https://doi.org/10.65166/jyz38377

International Journal of Behavioral and Social Analytics
Volume I, Issue 3, August 2026
eISSN: 3116-4358
https://journal.ijhba.com/index.php/ijbesa
https://slsipress.com

Reviewer Paper Color and Test Performance Among College Students: A Pretest–Posttest Experimental Study

Nathan Halle S. Ban and Felisse Marianne San Juan, PhD

Abstract

Visual characteristics of learning materials may influence attention, information processing, and memory, yet the role of paper color in printed review materials remains insufficiently examined in college settings. This study examined test performance among 30 college students who used identical reviewer materials printed on either blue or white paper. Participants were recruited through convenience sampling and randomly assigned to two conditions of 15 students each. A researcher-developed 20-item multiple-choice achievement test was administered electronically before and after the review period. Overall mean performance increased from 14.7 (SD = 3.12) at pretest to 16.0 (SD = 2.77) at posttest, while the median increased from 15.0 to 16.5. The reported directional paired-samples t-test indicated higher posttest scores, $t(29) = -1.79$, $p = .042$, and the Wilcoxon signed-rank test yielded a consistent result, $W = 79.0$, $p = .007$. The Shapiro-Wilk test indicated non-normality of the difference scores ($W = .878$, $p = .002$), making the nonparametric result particularly important. The findings support overall improvement following the review period. However, because the available analysis pooled the two paper-color conditions rather than directly testing whether change differed between blue and white groups, the improvement cannot be attributed specifically to reviewer paper color. The study therefore provides preliminary evidence concerning reviewer-based performance while underscoring the need for group-specific analysis before a color effect can be established.

Keywords: *paper color, reviewer materials, test performance, color cognition, memory, college students*

Received: January 12, 2026 Revised: March 31, 2026 Accepted: June 5, 2026

1. Introduction

Color is an important visual characteristic of learning materials because it can influence how information is perceived, attended to, and processed. Beyond its aesthetic function, color has been examined as a perceptual and emotional stimulus relevant to learning environments. Developmental research demonstrates that color perception and cognition are integral components of visual processing, while a systematic review of color-emotion research indicates that colors also carry recurrent affective associations that may shape responses to visual environments (Jonauskaite & Mohr, 2025; Maule et al., 2023). These processes are potentially relevant to academic learning, in which students must encode, retain, and retrieve information under varying visual conditions.

Evidence concerning color and cognitive performance is mixed. Jadhao et al. (2020) reported that background color conditions were associated with differences in attention and short-term memory, suggesting that visual context can influence cognitive engagement. In contrast, Acharya et al. (2021) found no statistically significant short-term memory advantage for a yellow background compared with a white background. Gnambs (2020), in a meta-analysis of red-color effects on cognitive performance, likewise found little evidence for a robust and general color-priming effect after accounting for publication bias. These findings indicate that color effects should not be assumed to operate uniformly across tasks, hues, or learning contexts.

One area that warrants direct examination is the physical presentation of reviewer materials used in preparation for examinations. Printed reviewers remain a common study resource because they allow students to revisit instructional content and reinforce material before assessment. Although white paper is conventionally used, colored paper may modify visual salience, comfort, attentional engagement, or contextual encoding. Research on digital

materials shows that background color can affect preference and engagement even when comprehension differences are not statistically significant (Gong et al., 2024). Similarly, color cues embedded in video lectures have been associated with learning performance through attention-guiding mechanisms (She et al., 2024).

The distinction between color used to highlight information and color used as the background medium is methodologically important. Color coding directs attention toward selected elements, whereas changing the paper color modifies the visual context of the entire learning material. Findings from highlighting, digital displays, ambient color, or color-emotion research therefore cannot be generalized automatically to printed reviewer paper. Direct experimental evidence is needed under conditions in which content, formatting, study period, and testing procedures are held constant.

Evidence more directly related to educational performance remains limited and heterogeneous. Deang (2024) reported differences in mathematics test performance across several paper colors among Grade 10 students, with patterns varying by sex and color condition. Eliot et al. (2024), using a descriptive survey among senior high school students, found strong perceived influence of color-coding on memorization, although that study measured perceptions rather than objective achievement. These studies support continued examination of color in educational materials while also showing that the nature of the outcome measure and the specific color manipulation matter.

