Asian Journal of Empirical Research
Volume 13, Issue 1 (2023): 23-29.
http://www.aessweb.com/journals/5004

Managing statistical misinformation in marketing: A study on consumers' attitudes and capabilities

Chi Hong Leung[a †]
Winslet Ting Yan Chan[b]

[a,b]*Department of Management and Marketing, The Hong Kong Polytechnic University Hung Hom, Hong Kong.*

† ✉ msleung@polyu.edu.hk *(Corresponding author)*

Article History
Received: 28 December 2022
Revised: 20 February 2023
Accepted: 3 March 2023
Published: 13 March 2023

Keywords
Marketing promotion
Misleading information
Purchase decision making
Statistical skills.

JEL Classification:
D12; M30.

ABSTRACT
This paper discusses various types of misleading statistical information in marketing promotion and explains why it is harmful for customers. The paper also studies the customers' attitudes to such misinformation and capabilities of managing it. A survey was used to collect data from 210 respondents' attitudes to analyzing data when purchasing products and 2) studied whether these respondents could properly evaluate such information found in promotional messages. The respondents were students in a university and they were supposed to have sufficient mathematical and logical capabilities of managing statisical information. Respondents showed positive attitudes to data investigation involved in the purchase decision although they lacked the relevant knowledge to process the misleading statisical information. In general, they might not make correct decisions in various deceptive situations. Relevant product information is usually necessary for customers when they have to consider and buy important products. Statistical information can support objective decision making but the misleading one is harmful for customers. More statistical knowledge and other relevant skills are required to enhance the ability of processing misleading information in marketing promotion. The paper suggests a number ways to acquire such knowledge and skills.

Contribution/Originality: This paper reveals that consumers have positive attitudes to investigation of data in marketing promotion. However, they lack sufficient knowledge and skills to analyze and calculate relevant data. The paper suggests several ways to enhance the capabilities of interpreting and processing data to avoid being deceived in marking communication.

DOI: 10.55493/5004.v13i1.4748
ISSN(P): 2306-983X/ ISSN(E): 2224-4425
How to cite: Leung, C. H., & Chan, W. T. Y. (2023). Managing statistical misinformation in marketing: A study on consumers' attitudes and capabilities. *Asian Journal of Empirical Research, 13*(1), 23–29. 10.55493/5004.v13i1.4748

1. INTRODUCTION
Marketers may be accused of deceptive practices because people are manipulated to think that they will get more than they do (Aagaard, 2020; de Lange, 2016; Hastak & Mazis, 2011). Deceptive promotion refers to mispresenting the performance and features of a product and enticing people to make a wrong decision to buy the product. The most difficult problem is to define deceptive promotion. For example, Red Bull's advertisement (O'Reilly, 2014) once claimed that it would give you wings but it is not intended to be taken literally. MasterCard and Visa suggest that your credit cards may make things happen to fulfill your dreams in spite of the costs. Marketers should avoid deceptive practices because these are harmful for their customers and, ultimately, their own businesses (Kariyawasam & Wigley, 2017). When customers do not get what they have expected, they may switch to other companies and products (Hattori & Higashida, 2015).

Marketers are selling highly standardized goods to people and develop effective mass communication techniques and routinely invest money in advertising to reach customers. Now marketers are facing marketing communication challenges because of the keen competition in the market. Marketing communication changes profoundly faster than other marketing areas. Advertising has been used for years on various channels including traditional and digital platforms. Even though advertising is used mainly by companies, not-for-profit organizations also advertise and disseminate their causes to the public. Advertising is to inform and encourage people to take actions, such as purchasing a product and requesting more product information. To inform consumers, advertising usually tells customers about new goods, communicates a value, and builds a company and brand image. To persuade consumers, advertising develops brand preference, persuades switching to a new brand, changes consumers' perceived product attributes and convinces customers to purchase immediately.

