (March 11, 2020). Is Statistics Racist? https://medium.com/  swlh/is-statistics-racist-59cd4ddb5fa9 (accessed 2022-01-08).  2. Sonabend, R. (January 27 2021). Statistics, Eugenics, and Me: A personal  reckoning of my failure to acknowledge the origins of my field. https://  towardsdatascience.com/statistics-eugenics-and-me-29eaf43efac7 (accessed  2022-01-08).  3. Bodmer, W., Bailey, R. A., Charlesworth, B., Eyre-Walker, A., Farewell, V.,  Mead, A., & Senn, S. (2021). The outstanding scientist, RA Fisher: his views on eugenics and race. Heredity, 126(4), 565-576. | Reading, Group Discussion using the following prompts:  1. In 2000, the American Statistical Association retired the Fisher Lecture, the most prestigious speaking engagement in the statistics community, due to growing concerns about Fisher's connections to eugenics. Was that the  correct decision? Why or why not?  2. The authors of the last reading argues that Fisher is not racist. Do you agree? What mistakes did they make in their arguments? | Grade for group discussion participation over course of semester and written reflection on the following prompts:  1. Do you think that the ASA should have retired the Fisher Lecture? Why or Why Not?  2. What incorrect assumptions did the founders of modern statistical methods make about the relationship between intelligence and social standing, and the relationship between intelligence and race? | U101, U102: CO 11 |
| 11 | U111: Through readings, group discussion and reflection, students will explain how statistics as a field can be a tool for social justice.  U112: Through readings, group discussion and reflection, students will list specific approaches to data collection and analysis that promote equity. | 1. Lawry, L., Johnson, K., & Asher, J. (2013). Evidence-based documentation of gender-based violence. Sexual violence as an international crime: Interdisciplinary approaches, 257. | Reading, Group Discussion using the following prompts:  1. How does this reading demonstrate the relationship between statistics  and social justice?  2. What methods do the authors advocate to reduce trauma, share power, and increase equity during the data collection process? | Grade for group discussion participation over course of semester and written reflection on the following prompts:  1. Think over everything you have learned about the connection between statistics—the collection, organization, analysis, and dissemination of data—and its connections to building a more equitable society. What have you learned about your own role in this process? How can you, as a professional and as a private citizen, help make the world more equitable through your interactions with data?  2. Over this semester, what did you learn about statistics as a field and its connection to civil society? | U111, U112: CO12, CO13 |

\* Social Identity Map for Reflection for Unit 2.

| **Domain** | **My Identity** | **At Slippery Rock University, this identity gives me a position of: Privilege (P), Marginalization (M)** | **In the place I grew up, this identity gave me a position of: Privilege (P), Marginalization (M)** |
| --- | --- | --- | --- |
| **Race** (e.g., white, black, biracial) |  |  |  |
| **Ethnicity** (e.g., German, Polish, Cuban, Hispanic, Japanese) |  |  |  |
| **Gender identity/ expression** (e.g., woman, man, nonbinary, transgender male, transgender female) |  |  |  |
| **Sexual orientation** (e.g., homosexual, heterosexual, bisexual, pansexual) |  |  |  |
| **Religion** (e.g., Catholic, Protestant, Jewish, Muslim) |  |  |  |
| **Dis/ability** (e.g., able-bodied, autistic, ADHD, deaf) |  |  |  |
| **First Language** (e.g., English, Spanish) |  |  |  |
| **First Generation Status** (first generation in college in nuclear family, not first generation in college) |  |  |  |
| **Socio-Economic Status** (as you feel it is best defined – use of governmental assistance programs such as WIC, Medicaid, or SNAP; middle class, working class, etc.) |  |  |  |
| **Other:** (you define) |  |  |  |