The present study examined college students who received identical reviewer materials printed either on blue paper or on standard white paper. The pretest and posttest were administered electronically, so the experimental manipulation concerned the reviewer used during preparation rather than the assessment medium itself. This design was intended to isolate reviewer paper color from test-paper color while examining changes in subsequent test performance.

Objectives of the Study

This study aimed to examine test performance among college students exposed to reviewer materials printed on blue or white paper. Specifically, it sought to:

- describe participants' test performance before and after exposure to the reviewer materials;
- determine whether overall test performance changed significantly from pretest to posttest; and
- determine what inference concerning reviewer paper color can be supported by the available statistical results.

2. Review of Related Literature

2.1 Color, Perception, and Cognitive Processing

Color operates as both a perceptual property and a contextual stimulus. Maule et al. (2023) reviewed the development of color perception and cognition, showing that color processing develops across multiple perceptual and cognitive domains and has implications for how visual information is experienced. Jonauskaite and Mohr (2025) further demonstrated, through a systematic review spanning more than a century of research, that colors are repeatedly associated with affective meanings. Although emotional association is distinct from academic performance, it provides a plausible pathway through which visual context may influence comfort, arousal, or engagement during learning.

Experimental evidence concerning cognitive performance is less consistent. Jadhao et al. (2020) examined background color perception in relation to attention span and short-term memory and reported condition-related differences. By contrast, Acharya et al. (2021) compared white and yellow backgrounds in a crossover study and found no statistically significant advantage for yellow in short-term memory performance. Gnambs (2020) similarly concluded from a meta-analysis that evidence for a robust red-color effect on cognitive performance was limited. Taken together, these studies indicate that color may be cognitively relevant in some settings but that its effects are contingent rather than universal. Evidence from adjacent experimental work likewise suggests that seemingly peripheral physical features of the study environment can affect task performance: first-year civil engineering students completed a standardized puzzle significantly faster at organized than disorganized desks, although the outcome concerned task efficiency rather than learning or retention (Manio et al., 2026).

2.2 Color in Learning Materials, Memory, and Retention

Color can be incorporated into learning materials as a background, cue, or organizational device. These forms of color manipulation are not equivalent, but they share the capacity to alter visual salience and the allocation of

attention. She et al. (2024) examined color cues in video lectures and reported effects on learning performance, supporting the view that appropriately placed visual cues can guide learners toward relevant information. Such findings are consistent with multimedia-learning explanations in which perceptual organization can facilitate encoding when visual elements are meaningfully integrated with instructional content.

Background color produces a broader change in visual context. Gong et al. (2024) tested eight background colors in digital learning materials among higher-education participants and found no significant effect on comprehension metrics, although preferences differed across groups and color affected aspects of learner experience. The result is important because it cautions against equating visual preference or engagement with objective improvement in comprehension. A related distinction appears in Philippine educational-technology research, where AI tools were perceived more favorably for engagement, content relevance, and analytics than for direct academic-performance improvement, reinforcing the need to separate learner experience from demonstrated achievement effects (Rao et al., 2025). Related work also suggests that learner self-regulation is relevant to how such conditions are experienced; among Chinese college students, self-control—defined partly in terms of concentration and resistance to distraction—was positively associated with general self-efficacy (Rui, 2026).

Cai and Wang (2024), in a Research Square preprint involving learning materials and Chinese-character memory, likewise examined background color as a memory-related variable. Because the work is a preprint, its findings should be interpreted cautiously, but it contributes to the emerging evidence that background color may interact with memory processes. Collectively, the literature suggests that color can structure learning experiences, yet effects vary according to whether color functions as a targeted cue, a full-background manipulation, or a broader environmental feature. In another adjacent higher-education context, craftsmanship spirit was strongly associated with endogenous learning motivation among Chinese vocational students, underscoring that motivation can vary with learner-level dispositions independently of material design (Yan, 2026).

2.3 Paper Color and Academic Performance

Research directly examining paper color in educational assessment is comparatively limited. Deang (2024) studied Grade 10 mathematics performance using white, red, blue, yellow, and green paper and reported differences across color conditions, including variation in the highest-performing colors for male and female students. The study is relevant because paper color itself was manipulated, but its secondary-school context and multi-color design differ from a college reviewer intervention.