But whether customers can protect themselves from deception is a question. Are they careful to recognize marketers' selling intent and do not believe entirely what they claim? People may use analytical approaches to make decisions. Customers make purchase decisions regarding, for example, what online seller on eBay should be selected and what brand of toothpaste is more effective to kill bacteria. There are various ways to make decisions. It may be tradition, intuition (i.e., gut feeling), and rules of thumb based on the accumulated experience. Experience and intuition may be valuable in decision-making. But when customers process statistical data and information, it is reliable to analyze numerically and objectively.

There are five stages in a typical buyer decision making process. They are 1) need recognition, 2) information search, 3) evaluation of alternatives, 4) purchase decision, and 5) post-purchase behavior (Kotler & Armstrong, 2020). Before the actual purchase, a long buying process starts. Marketers should focus on the whole buying process instead of the purchase decision only. In a routine purchase (e.g., toothpaste), buyers usually skip some stages in the buyer decision making process and arrive to purchase decision without information searching and comparison of alternatives. When a buyer faces a complicated buying situation, it is likely that he or she will go through all stages.

How does a customer choose among the alternative brands (i.e., the third stage mentioned above)? In alternative evaluation, customers process information to decide brand choices. They do not use one simple evaluation method in all purchase situations. Instead, different evaluation processes may be applied. Sometimes, customers rely on rational thinking and cautious calculations. Sometimes, they buy on impulse based on intuition without evaluation. They may make purchase decisions on their own or consult salespeople, consumer guides and friends for advice.

This paper will first discuss common deceptive promotion in terms of statistical misinformation in the market and then present the results of a survey on customers' attitudes to the application of data analysis for processing relevant data before important purchases. This survey also revealed the respondents' capability of processing data to find out if there was any deficiency of relevant skills and knowledge. Finally, some suggestions are provided to enhance the statistical abilities and techniques that are useful for processing data from various information sources on the market.

2. STATISTICAL MISINFORMATION IN DECEPTIVE PROMOTION

With technological advancement, it becomes easy to collect data on various sources like the Internet. Naturally businesses use these data for improving profitability by analyzing customer purchase behavior and pattern. It is common for businesses to rely on computational approaches to processing massive amounts of data effectively with better computer software and hardware. Thus, a company should be able to present accurate data and information to its customers in their promotional campaigns like advertising. But false advertising contains untruthful claims and misleads people to a wrong conclusion (Pagura, 2019; Schmuck, Matthes, & Naderer, 2018).

A typical example of misusing statistics is Colgate (Clarke, 2007). Its advertising claimed that 80% of dentists recommended its toothpaste. Although it was true, the company did not mention that those dentists also recommended other brands as well. Thus, the company deliberately informed an incomplete research result in advertising. From iPhone 8, Apple claimed its smart phones could be water resistant in advertising. But the company did not tell that it was attainable under a certain condition in the laboratory (Turner, 2021). Some consumers really tested and damaged their new phones. In 2015, Apple was sued for claiming that its new iPhone had 16 GB of RAM but actually only 12 GB were free for the usage (Goldman, 2015). In 2017, Uber lied about hourly salaries of drivers in advertising and claimed that it was $21/hour in Chicago. But actually, less than 20% of drivers could earn that much (Dickey, 2019).People may rely on analyzing data and information numerically and objectively. But following are various ways to mislead people statistically.

2.1. Loaded Question

In a survey, a question should collect data in an unbiased manner that does not affect an emotional response or imply an answer. But when a question is loaded, it will lead a respondent to select an option intentionally. The following are examples. Both questions basically are the same, but they will not have the identical effect and results in the survey.

- Do you support a price adjustment?
- Do you support a price adjustment that would be beneficial for customers?

It is important to collect data from a neutral source. A loaded question may use an unjustified assumption to collect responses in a biased manner. For instance, in the question "*Have you stopped doing a bad thing?*", respondents will admit to having done a bad thing, no matter if the answer is yes or not.

2.2. Improper Relationship among Data

In statistics, it is common to find out if there is any correlation between two variables (e.g., the outdoor temperature and the sales figure of an ice-cream). A correlation may prove causation that one variable affects another. For example, when the outdoor temperature increases, more people like to buy ice-creams and the sales figure follows to increase.

