

Survey development best practices and why most surveys are bad science

September 8, 2023
Dr. Steven Conrad



87% OF THE 56% WHO COMPLETED MORE THAN 23% OF THE SURVEY THOUGHT IT WAS A WASTE OF TIME



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Brief outline of today's talk



1. The advantages of surveys in human subject research
2. Key survey elements - Applying Rigorous Methods for Survey Development
3. Some questionnaire guiding principles
4. Failures in surveys and questionnaires
5. Resources

The value of surveys in the human study conundrum



The contribution of surveys to human subject research

useful for describing characteristics of a larger population

Standardized approach

more time and cost-effective than other data collection methods

Surveys are particularly useful for **quantifying** factors (compared to focus groups, etc)

Anonymity



Benefits review

Feng, Yan et al. “Data Collection Methods for Studying Pedestrian Behaviour: A Systematic Review.” Building and environment 187 (2021): n. pag. Web.

- have high experimental control to design predetermined questions in a survey
- opportunity to gather insights regarding behaviours that rarely happen or have not presented itself in real-life situations.
- Offers opportunities to capture additional data (characteristics of humans – explanatory variables)
- Collect data from a wide range of respondent perspectives in a wide range of conditions (also a con)

qualtrics^{XM}



Checkbox



Toluna

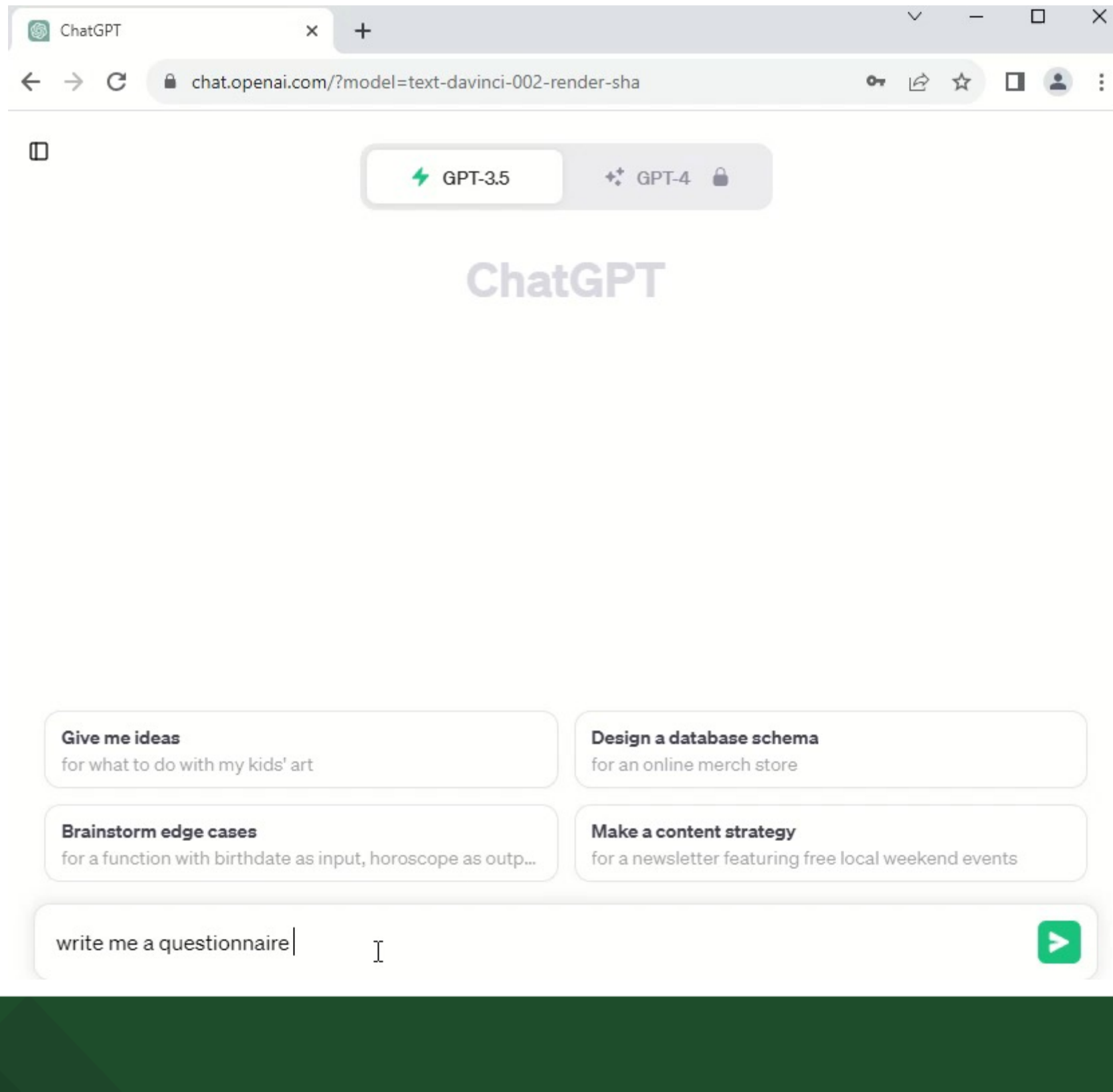
GoSurvey

Alchemer
Formerly SurveyGizmo

KeySurvey



Google Forms
Software



Must adopt a rigorous process when developing surveys

- Minimum Survey steps
 - Defining the problem, objectives, and hypotheses the survey is addressing
 - Reviewing relevant literature and knowledge gaps (as they apply to the survey)
 - Outline what should be included in the questionnaire

Bad science point 1

- failure to connect questions to a theory or needed data for analysis

Failure to establish clear research objectives can result in vague survey questions and data that do not address the research goals effectively.

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"After analyzing all your data, I think we can safely say that none of it is useful."

Must adopt a rigorous process when developing surveys

- Minimum Survey steps
 - Identifying population and sampling strategy (mail, online, snowball, panel study)
 - Developing and repeatedly testing the questionnaire
 - Expert review
 - Pretesting

Bad science point 2

- Lack of pre testing

Failing to pre-test the survey on a small group of participants can result in unforeseen issues with question clarity, wording, or response options.



"WE WERE HOPING FOR SOMETHING OTHER THAN 'WHATEVER' AS ANSWERS TO OUR SURVEY QUESTIONS."