Eliot et al. (2024) investigated senior high school students' perceptions of color-coding and memorization. Respondents generally reported that color-coding helped them remember information, with perceived effects differing across profile characteristics. Because the study used self-reported perceptions rather than an objective pretest-posttest achievement measure, it provides contextual rather than causal evidence concerning color and memory.

These findings indicate that paper and material color may warrant educational consideration but do not establish that colored paper is inherently superior to white paper. The mixed evidence from experimental, survey, and digital-background studies reinforces the need to evaluate color effects within the specific task and material format in which they are applied (Acharya et al., 2021; Gnambs, 2020; Gong et al., 2024). Student-level heterogeneity may also matter when interpreting material interventions; in a Philippine student sample, knowledge-related outcomes differed significantly by educational level and academic program, illustrating how prior educational exposure and specialization can structure measured learning-related outcomes (Espelita et al., 2025).

2.4 Synthesis and Literature Gaps

The literature indicates that color can influence perceptual experience, affective association, attention allocation, and some learning outcomes, but the magnitude and direction of these effects are inconsistent. Evidence ranges from positive effects under particular cueing or color conditions to null or weak effects in other cognitive tasks (Acharya et al., 2021; Gnambs, 2020; She et al., 2024). Direct evidence concerning printed paper color is much thinner than the literature on digital backgrounds or color cues. More broadly, contemporary educational research emphasizes that learner outcomes emerge from interacting instructional, psychosocial, and institutional conditions rather than from isolated design features alone (Bermido et al., 2025). Comparable evidence from student well-being research indicates that the academic experience is embedded in broader lifestyle and psychosocial conditions: sleep duration, screen time, and physical activity were associated with burnout dimensions among dormitory medical students, while academic distress also varied significantly across university contexts (Quinto et al., 2025; Malabanan, 2026). At the secondary-school level, academic-demand management difficulties, fear of

failure, performance anxiety, and lesson-comprehension challenges were likewise represented within measures of dishonesty-related tendencies, illustrating that assessment contexts are shaped by pressures beyond the presentation of materials themselves (Lolong et al., 2026).

Three gaps are particularly relevant. First, much of the evidence concerns digital materials, color coding, or general color perception rather than the physical color of printed reviewer paper. Second, existing findings suggest that effects may depend on hue, task, population, and outcome measure. Third, relatively little controlled evidence addresses whether printed reviewer paper color is associated with subsequent objective test performance among college students. The present study responds to these gaps by holding reviewer content and assessment procedures constant while varying whether the reviewer was printed on blue or white paper. Methodologically, controlled pretest-posttest research also demonstrates why overall improvement cannot be equated with a treatment effect: San Juan et al. (2026) observed significant improvement over time in perceived sleep quality while the group-by-time interaction remained nonsignificant.

3. Methodology

3.1 Research Design

The study employed a quantitative pretest–posttest experimental design. Following recruitment, participants were randomly assigned to one of two reviewer conditions. One condition received instructional reviewer materials printed on blue paper, while the comparison condition received the same materials printed on standard white paper. Content, layout, font style, font size, assessment instrument, and general testing procedures were kept consistent. The pretest and posttest were administered electronically; therefore, the manipulated feature concerned the reviewer material used during preparation rather than the medium on which the test itself was answered.

3.2 Participants and Sampling

The study involved 30 college students enrolled at a private higher education institution in Bulacan, Philippines. Participants were recruited through convenience sampling based on availability and willingness to participate. After recruitment, random assignment was used to allocate 15 students to the blue-paper reviewer condition and 15 to the white-paper reviewer condition. Eligibility required current college enrollment and voluntary agreement to participate.

3.3 Research Instruments and Experimental Materials

Two researcher-developed materials were used: a two-page reviewer and a 20-item multiple-choice achievement test. The reviewer versions were identical in content, layout, font style, and font size; only the paper color differed. The achievement test contained one correct option and three distractors per item, with one point awarded for each correct response and a maximum score of 20. The same achievement test was administered at pretest and posttest to measure change across the review period. Both the reviewer and achievement test were evaluated and approved by a subject teacher before use as a procedure for establishing content validity. No reliability coefficient for the achievement test was reported in the source study.