However, when two variables are found to be correlated, it is not necessary to be a causal relationship. For example, when studying the body weight and the intelligence of primary school students (aged between 6 and 12), a correlation between these two variables can be found and this may lead to a wrong conclusion that a larger body weight results in a higher intelligence. These two variables are affected by another factor, and this makes them look correlated superficially.

2.3. Data Fishing

Traditionally, data analysis begins with a hypothesis that is to be proved or disproved by testing data like t-test and ANOVA (Analysis of Variance) that compares variances across the means of different data groups. Data fishing is a kind of data mining practice to find any possible relationships among a large volume of data. Then, hypotheses about why these relationships exist are formed. When it is conducted unethically, data fishing may lead to premature conclusions.

2.4. Misleading Data Visualization

Visual and graphical presentation of data is important for audiences to understand the overall picture of data. For example, a histogram can tell more than thousands of numerical raw data. However, an improper way to present graphically may lead to a wrong interpretation of results. A wrong scale is a typical example. For example, an exponential curve shown on a normal scale will become a straight line with a semi-log scale.

A graph, like a bar chart, is usually helpful to present data for comparison. But a truncated axis (that shows only a particular portion of the complete axis) may create a different perception to the audience. For example, Figure 1 shows two bar charts that are supposed to convey the same information. But when the y-axis is truncated, the difference will be enlarged visually but not mathematically. The perceived difference may be larger than the real one.

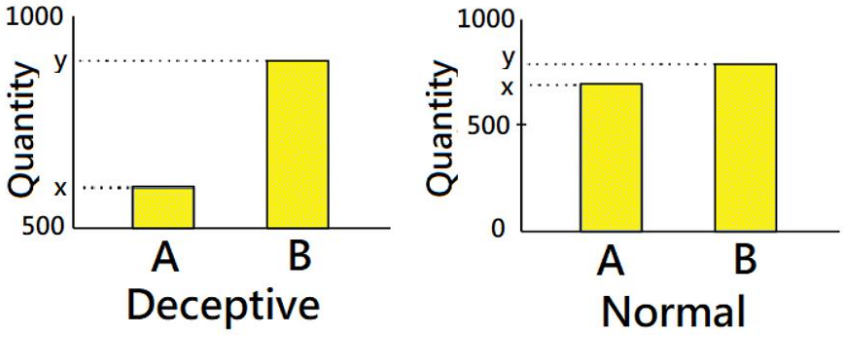

Figure 1. An example of a truncated axis in a bar chart.

2.5. Sampling Problem

A population is usually large, and it is impossible to collect data from all people in the whole population in a survey. It is essential to collect data from a representative sample that can reflect the whole population. Regarding sampling, there are two common problems: sample size and sample formation.

The sample size should be large enough and is related to several factors including the population size and margin of error. A small sample size cannot provide any conclusion certainly. The following is the formula that determines a proper sample size (Carlson & Winquist, 2021).

Sample size = $1 + \lceil z^2 \times s \times (1-s) \rceil / \lceil e^2 \times N \rceil$, where

N = population size,

e = margin of error,

z = z score, and

s = standard deviation.

In a survey, if the sample size is not large enough, the statistical findings are not reliable. For example, when there are 10 respondents and only one says "yes" to a question, it is 10% responding yes. But when there are 1,000 respondents and 100 say "yes" to a question, the 10% responding yes will become more reliable.

A sample also should be formed without bias. For example, in a survey collecting respondents' attitudes to the usage of the Internet, if the sample consists of a majority of young (or old) people, the result will be biased. It is necessary to make sure the respondents in a sample are selected fairly. A biased sample will lead to overgeneralization that occurs when a conclusion obtained in a particular situation is thought to be valid in other situations. If the popularity of a trendy product is calculated based on the responses from young people only, this cannot reflect how the product is accepted by the whole population with various ages.

2.6. Misleading Average

It is quite common to use the average to represent the central tendency of the sample data. This practice is only valid when the data follow the normal distribution. Otherwise, it is better to use the mode or median to represent the central tendency. For example, in the data set "1, 2, 3, 4, 100", the median is 3 while the average is 22. Therefore, the average should not be used when the data are not normally distributed. The usage of the average in a situation with skewed data may lead to a wrong perception.