Sometimes pre-testing fails

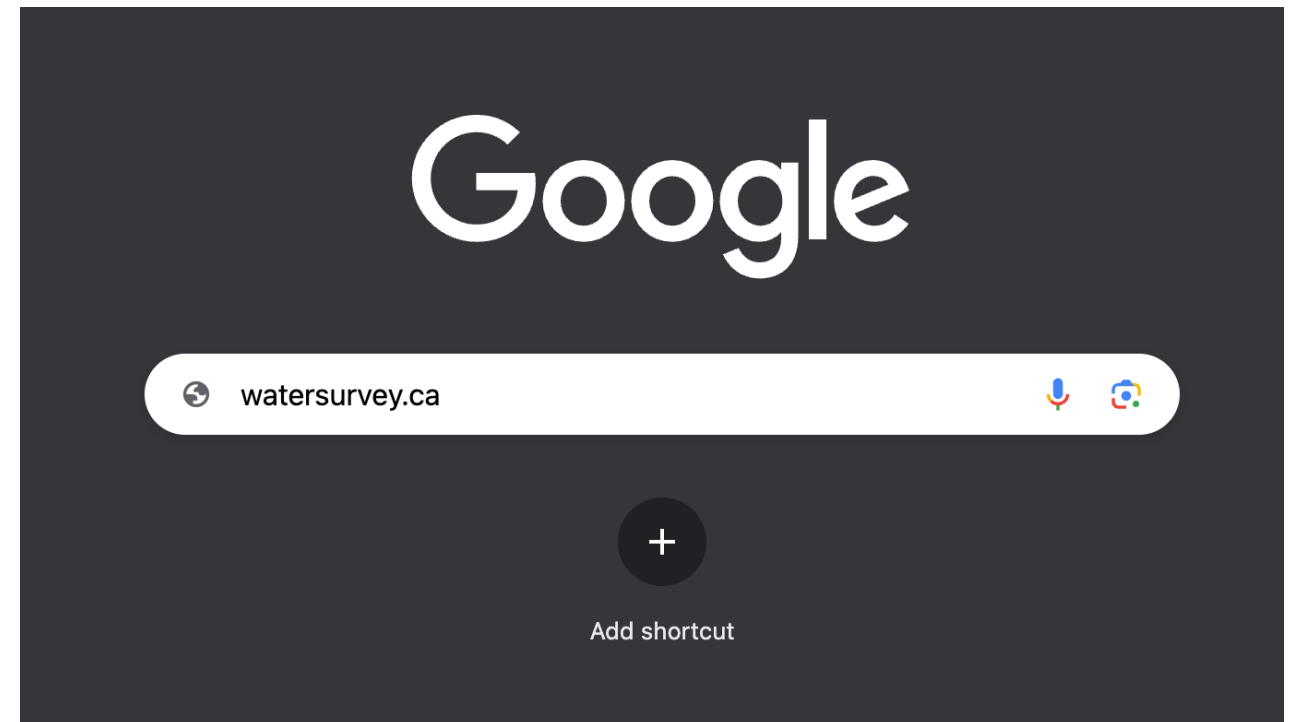
Monthly Energy Bills



Home Energy Score



Confusion with scales




Confusion in accessing survey

Sometimes pre-testing fails

2012

Today

 Illinois Water Survey
<https://www.isws.illinois.edu>


Welcome to the Illinois State Water Survey

The Illinois State **Water Survey** has been a leader in the study of water resources for more than a century. Make a ... Illinois State **Water Survey** Twitter feed.
[Contact](#) · [About](#) · [Water Inventory Program](#) · [Water Supply Planning](#)

Questions related to your search


- What is a water survey?
- How is a water survey carried out?
- How do you survey water quality?
- What is survey in-water engineering?

[Feedback](#)

 WaterWise Consulting
<https://www.waterwise-consulting.com>


Residential Water Surveys - WaterWise Consulting, inc.

A residential **water survey** consists of having a well-trained and experienced surveyor visit a residence to review landscape and irrigation conditions in ...

 Marin Water
<https://www.marinwater.org>

Do it Yourself Water Survey


This DIY Home **Water Survey** will guide you through activities to find out how to save water at your home. Follow the steps.
8 pages

 Generative AI is experimental. Info quality may vary.

Watersurvey.ca is a website that hosts a farmer survey. To start the survey, you can select one of two options: New Participants or Returning Participants. You'll then need to enter a survey code.


The development of two separate web surveys for watersurvey.ca increased the time and cost of web development.

[Ask a follow up](#)

 watersurvey.ca
<http://watersurvey.ca>

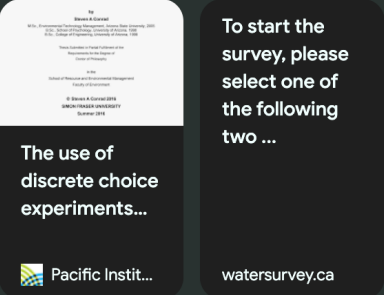
To start the survey, please select one of the following two ...

To start the survey, please select one of the following two options. New Participants, Returning Participants. Enter survey code: ...

 Pacific Institute for Climate Solutions
<https://pics.uvic.ca>

The use of discrete choice experiments and a coupled socio ...

... **watersurvey.ca** to host the farmer survey. Due to the need to develop two separate web surveys, web development time and costs were significantly higher than ...
327 pages



The screenshot shows a survey interface with two options: 'New Participants' and 'Returning Participants'. Below the options, there is a section titled 'The use of discrete choice experiments...' and a logo for 'Pacific Institut...'. To the right, there is a text box that says 'To start the survey, please select one of the following two ...' and the website name 'watersurvey.ca'.

