Understanding Students' Perception and Interpretation of Radar

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1. Introduction

- With the rise of more sophisticated mobile application technology, it is simpler than ever to access readily available radar data without the assistance of broadcast meteorologists
- We seek to study how college students leverage weather data, primarily radar data, to influence their decision making as it relates to their personal safety, and the protection of their property
- We conducted a survey and statistical analyses to determine this level of understanding

2. Methodology

- For this work, an image of a supercell from April 27th, 2024, is presented, using both reflectivity and radial velocity products
- The survey instrument consisted of 56 questions including, but not limited to:
  - Likert Scales
  - True/False
  - Multiple Choice
  - Open-ended
- Regions of the selected storm were tested based on visible features

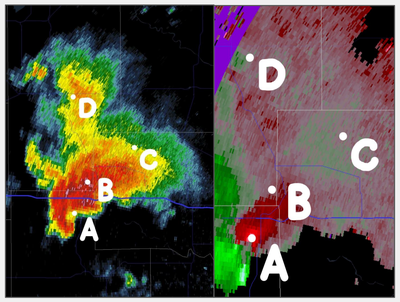


Fig. 1: Radar images used in the survey

3. Instrument

- This work was approved under IRB #17734
- The survey instrument was built using Qualtrics XM software, and disseminated using flyers and the University of Oklahoma Mass Email System
- Respondent's information was securely encrypted under IRB regulation



Fig. 2: Survey Flyer

4. Results

Survey Demographic

Total Number of Respondents: 275		Count	Percent
Gender	Male	100	36.3%
	Female	158	57.5%
	Non-Binary / Third Gender	15	5.5%
	Prefer not to say	2	0.7%
Age	18-29	196	71.3%
Mean Age of 26.8	30-49	66	24%
	50-64	13	4.7%
Ethnicity (Multiple Allowed)	White	238	86.5%
	Hispanic	29	10.5%
	American Indian or Alaska Native	25	9.1%
	Black or African American	14	5.1%
	Asian	14	5.1%
	Native Hawaiian or Pacific Islander	1	0.4%

Tab. 1: Survey demographic

Fig. 5: Total Correct Responses by Defined Question Groupings

Fig. 7: Comparing respondent's correctness in weather knowledge to correctness in radar knowledge

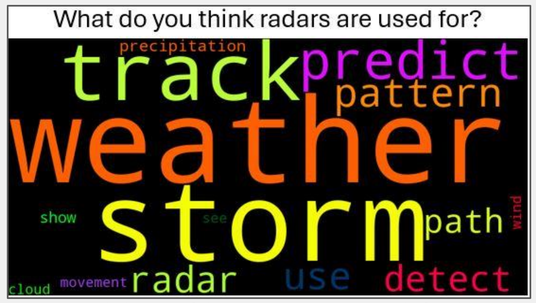


Fig. 3: A word cluster of the most common words for the question

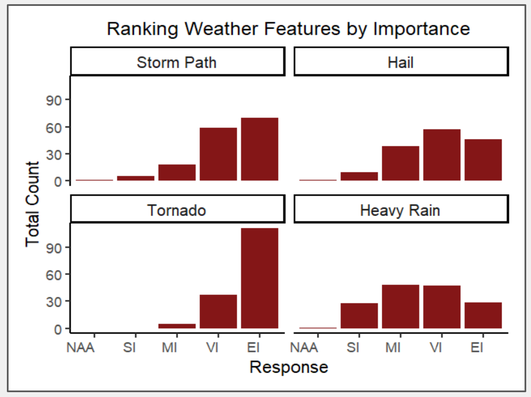


Fig. 4: Respondents' Weather Feature Importance

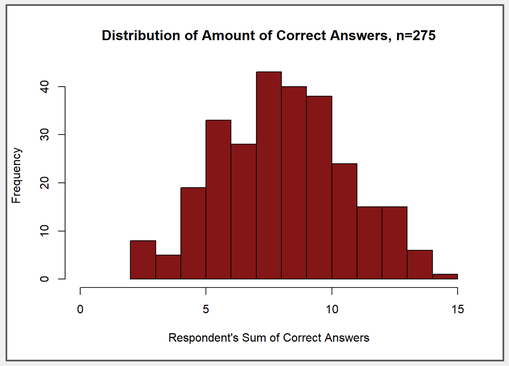


Fig. 6: Distribution of Total Correct Answers for Each Respondent

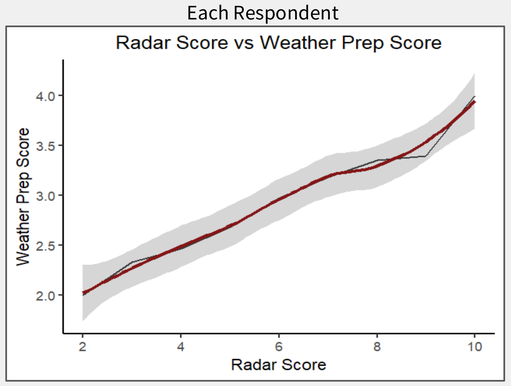


Fig. 8: Using the respondents Radar score, comparing that to weather preparedness score

5. Discussion

- To quantitatively identify survey takers' understanding of the concepts surveyed, fifteen questions were selected for binomial significance testing. Testing was conducted with a significance level $\alpha = 0.05$ and with hypotheses $H_0: p = 0.5$ and $H_1: p > 0.5$, indicating statistically significant correctness (SSC) and an understanding of the topic/question. If H_1 was not accepted, then $H_1: p < 0.5$ was tested, indicating statistically significant incorrectness (SSI) for the specific question tested, and a lack of understanding
- For reflectivity radar questions, survey takers were SSC when asked to identify regions of expected large hail and tornado formation. They correctly distinguished between colors representing heavy rain and colors representing light rain, with a 96 and 98 percent correct rate, respectively.
- For questions relating to radial velocity radar, survey takers struggled, with many questions indicating SSI. While there was an understanding of identifying rotation features, survey takers struggled with identifying the difference between winds toward and winds away as it relates to the velocity display, with SSI rates as low as 14%

6. Future Work

- Potential improvements to radar displays will be investigated, including a possible radar tutorial over features with significant SSI rates, as well as a color-deficient display
- Due to high SSI rates, radial velocity display understanding should be revisited and surveyed in depth to determine display improvements

Acknowledgements/Appendix

For acknowledgements, references, and appendix, scan here: