**Exercise: Understanding the Structure of a Research Paper**

When writing a report, you must present information in the appropriate section. Consider the role each piece of information you are presenting will play in communicating your ideas to the reader, and be sure to place it in the section where it will best perform that role. Recall that each section should address the following:

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| --- | --- |
| **Abstract** | *Does it provide a brief overview of the entire research and findings?* |
| **Introduction** | *Does it provide background to the research? Does it state the problem?* |
| **Methods** | *Does it describe techniques used to solve the problem?* |
| **Results** | *Does it present findings in a factual manner?* |
| **Conclusion** | *Does it provide context for the findings in light of the original problem? Does it make recommendations for the future?* |

For this exercise, read the following short extracts from reports. Then, (1) decide which of the above sections they are from, and (2) describe why they are appropriate for this section.

**Example 1:** After using constrained spline estimation to estimate the variables’ values, the log transform of each variable was modeled to compare cluster sizes in three different mixed modeling techniques. Since multiple pulses were drawn on the same particle clusters, a random particle cluster effect was fit for each modeling technique. The first technique cluster size was treated as a binary factor, where if the cluster was less than seven particles, the factor was coded zero and if the cluster was seven or more particles the factor was coded one…

**Example 2:** There were several barriers identified by the pharmacists to Informed Shared Decision Making (ISDM). One major barrier was perceived lack of collaboration between pharmacists and physicians. Some of the pharmacists said that they were often reluctant to intervene because physicians were not receptive to their interventions. The current literature agrees with this point of view, suggesting that most pharmacist-physician relationships in the community setting are not at a stage to allow seamless interdisciplinary collaboration. However, it was surprising to find such a large number of pharmacists from the hospital category also express lack of teamwork as a barrier.

**Example 3:** The fitted equation for log $τ\_{on}$ using Model 1 was $\hat{y}=1.34+0.29\*Cluster size\geq 7$. Particle clusters with seven or more particles had a larger log $τ\_{on}$ (1.63 log seconds than clusters with less than seven particles (1.34 log seconds) although this difference was not significant(p-value =.107). After transforming the log $τ\_{on}$ estimates back to the original scale, it was seen that, for clusters within the study, those with less than seven particles had, on average, a $τ\_{on}$ of 3.82 seconds compared to 5.08 seconds for particle clusters of at least seven clusters. The observed $τ\_{on}$ for the seven and greater particle clusters was 33.2% higher than for smaller clusters (95% CI: 7.2%, 91.1%).

**Example 4:** As shown in our analysis, machine learned models show promising results in detection of aforementioned diseases in patients. A possible real-world applicability of such a model can be in the form of a web-based tool, where a survey questionnaire can be used to assess the disease risk of participants. Based on the score, the participants can opt to conduct a more through check-up with a doctor. As a part of our future efforts, we also plan to explore the effectiveness of variables in electronic health records towards development of more accurate models.

**Example 5:** The Survey of Attitudes Toward Statistics (SATS) is a tool widely used by statistics educators to help gain insight into students’ attitudes and how they impact teaching and learning in introductory statistics courses. Three instructors at Winona State University have been administering this survey to students both at the beginning and end of several semesters since 2011. This study involved an analysis of the data collected in these courses to investigate students’ attitudes towards statistics and how they change throughout the semester. The results were also compared to national norms. Finally, an exploratory factor analysis was conducted using the data collected from Winona State University courses to investigate the construct validity of the SATS tool. It was found that this national survey might not actually be measuring what the creators of the survey intended.

**Example 6:** After understanding the results of Winona State University students, it was of interest to compare them to the national norms to determine if they were similar. The creators of the SATS revealed the survey’s national norms in a personal communication with the professors involved in this study. *Value, Interest,* and *Effort,* the three components that showed a decrease from the beginning of the semester to the end, are in-line with what is typically observed nationally. After taking an introductory statistics course, Winona State students have significantly higher attitude scores relating to *Affect, Cognitive Competence,* and *Difficulty.* This, however, is not typically observed nationally. *Difficulty* usually tends to decrease, while *Affect* and *Cognitive Competence* stay about the same. Because *Difficulty* increased at the Winona State level and, on average, decreased at the national level, the professors in Winona are possibly teaching statistics better, since students think statistics was easier after taking the course than when they had first started.

**Example 7:** Electrochromic devices experience property changes due to the application of a voltage. The devices are used in many different applications, including smart window technology - windows that change light absorption due to a voltage. This device is important because it has the potential to reduce energy use by 25% for heating and cooling (1), as these windows have the capability to absorb or allow infrared radiation, essentially heat, based on the state of the window. Smart windows operate using a thin film constructed of tungsten oxide ($WO\_{3})$ nanorods. An example of the capabilities of smart window technology can be seen in Figure 1. The nanorods change light absorption capability, or optical density, with an applied voltage. This research focuses on the $WO\_{3}$ single particles and small clusters of particles rather than $WO\_{3}$ films. More specifically, the focus of this study is to assess the impact that particle-particle interactions have on the magnitude and speed at which the $WO\_{3}$ nanorods change optical density within particle clusters.