Must adopt a rigorous process when developing surveys

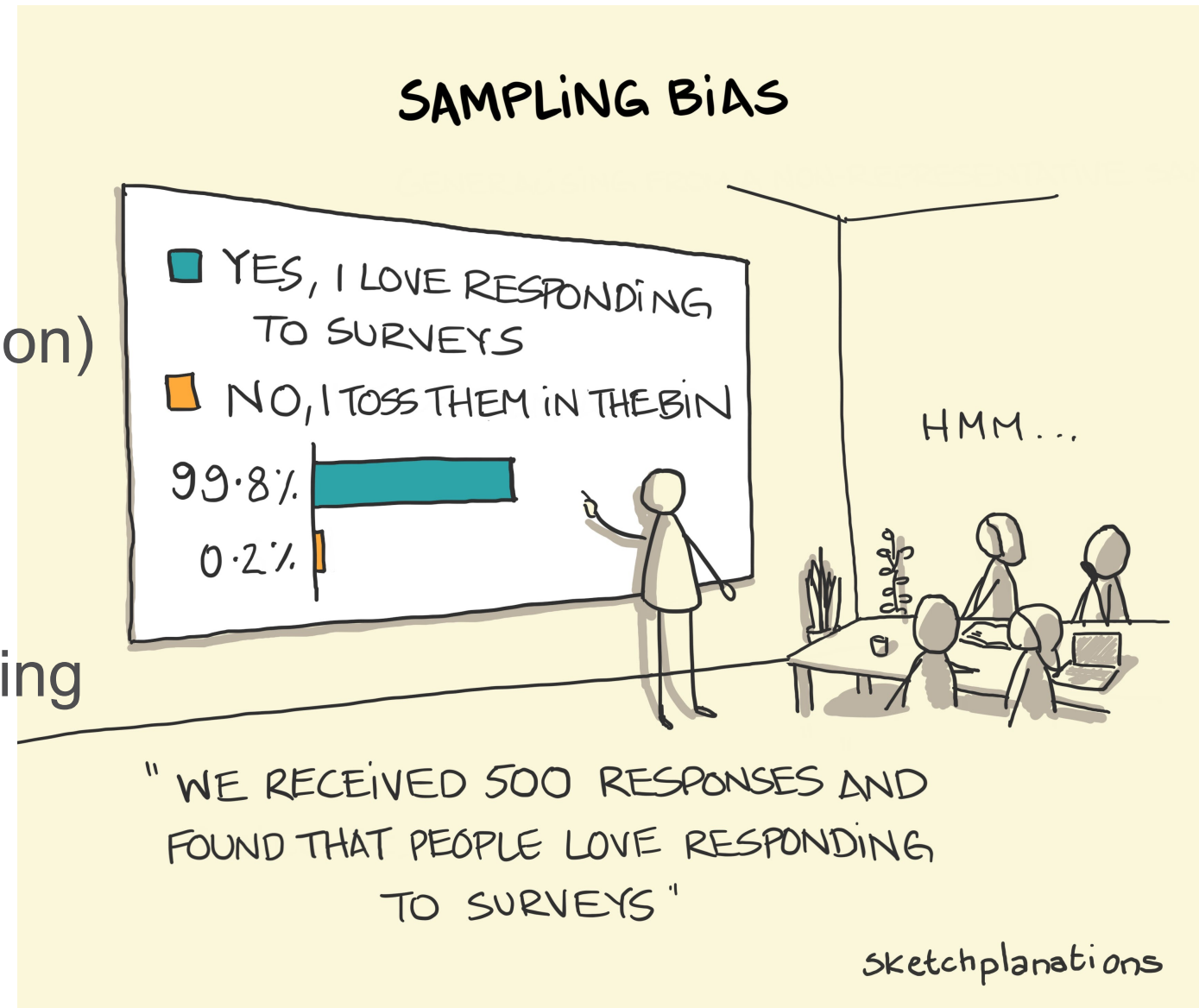
- Minimum Survey steps
 - Coding and outlining the analysis strategy
 - Code and **distribute the final questionnaire**
 - **MANAGE responses - contacts, reminders, incentives***
 - Conduct a response review and post data cleanup (exclude protest responses, response biases)
 - Analyze and report significance

*Tailored Method

Bad science point 3

failure to account for biases

- Non response bias (missing population)
- Response bias (guessing)
 - Forced responses
 - Under-Reporting or Over-Reporting
- Sampling bias (wrong population)
- Volunteer bias (eager to please)



Multiple problems here

Where do you like to go swimming?

- The beach
- Community or public pool
- Private pool
- Lakes

...city recreation survey...

Response bias
Leading question
Sampling bias

Questionnaire best practices

- Use simple words
- Do not be vague
- Keep it short
- Don't be too specific
- Don't talk down to respondents
- Avoid bias
- Avoid objectionable questions
- Avoid hypothetical questions

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Example guidelines (of 33+)

- *Guideline 1*

Identify exactly what kind of information you want respondents to provide

Would you be willing to pay an access fee for an AI assistant service?

...product marketing survey...

Yes

No

What is the maximum amount that you would be willing to pay per month to access an AI assistant service?

Better -

I would be willing to pay \$_____ per month for an AI assistant service.

Even Better – use more sophisticated WTP methods

Choice methods - maxdiff

Example guidelines (of 33+)

- **Guideline 3**
Use simple words

Phrase	Frequently used
People who live here	Occupants of this household
Your answers	Your responses to this survey
What you do after school	Post school extracurricular activities
Job concerns	Work related employment issues
Area of the country	Subnational region

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Example guidelines (of 33+)

- *Guideline 8*

Include "no opinion" to differentiate from neither

How pleased are you with your drive to work?"

Extremely displeased

Somewhat displeased

Neither pleased nor displeased

Somewhat pleased

Extremely pleased

What about non drivers?

...city public infrastructure survey...



Example guidelines (of 33+)

- *Guideline 17*

Avoid using slanted / leading introductions & questions

Leading Question	Alternative Wording	Reason for Change
"In general, how healthy are you?"	"In general, how would you rate your health?"	A health rating is neutral since it doesn't lean in one direction ("healthy" vs. "unhealthy").
"To what extent do you agree with each of the following statements?"	"To what extent do you agree or disagree with each of the following statements?"	Stating both sides of the agreement scale is preferable to including the positive side only.
"We encourage employees to enhance their skills. Would you be interested in receiving training?"	"Please rate your interest in receiving training?"	Avoid coercive language.

Example guidelines

- *Guideline 17*
Avoid using slanted / leading introductions & questions

Water conservation is the practice of using water efficiently to reduce unnecessary water usage. According to Fresh Water Watch, water conservation is important because fresh clean water is a limited resource, as well as a costly one. As a homeowner, you're probably already well aware of the financial costs of inefficient water use. Conservation of this natural resource is critical for the environment — and our wallets.

To what extent do you agree or disagree with the following statements about water conservation?

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
It is important to protect my county's water resources.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My personal actions can affect the availability of water in my county.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am concerned about future water availability in my county	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

...UBC student research survey...



Example guidelines (of 33+)

- *Guideline 19*

Minimize number of “check all that apply” questions to avoid “primacy” and “recency” effects

11. Which of the following home improvements has your household taken to reduce water use in and around your residence?
Please select all that apply.

- Use a low water use dishwasher
- Use a low water use clothes washer
- Use low flush toilets
- Use low flow shower fixtures
- Use an automatic irrigation timer
- Use rainwater basins for outdoor irrigation
- Use native or low water use vegetation in outdoor landscapes
- Use a layer of heavy topsoil to improve soil water retention
- Use the results of an irrigation efficiency audit to improve landscape irrigation
- Reduced the amount of lawn in my yard
- Replaced my lawn with a water conserving variety
- Other _____

...one of my first surveys...

What exactly will this data provide for you?

Example guidelines (of 33+)

- **Guideline 20**

Use response categories that are mutually exclusive

How did you first learn about the flood of 1997?

From a friend or family member

From my spouse

From the radio

While at home

While at work

While attending a meeting

...Fort Collins survey??...

Many of these things could exist together



Survey construction best practices

- Start with an interesting, easy, & relevant question
- Never start with demographic questions
 - Unless you need it to segment or control the flow of your questionnaire – qualify respondents
- Group similar questions into logical sections
- Use transitions to guide respondents through survey

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Survey construction best practices

- Minimize use of skip patterns (e.g., if no, skip to Q4)
- Be consistent with formatting response categories
- Short surveys not necessarily better - Use white space
 - Applies mostly to paper versions but you can consider this in Qualtrics/online tools in groupings

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Bad science point 4

- Order effects

Failing to account for order effects can influence responses



*You too? I also checked
“go directly to jail and do not pass go”
to question 1.*



Bonus guideline

Intersection of North Mason Street and Cherry Street

...recent transportation survey...

1. Have you experienced conflict or felt unsafe while traveling through the intersection of North Mason Street and Cherry Street?

Yes

No

2. If so, what happened, or what specifically about this intersection makes you feel unsafe?

Don't require responses unless absolutely necessary

3. How do you think this intersection could be improved?

Bonus guideline #2

Include a last words question.

Last Words

If you have any suggestions or additional comments regarding this survey, we would appreciate to know about it.

Bad science point 5

- Relying on descriptivism

Failing to look for significance in findings limits applicability of survey results.



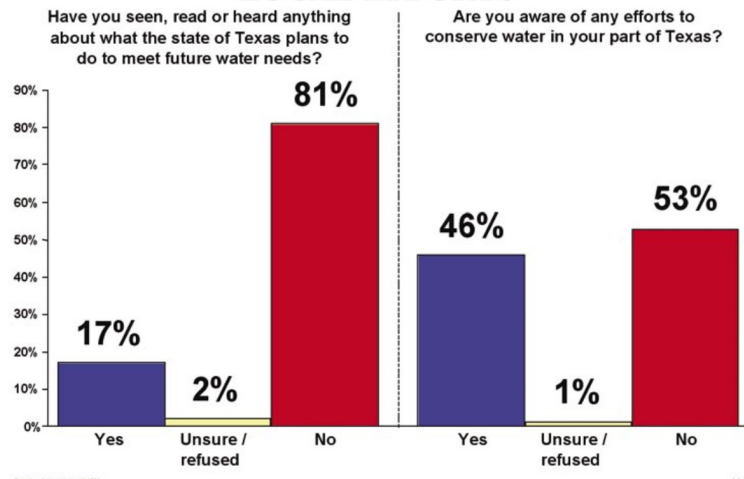
"I already wrote the paper. That's why it's so hard to get the right data."



Water Conservation Quantitative Research Report Summary

Only 17 percent have read or heard anything about any State of Texas plans for water. Nearly half (46 percent) are aware of local efforts to conserve water.

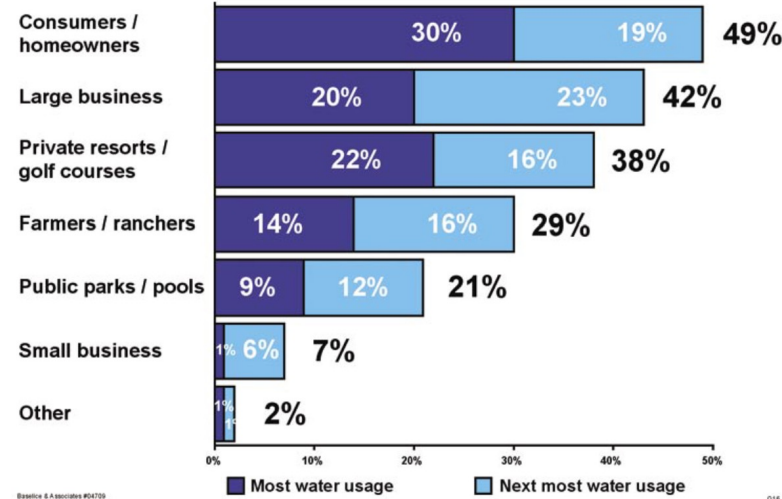
AWARENESS OF STATE OF TEXAS AND LOCAL EFFORTS



...state program study...

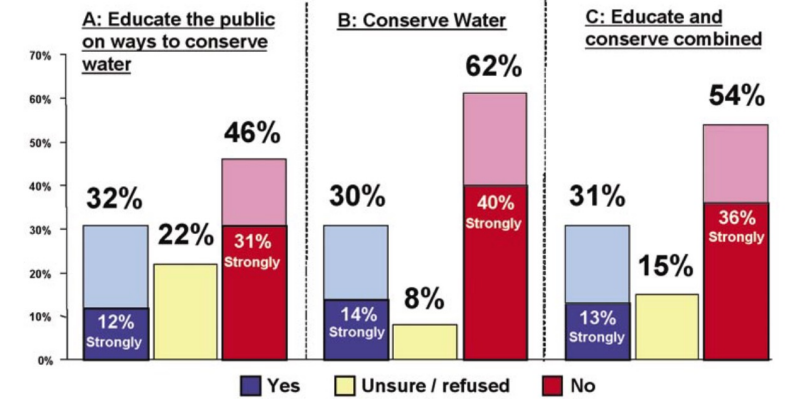
WATER USERS

Which of the following do you think uses the most water?



IS THE STATE OF TEXAS GOVERNMENT DOING ENOUGH?

Do you believe the Texas state government is doing enough to (B: educate the public on ways to) conserve water?



greater percentage of respondents feel their local water supplier is doing enough.

IS THE LOCAL WATER SUPPLIER DOING ENOUGH?

Do you believe your local water supplier is doing enough to (B: educate the public on ways to) conserve water?

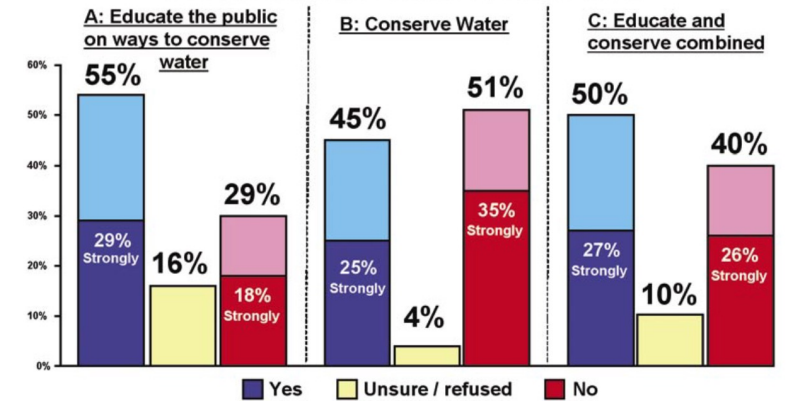


Table 5-1. Gender and Race Decision and Decision to Conserve

	Gender		Race/Ethnicity	
	Value	Significance (p)	Value	Significance (p)
Cramer's V	0.19	0.05*	0.19	0.52
Uncertainty Coefficient	0.05	0.05*	0.04	0.61

* = significant at the .05 level
 ** = significant at the .01 level

Table 5-4. Familiarity with Policy and Decision to Conserve

	Conservation Policy		Quality Policy		Official Drought Status	
	Value	Significance (p)	Value	Significance (p)	Value	Significance (p)
Cramer's V	0.26	0.21	0.29	0.11	0.25	0.16
Uncertainty Coefficient	0.12	0.06	0.14	0.03*	0.09	0.12

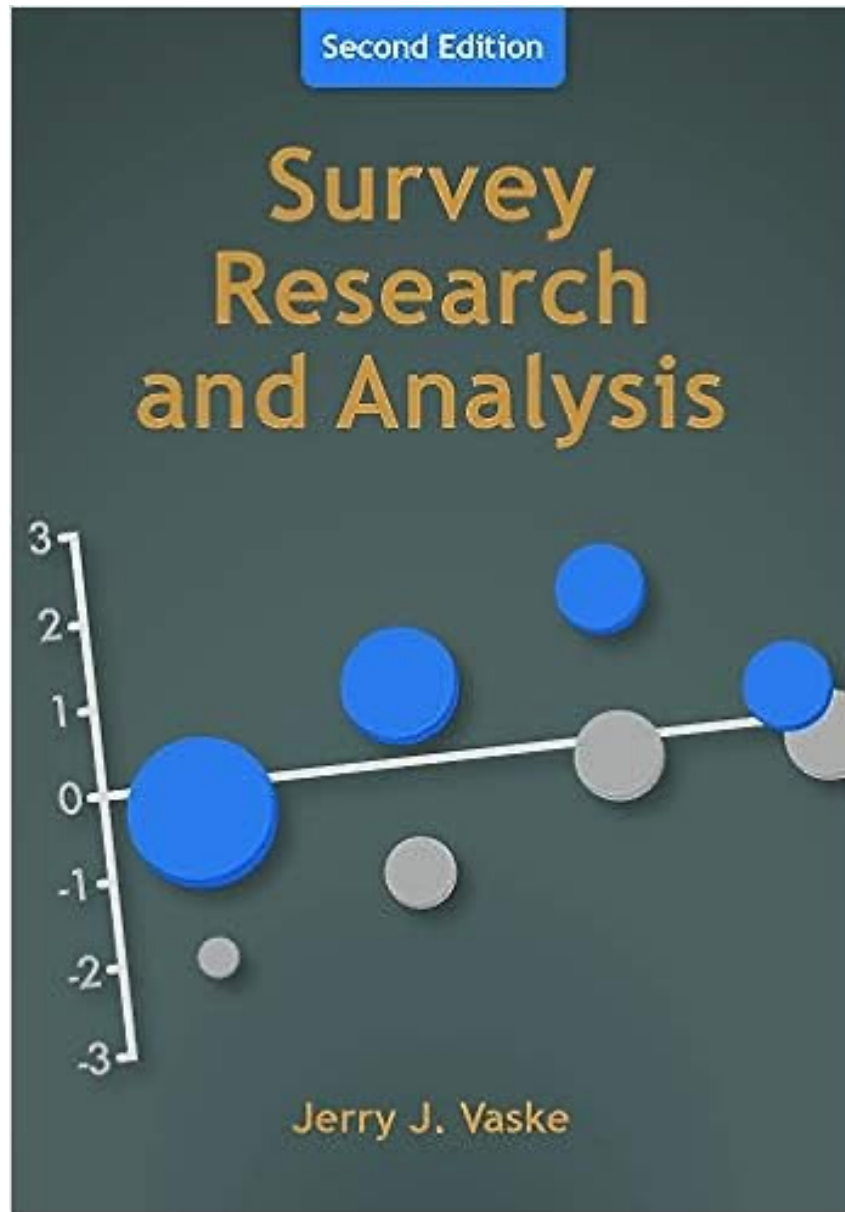
* = significant at the .05 level
 ** = significant at the .01 level