3.4 Data Gathering Procedure

Permission to conduct the study and informed consent from participants were obtained before data collection. Participants first completed the 20-item pretest through Google Forms under standardized instructions and a 30-minute time limit. After the pretest, they were randomly assigned to the blue-paper or white-paper reviewer condition and were given one full day to study the same two-page reviewer independently without additional instructional assistance. Participants subsequently completed the same 20-item posttest through Google Forms under the same time limit and general testing conditions. Responses were coded and entered into jamovi for analysis.

3.5 Data Analysis

Descriptive statistics were used to summarize pretest and posttest performance. Normality of the pretest-posttest difference scores was assessed using the Shapiro-Wilk test. The source analysis reported a directional paired-samples t-test to examine whether pretest scores were lower than posttest scores, with Cohen's d as the standardized effect-size measure. Because the difference scores departed significantly from normality, a directional Wilcoxon signed-rank test was also reported, together with rank-biserial correlation. The available statistical output evaluates overall pretest-posttest change across all 30 participants. It does not report a direct inferential comparison of change between the blue-paper and white-paper conditions.

3.6 Ethical Considerations

Participation was voluntary and informed consent was obtained before involvement. Participants were informed of the study purpose, procedures, duration, and right to withdraw without penalty. The research involved activities comparable to ordinary academic reviewing and testing and was treated as minimal risk. The study methodology states that names, student numbers, and other personally identifiable information were not collected for the research dataset. Responses were treated confidentially and used only for academic research purposes.

4. Results and Discussion

4.1 Pretest and Posttest Performance

Descriptive statistics indicated an overall increase in test performance following the review period. As shown in Table 1, the mean score increased from 14.7 (SD = 3.12) at pretest to 16.0 (SD = 2.77) at posttest. Median scores likewise increased from 15.0 to 16.5. The change in both mean and median indicates a general upward shift in performance rather than an improvement reflected only in one summary statistic.

Table 1 *Descriptive Statistics for Pretest and Posttest Performance*

Assessment	N	Mean	Median	SD	SE
Pretest	30	14.7	15.0	3.12	0.569
Posttest	30	16.0	16.5	2.77	0.506

The standard deviation decreased modestly from 3.12 to 2.77, indicating slightly less dispersion in posttest scores. Descriptively, the sample therefore performed better after exposure to the reviewer materials.

4.2 Pretest–Posttest Difference

The Shapiro-Wilk test for the pretest-posttest difference scores was significant, W = .878, p = .002, indicating departure from normality. The nonparametric analysis was therefore particularly important in evaluating the direction of change. The reported directional paired-samples t-test yielded t(29) = -1.79, p = .042, with Cohen's d = -0.327. The Wilcoxon signed-rank test similarly indicated higher posttest performance, W = 79.0, p = .007, with a rank-biserial correlation of -.550. Negative effect-size signs reflect the ordering of the comparison as pretest minus posttest.

Table 2. *Tests of Pretest–Posttest Differences*

Analysis	Statistic	df	p	Effect size
Paired-samples t-test	t = -1.79	29	.042	Cohen's d = -.327
Wilcoxon signed-rank test	W = 79.0	—	.007	Rank-biserial r = -.550

Note. The source statistical output used directional alternatives in which pretest scores were expected to be lower than posttest scores.

The two reported analyses are consistent in showing a directional increase from pretest to posttest. Given the significant normality test, the Wilcoxon result provides the more distribution-robust support for the conclusion that posttest scores tended to be higher in the sample.

4.3 Inference Concerning Reviewer Paper Color

The experimental design included two reviewer conditions, but the statistical results available in the source manuscript pool all 30 participants for the pretest-posttest comparison. Separate pretest means, posttest means, gain scores, or an inferential comparison between the blue-paper and white-paper groups were not reported.

Consequently, the available results do not establish whether students who used blue-paper reviewers improved more than students who used white-paper reviewers. The overall increase could reflect exposure to the reviewer content, repeated administration of the same achievement test, general learning during the interval, paper-color effects, or some combination of these influences. A direct between-condition analysis would be necessary before improvement could be attributed specifically to reviewer paper color.

4.4 Discussion

The study demonstrated an overall increase in achievement-test performance after the review period. This pattern is compatible with the broader proposition that visual and instructional characteristics may shape learning experiences, but it should not be interpreted as direct confirmation of a blue-paper advantage.

Prior research provides reasons both to investigate color and to interpret color effects cautiously. Jadhao et al. (2020) reported background-color-related differences in attention and short-term memory, whereas Acharya et al. (2021) found no significant short-term memory advantage for yellow compared with white. Gnambs (2020) likewise found limited evidence for a robust red-color effect on cognitive performance. The current pattern therefore fits a literature in which color can be relevant under some conditions but does not function as a universally beneficial stimulus.

Studies of educational materials also distinguish subjective or engagement-related responses from objective learning gains. Gong et al. (2024) found no significant comprehension differences across digital background colors despite differences in preference, while She et al. (2024) reported learning effects when color was used as an instructional cue. Eliot et al. (2024) documented positive student perceptions of color-coding and memorization, but those perceptions should not be equated with experimentally demonstrated improvement. These distinctions are directly relevant to interpreting the present study.

The design nevertheless provides a useful foundation for a more specific test of paper color because the reviewer content and format were held constant while the physical paper color differed. If the original group-level scores remain available, an analysis that includes reviewer condition would permit the central color hypothesis to be evaluated directly. Without that comparison, the strongest conclusion supported by the reported evidence is that performance improved after the review period.

5. Conclusions, Recommendations, and Implications

5.1 Conclusions

The 30 participants demonstrated higher achievement-test performance after the review period, with the mean increasing from 14.7 to 16.0 and the median from 15.0 to 16.5. The reported directional paired-samples and Wilcoxon analyses were consistent with a statistically significant increase in posttest scores.

The findings therefore support a conclusion of overall improvement following exposure to the reviewer materials. They do not, however, establish that reviewer paper color caused the improvement. Because the reported inferential analyses combined the blue-paper and white-paper conditions, the differential effect of paper color remains undetermined from the available statistical results.

5.2 Recommendations

Educators may continue to use structured reviewer materials as part of assessment preparation, but routine adoption of blue or other colored paper specifically to improve test performance is not warranted by the present analysis.

If the original participant-level dataset remains available, separate pretest and posttest results should be summarized for the blue-paper and white-paper groups and analyzed using a method that directly tests the treatment condition while accounting for baseline performance. This would permit the original experimental question to be answered.

Future studies should use larger and more diverse samples, consider parallel rather than identical pretest and posttest forms to reduce practice effects, and examine additional outcomes such as delayed retention, reading comfort, cognitive load, attention, test anxiety, and color preference. Comparisons across multiple hues and saturation levels may also clarify whether any effects are color-specific.

5.3 Implications of the Study

Educationally, the study illustrates why the physical presentation of learning materials should be examined empirically rather than treated as purely aesthetic. Visual design may affect learner experience, but objective performance evidence is necessary before specific material features are recommended.

Methodologically, the study highlights the importance of aligning statistical analysis with experimental design. In a two-condition pretest-posttest experiment, a pooled before-and-after comparison can establish overall change

but cannot determine whether the manipulated condition produced that change. Treatment condition must be incorporated directly into the principal inferential analysis.

From a research perspective, the findings contribute to a mixed literature on color and cognition by showing that reviewer-based performance improved while leaving the specific contribution of paper color unresolved. This distinction provides a clear direction for subsequent experiments and reanalysis of the existing dataset.

6. References

Acharya, M. S., Keertish, N., Gowda, H. T., & Krithishree, S. S. (2021). Effect of white and yellow background colour on short term memory: A cross-over study. *Journal of Clinical and Diagnostic Research, 15*(6), VC07–VC09. https://doi.org/10.7860/JCDR/2021/46349.15042

Bermido, C. M., Quinto, L. F., & Atento, R. G. O. (2025). A qualitative thematic review of contemporary challenges affecting health professions education: Implications for higher education leadership. *International Journal of Health and Business Analytics, 1*(2). https://doi.org/10.65166/yfm5w791

Cai, P., & Wang, J. (2024). *The effect of background colors of learning materials on memory: Evidence from Chinese characters* [Preprint]. Research Square. https://doi.org/10.21203/rs.3.rs-5266192/v1

Deang, E. M. (2024). The effect of colored paper on the test performance in mathematics of Grade 10 students of Olongapo City National High School. *International Journal of Research in Engineering, Science and Management, 7*(11), 1–9.

Eliot, L. B. E., Galigao, J. D., Ortiz, T. V., Gaddi, J. A. G., Pongcol, A. M. P., & Entendez, C. E. (2024). Influence of colors to the memorization skill of the senior high school students. *International Journal of Current Science Research and Review, 7*(6), 3702–3709. https://doi.org/10.47191/ijcsrr/V7-i6-17

Espelita, C. A. M., Atento, R. G., Rao, L. J., & Tian, Y. (2025). Understanding monetary policy: Student awareness, perceptions, and financial behaviors in the Philippine context. *International Journal of Health & Business Analytics, 1*(1). https://doi.org/10.65166/f7eayj47

Gnambs, T. (2020). Limited evidence for the effect of red color on cognitive performance: A meta-analysis. *Psychonomic Bulletin & Review, 27*(6), 1374–1382. https://doi.org/10.3758/s13423-020-01772-1

Gong, Z., Lee, S., Westland, S., Henry, P., & Queiroz, F. (2024). Effect of background colours in digital material on comprehension. *Journal of the International Colour Association, 37*, 36–47. https://doi.org/10.82019/JAIC.3703

Jadhao, A., Bagade, A., Taware, G., & Bhonde, M. (2020). Effect of background color perception on attention span and short-term memory in normal students. *National Journal of Physiology, Pharmacy and Pharmacology, 10*(11), 981–984. https://doi.org/10.5455/njppp.2020.10.06162202017072020

Jonauskaite, D., & Mohr, C. (2025). Do we feel colours? A systematic review of 128 years of psychological research linking colours and emotions. *Psychonomic Bulletin & Review, 32*(4), 1457–1486. https://doi.org/10.3758/s13423-024-02615-z

Lolong, J. R. V., Aparejado, A. S. S., Carino, S. Y. M., Valderama, M. L., & Atento, R. G. (2026). Dark triad personality traits and academic dishonesty-related tendencies among senior high school students: A correlational study. *International Journal of Behavioral and Social Analytics, 1*(1). https://doi.org/10.65166/2xe1ga71

Malabanan, M. G. A. (2026). A confirmatory factor analysis on the risk factors for mental health challenges among university students in Calabarzon: Basis for a dual continua wellness initiative (DCWI). *International Journal of Behavioral and Social Analytics, 1*(1). https://doi.org/10.65166/fvqyqy91

Manio, C. M. D., San Juan, F. M. Z., Atento, R. G., & Valderama, M. L. P. (2026). Desk organization and task efficiency: A within-subjects quasi-experiment on puzzle completion time among first-year civil engineering students. *International Journal of Behavioral and Social Analytics, 1*(1). https://doi.org/10.65166/vt40ef74

Maule, J., Skelton, A. E., & Franklin, A. (2023). The development of color perception and cognition. *Annual Review of Psychology, 74*, 87–111. https://doi.org/10.1146/annurev-psych-032720-040512

Quinto, L., Agang-Ang, G., Kim, Y., Eustaquio, J. C., De Vera, R. K., Crisologo, J., ... & Lavalle, D. K. (2025). Gender Differences in Nutrition, Lifestyle, and Distress Among Dormitory Medical Students: A Cross-Sectional Study. *International Journal of Health & Business Analytics, 1*(1). https://doi.org/10.65166/xngg1k50

Rao, L., Tian, Y., & Atento, R. G. O. (2025). Adoption and perceived effectiveness of AI in education: Personalization, outcomes, and equity. *International Journal of Health & Business Analytics, 1*(1). https://doi.org/10.65166/qgq89291

Rui, J. (2026). Perceived parenting style, self efficacy and self control among college students. *International Journal of Behavioral and Social Analytics, 1*(1). https://doi.org/10.65166/p696ww65

San Juan, F. M. Z., Elardo, C. J., Atento, R. G., & Valderama, M. L. P. (2026). Digital sleep diary self-monitoring and perceived sleep quality in civil engineering students: A pilot pretest-posttest controlled study. *International Journal of Behavioral and Social Analytics, 1*(1). https://doi.org/10.65166/cdq7k160

She, L., Wang, Z., Tao, X., & Lai, L. (2024). The impact of color cues on the learning performance in video lectures. *Behavioral Sciences, 14*(7), Article 560. https://doi.org/10.3390/bs14070560

Yan, H. (2026). Craftsmanship spirit, professional values, and learning motivation among Chinese higher vocational college students. *International Journal of Behavioral and Social Analytics, 1*(1). https://doi.org/10.65166/wvm4ge89