2.7. Percentages Used Instead of the Exact Numbers

In a survey, there are only four respondents and three of them prefer a particular product. The conclusion is that 75% prefers the product. The percentage can make the result looks more trustworthy than they are. Thus, it is necessary to request information on the sample size when not provided.

Misleading information may confuse and trap people. It is necessary to recognize misleading data and their statistics (Trendel, Mazodier, & Vohs, 2018). When coming across a statistical presentation in marketing promotion, it is required to consider 1) the source of data, 2) whether the source is controlled, 3) what factors affecting the result and 3) most importantly, whether the information tries to inform or direct to a predetermined conclusion.

3. SURVEY AND RESULTS

A total of 210 business students in a university were invited to participate in the survey that consisted of two sections. The first section collected data about their attitudes to the application of data investigation to support their purchase decisions. Table 1 presents the responses to questions in the section.

Table 1. The results of the survey on attitudes to data investigation for supporting purchase decisions.

Questions (1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree)	Mean	Standard deviation
1. You like to investigate data (e.g., studying statistical data about the best prices, popular items and best sellers) before purchasing important goods.	3.85	0.78
2. You believe data investigation is helpful when making purchase decisions on important goods.	4.10	0.74
3. With data investigation, your purchase decisions are easier.	3.82	0.77
4. With data investigation, your purchase decisions are more accurate.	3.84	0.77
5. With data investigation, your purchase decisions are faster.	3.40	0.99
6. You are good at data investigation to support purchase decisions.	3.48	0.94
7. It is easy for you to understand how to investigate data.	3.56	0.79
8. It is easy for you to perform to investigate data.	3.45	0.89
9. Learning data investigation is easy for you.	3.29	0.89
10. You usually collect data relevant to purchase decisions on important goods.	3.83	0.72
11. It is easy to collect data to support purchase decisions on important goods.	3.56	0.86
12. You usually confirm the data or information provided by sellers before purchasing important goods.	3.63	0.89
13. You trust the analytical results provided by sellers.	3.31	0.91

On the whole, the respondents showed positive responses to the importance of data analysis in making purchase decisions. They also slightly agreed that they would confirm the data and information provided by sellers and trust the sellers' analytical results.

In the second section of the survey, respondents were asked to process some statistical data in six imaginary scenarios. This section was to reflect their capabilities of processing simple data in marketing promotion. The performance of the respondents and the explanation of the answers are discussed below.

Q14. A company increased its sales figure by 50% in 2019. Because of the serious pandemic situation, by the end of 2021, the sales figure was 50% less than it was two years earlier. Therefore, the sales figure remains the same over the three-year period. Is this conclusion right or wrong?

- *Right.*
- *Wrong (correct answer).*
- *Maybe right or wrong, depending on a subjective viewpoint.*
- *Insufficient information to decide.*

The proportion of correct responses is 50.8%. This question provides percentage figures only. This makes it difficult to trace the change of the sales figure. Some may think it is impossible to calculate because there is no real sales figure provided. Intuitively, the final sales figure looks unchanged, but the cautious calculation finds the difference. When 100% increases by 50%, it changes to 150%. Then, when it decreases by 50%, it changes to 75%. Therefore, the sales figure does not remain the same.

Q15. A marketing survey collected data from sufficient respondents and finds that 35% of respondents like Product A, 30% like Product B, and 25% like Product C. A marketer says that most people like Product A the best. Is this conclusion right or wrong?

- *Right.*

- *Wrong (correct answer).*
- *Maybe right or wrong, depending on a subjective viewpoint.*
- *Insufficient information to decide.*

The proportion of correct responses is 18.9%. There is a tricky question that provides a confusing background. When a number of figures are provided, usually one of them is the largest. But it does not imply that such the largest number is really large in the relevant context. When only 30% of respondents like a product, most people dislike it actually. If the question mentions Product A's percentage only, the correct conclusion may be drawn more undoubtedly.

Q16. A university conducts a survey to find that 100 students would prefer adding an extra teaching week in a semester and, thus, concludes that such a change would be accepted by most students on the campus. Is this conclusion right or wrong?

- *Right.*
- *Wrong.*
- *Maybe right or wrong, depending on a subjective viewpoint.*
- *Insufficient information to decide (correct answer).*

The proportion of correct responses is 28.7%. The question does not provide other important information including the sample size and the sampling method. If the sample size is 101, the conclusion is correct. When the sample is 1000, the conclusion is incorrect. If the respondents are randomly selected, the conclusion is reliable. But if the sample just consists of hardworking students, the conclusion may become biased.

Q17. A company has a sale that allows you to choose one of the following two options:

a) take a discount of 10% of a product's regular price, then take 10% off the reduced price.

b) take a discount of 20% of a product's regular price.

Which option should you choose to save much money?

- *Option a.*
- *Option b (correct answer).*
- *Either because of no difference between them.*
- *Insufficient information to decide.*

The proportion of correct responses is 72.1%. Similar to Q14, this question provides percentage figures only. This makes it difficult for some to analyze correctly. Intuitively, the total discounts of the two options look the same but the cautious calculation finds the difference. In option a, when 100% is reduced by 10%, it becomes 90%. Then, after further reduction by 10%, 90% changes to 81%. In option b, when 100% is reduced by 20%, it becomes 80%. Thus, option b saves much money.

Q18. There are two stores in a street. The probabilities of your buying goods from them are 40% and 50% respectively. What is the probability that you will buy goods when visiting the street?

- *20%*
- *45%*
- *70% (correct answer)*
- *90%*

The proportion of correct responses is 24.6%. This is a straightforward probability calculation. The probability of not buying anything from the two stores is (1 – 40%) x (1 –50%) = 30%. Thus, the probability of buying something is 1 – 30% = 70%. Intuitively and incorrectly, some may calculate the sum, multiplication or average of 40% and 50%. Incorrectness reflects the lack of basic mathematical skills.

Q19. Every week you will receive only 1 e-coupon issued from either Company A or Company B with an equal chance (i.e., 50% each). Now you have 2 e-coupons issued from Company A and 1 from Company B. After collecting 3 e-coupons issued from the same company, a gift will be sent to you automatically. What is the probability that you will FIRST receive Company B's gift?

- *1/2*
- *1/3*
- *1/4 (correct answer)*
- *1/5*

The proportion of correct responses is 47.5%. To first receive Company B's gift, there is only one way that two e-coupons from Company B must be received consecutively (P = ½ x ½ = ¼). But some may apply the wrong logic to analyze the data. Given that there are 2 collected e-coupons from Company A and 1 from Company B, one may intuitively and incorrectly think that P(Company A's gift) = 2/3 and P(Company B's gift) = 1/3.

From the results in this section, most respondents lacked the statistical and reasoning skills to process data properly. But these are important to criticize and judge numerical information provided in the deceptive marketing promotion.

4. CONCLUSION

To equip with the proper ability to process statistical data and information, students need to have more training on statistical applications that collect, organize, analyze and interpret data (Idris, 2018; Vlach & DeBrock, 2019). Statistics can be used in different fields including business, psychology, education and healthcare. It can be used to answer questions and recognize and predict trends. It is an essential skill to make decisions and solve problems. For

instance, statistics can determine the most suitable location for a new company and it can track trends, such as the number of consumers purchasing a product on an online channel. Statistics is a combination of a number of qualifying traits, including data analysis, computer literacy and critical thinking. These skills allow people to better understand how to review data critically to find out useful information and insights that help in decision making and problem solving processes (Kusumarasdyati, 2019; Lelonkiewicz, Ullman, & Crepaldi, 2022).

Data analytics is used to transform data to create information to support decision making and make conclusions. There are a variety of methods and techniques for collecting and processing data, including regression analysis, time series analysis, forecasting and probability.

Computing software is available for data analysis and statistical processes and helps collect and optimize how users interpret data for useful information. It is important for users to understand how to use these software and applications. With programming skills, users may develop and build data processing software. When understanding programming logic and languages, a user may access more resources and tools to perform specific data analytic processes. The more programming skills, the better a user can analyze data with efficiency and clarity (Counsell & Cribbie, 2020; Tenório, Lopes, Góis, & Dos Santos Junior, 2019). Database management is also important because this helps collect and store data safely for its usage in the future. When data are maintained and updated well, one may have high quality data for data analysis with minimal delay for more beneficial decisions.

When viewing data and statistics, one seeks to gain insights to make decisions and solve problems. Problem solving requires the capability of thinking about a specific condition and identifying resolutions to them. With this skill, one may make more beneficial decisions and process difficult situations more effectively. Critical thinking is the ability to look past superficial indicators to decide what a result really means. It begins with observing a particular piece of information and analyzing it for valuable details. One makes inferences of such details and determines if they make sense or not. Critical thinking helps develop more logical ideas and thoughts and makes better conclusions.

Because data analysis is an essential element of statistics, improving analytical skills helps strengthen statistical skills. One may practice with different data and statistical analysis methods and become more knowledgeable on how to select the appropriate method for data. There are practice problems in textbooks and online designed for practicing statistical skills. They may help improve statistical techniques (Monge-Rogel, Durán-González, Panes-Martínez, & Juárez-Hernández, 2022). In addition, software can help with statistical analysis. It may perform calculations and simulations, create charts and graphs.

When confronted with a difficult question, one conducts research, calculates some equations, and analyzes data critically. Doing this regularly can enhance statistical skills to be more knowledgeable and reliable in statistical processes (Slootmaeckers, Kerremans, & Aiaensen, 2014). Another important way to improve statistical skills is to adopt several perspectives when solving a unique question. Sharing one's perspective and skills with others may help one develop own perspectives. It is possible to better understand others' approaches to solve the problem (Nasir & Hasmar, 2018; Sherwood & Kwak, 2017).

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Both authors contributed equally to the conception and design of the study.

REFERENCES

Aagaard, L. (2020). Marketing of healthcare services in Denmark: The concept of misleading advertising. *International Journal of Clinical Pharmacy, 42*(6), 1524-1527. https://doi.org/10.1007/s11096-020-01111-3

Carlson, K. A., & Winquist, J. R. (2021). An introduction to statistics: An active learning approach. In (3rd ed., pp. 213). Thousand Oaks, Calif: Sage Publications.

Clarke, O. (2007). *Colgate's '80% of dentists recommend' claim under fire. Marketinglaw.* Retrieved from https://marketinglaw.osborneclarke.com/retailing/colgates-80-of-dentists-recommend-claim-under-fire/

Counsell, A., & Cribbie, R. A. (2020). Students' attitudes toward learning statistics with R. *Psychology Teaching Review, 26*(2), 36-56. https://doi.org/10.53841/bpsptr.2020.26.2.36

de Lange, R. (2016). Misleading advertising: A case study of a marketer's 'prescribed by doctors' slogan. *Critical Arts, 30*(2), 187-199. https://doi.org/10.1080/02560046.2016.1187799

Dickey, M. R. (2019). *Uber proposes policy that would pay drivers a minimum wage of $21 per hour while on a trip. TechCrunch.* Retrieved from https://techcrunch.com/2019/08/28/uber-proposes-policy-that-would-pay-drivers-a-minimum-wage-of-21-per-hour/

Goldman, D. (2015). *Apple sued because iPhone isn't really 16 GB. CNN Business.* Retrieved from https://money.cnn.com/2015/01/02/technology/mobile/apple-iphone-lawsuit/

Hastak, M., & Mazis, M. B. (2011). Deception by implication: A typology of truthful but misleading advertising and labeling claims. *Journal of Public Policy & Marketing, 30*(2), 157-167. https://doi.org/10.1509/jppm.30.2.157

Hattori, K., & Higashida, K. (2015). Who benefits from misleading advertising? *Economica, 82*(328), 613-643. https://doi.org/10.1111/ecca.12149