Table 5-12. Local Water Concern and Number of Behaviors

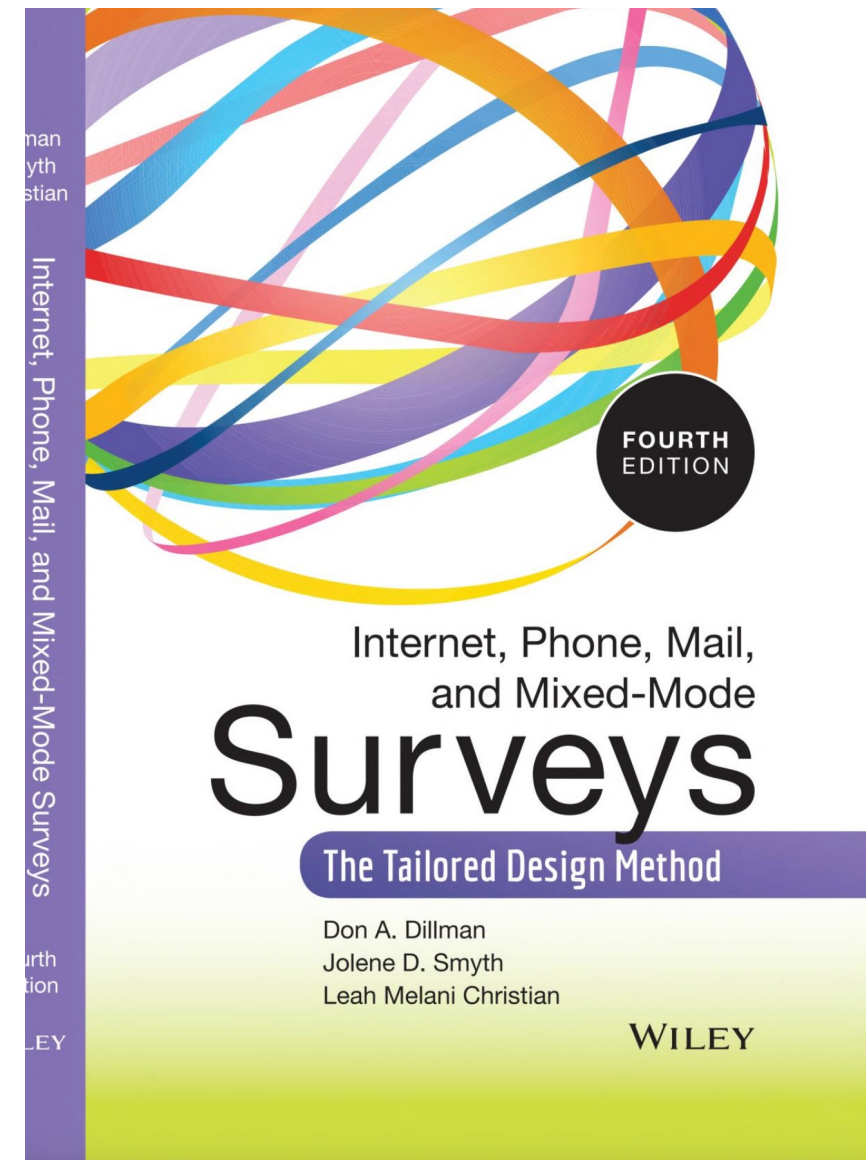
	Quality		Availability		Future Availability	
	Value	Significance (p)	Value	Significance (p)	Value	Significance (p)
Somer's d	0.05	0.64	0.12	0.19	0.14	0.10
Kendall's tau b	0.05	0.64	0.11	0.19	0.13	0.10
Gamma	0.07	0.64	0.15	0.19	0.18	0.10

Jarrett, Jr., William Blakely, "A Survey of the Influences on Water Conservation Behavior in Pickens and Oconee Counties" (2015). All Theses. 2120.

Vaske, Jerry. *Survey Research and Analysis*. Second edition. Champaign, IL: Sagamore Venture, 2019.



Available in print and online at colostate library



Dillman, Don A., Jolene D. Smyth, and Leah Melani Christian. *Internet, phone, mail, and mixed-mode surveys: The tailored design method*. John Wiley & Sons, 2014.

Classes

ENGR 535 – Modelling Human Systems Behavior

NRRT665 – Survey Research and Analysis

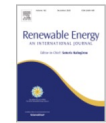
Example analysis from Systems Faculty

<https://www.mdpi.com/2079-9276/12/2/22> – Dr. Simske

<https://doi.org/10.1016/j.renene.2020.08.054> - Dr. Conrad



Renewable Energy
Volume 162, December 2020, Pages 754-765



Expert opinion on influential factors driving renewable energy adoption in the water industry

A. Strazzabosco^a , S.A. Conrad^c, P.A. Lant^b, S.J. Kenway^a

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<https://doi.org/10.1016/j.renene.2020.08.054> 

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Abstract

Interest in renewable energy adoption in the water industry is growing amid numerous barriers. Overcoming these barriers requires an understanding of the influencing factors that drive renewable energy adoption, namely i) what drives the industry to uptake renewable energy projects, ii) what policies and regulations are perceived by the industry as effective in supporting this trend, and iii) what renewable energy technologies are preferred. To identify influencing factors, a survey was conducted of Australian professionals working in water and wastewater related fields. Reducing costs associated with energy consumption were perceived as the most significant factors influencing renewable energy projects. Respondents perceived compulsory greenhouse gas emissions reduction as the most influential policy. Respondents did not perceive any government financial policy or regulation established for the development of a renewable energy market as highly influential for the water industry. Among all respondents, biogas from sewage sludge and solar photovoltaic were considered the most important technologies available to the industry. Yet, the priority of these