Idris, K. (2018). Teaching and learning statistics in college: How learning materials should be designed. *Journal of Physics. Conference Series, 1088*(1), 12032. https://doi.org/10.1088/1742-6596/1088/1/012032

Kariyawasam, K., & Wigley, S. (2017). Online shopping, misleading advertising and consumer protection. *Information & Communications Technology Law, 26*(2), 73-89. https://doi.org/10.1080/13600834.2017.1289835

Kotler, P., & Armstrong, G. (2020). Principles of marketing. In (18th ed., pp. 490). Essex, England: Pearson Education Limited.
Kusumarasdyati. (2019). Statistical reasoning or statistical method: Students' preferences for learning statistics. *Journal of Physics. Conference Series*, *1417*(1), 12041. https://doi.org/10.1088/1742-6596/1417/1/012041
Lelonkiewicz, J. R., Ullman, M. T., & Crepaldi, D. (2022). Knowledge of statistics or statistical learning? Readers prioritize the statistics of their native language over the learning of local regularities. *Journal of Cognition*, *5*(1), 18–18. https://doi.org/10.5334/joc.209
Monge-Rogel, R., Durán-González, G., Panes-Martínez, M., & Juárez-Hernández, L. G. (2022). Design of an instrument to assess students' perception of learning objects in statistics. *Education and Information Technologies*, *27*(7), 9523-9539. https://doi.org/10.1007/s10639-022-11011-w
Nasir, A. M., & Hasmar, D. H. (2018). Relation between student's perceptions to the statistics lecturer in learning process with statistics achievement. *Malikussaleh Journal of Mathematics Learning*, *1*(1), 9–12. https://doi.org/10.29103/mjml.v1i1.609
O'Reilly, L. (2014). *Red Bull will pay $10 to customers disappointed the drink didn't actually give them 'wings'. Business Insider*. Retrieved from https://www.businessinsider.com/red-bull-settles-false-advertising-lawsuit-for-13-million-2014-10
Pagura, I. (2019). False and misleading advertising: Misleading and deceptive conduct. Know the rules or risk being fined. *Journal of the Australian-Traditional Medicine Society*, *25*(3), 160–161.
Schmuck, D., Matthes, J., & Naderer, B. (2018). Misleading consumers with green advertising? An affect–reason–involvement account of greenwashing effects in environmental advertising. *Journal of Advertising*, *47*(2), 127–145. https://doi.org/10.1080/00913367.2018.1452652
Sherwood, C., & Kwak, D. W. (2017). New insights into an old problem - Enhancing student learning outcomes in an introductory statistics course. *Applied Economics*, *49*(56), 5698–5708. https://doi.org/10.1080/00036846.2017.1332750
Slootmaeckers, K., Kerremans, B., & Aiaensen, J. (2014). Too afraid to learn? Attitudes towards statistics as a barrier to learning statistics and to acquiring quantitative skills. *Politics (Manchester, England)*, *34*(2), 191–200. https://doi.org/10.1111/1467-9256.12042
Tenório, M. M., Lopes, R. P., Góis, L. A., & Dos Santos Junior, G. (2019). Design and evaluation of a gamified e-learning system for statistics learning activities. *Literacy Information and Computer Education Journal*, *10*(1), 3078–3085. https://doi.org/10.20533/licej.2040.2589.2019.0404
Trendel, O., Mazodier, M., & Vohs, K. D. (2018). Making warnings about misleading advertising and product recalls more effective: An implicit attitude perspective. *Journal of Marketing Research*, *55*(2), 265–276. https://doi.org/10.1509/jmr.14.0305
Turner, J. (2021). *Apple is being sued over waterproof iPhone claims. Tech.Co*. Retrieved from https://tech.co/news/apple-sued-iphone-waterproof
Vlach, H. A., & DeBrock, C. A. (2019). Statistics learned are statistics forgotten: Children's retention and retrieval of cross-situational word learning. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, *45*(4), 700–711. https://doi.org/10.1037/xlm0000611