

The Hidden Language of Colors in Human Emotions

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Abstract

This study examined how secondary school students associate common colors with selected emotional meanings and determined whether color preference is significantly associated with self-reported emotional state. It was anchored in the Color-in-Context perspective and the affective dimensions of valence and arousal, recognizing that color meanings are shaped by hue, brightness, saturation, personal experience, cultural interpretation, and environmental context. A descriptive-correlational research design was employed among 100 Grade 7 to Grade 10 students from a secondary school located in Barangay 311, Zone 31, Santa Cruz, Manila. The sample comprised 50 male and 50 female respondents selected from a population of 450 through stratified random sampling with equal allocation. Data were collected using a researcher-developed questionnaire covering demographic characteristics, multiple-response color-emotion associations, primary color preference, and self-reported emotional state. Frequency, percentage, and the chi-square test of independence were used to analyze the data. Blue was most strongly associated with calmness at 82%, black with sadness at 79%, yellow with happiness at 78%, red with excitement at 75% and anger at 68%, green with calmness or relaxation at 74%, orange with excitement at 70%, gray with sadness or boredom at 67%, white with calmness or clarity at 65%, and purple with calmness or creativity at 62%. The chi-square test indicated a statistically significant association between color preference and self-reported emotional state, with $p = .021$. However, the available statistical output did not establish the strength of the association. The study concludes that colors function as a recognizable but flexible language of emotion whose meanings vary according to visual, personal, cultural, and contextual factors. The findings support SDG 3 on Good Health and Well-Being and SDG 4 on Quality Education by providing evidence that may guide context-sensitive visual design in educational environments.

Keywords: Color-Emotion Association, Color Preference, Color Psychology, Emotional State, Learning Environment, Student Well-Being

1. Introduction

Color is a fundamental feature of natural, built, artistic, and digital environments. It does more than distinguish objects or improve visual appeal; it can communicate affective meaning, attract attention, influence perceptions, and become associated with particular emotional experiences. Nevertheless, the psychological meaning of color is not determined by hue alone. Saturation, brightness, personal preference, cultural learning, environmental context, and previous experience may shape how a person interprets and responds to a color. Accordingly, color should not be treated as having one fixed or universal emotional meaning. This study examines the color-emotion associations of secondary school students, their perceptions of the emotional meanings of commonly encountered colors, and the relationship between their color preferences and self-reported emotional states. The inquiry is relevant to psychology, education, environmental design, visual communication, and student well-being. By focusing on Grade 7 to Grade 10 students from a secondary school located in Barangay 311, Zone 31, Santa Cruz, Manila, the study seeks to provide contextual evidence that may guide the responsible use of color in classrooms, learning materials, digital resources, artistic products, and other environments regularly experienced by young people.

Colors are continuously encountered in nature, clothing, school facilities, printed materials, digital interfaces, advertisements, art, and interior spaces. Through repeated exposure, individuals may develop emotional and symbolic associations with particular colors. These associations can influence whether a color is perceived as pleasant, calming, stimulating, threatening, serious, cheerful, or emotionally neutral. Color psychology therefore examines the psychological meanings and responses associated with color perception, including possible relationships with emotion, attention, judgment, preference, and behavior. Scientific research indicates that color is multidimensional. Hue refers to the identifiable color category, such as red, blue, or yellow; saturation describes the purity or intensity of a color; and brightness

or lightness concerns how light or dark the color appears. Wilms and Oberfeld (2018) demonstrated that these dimensions interact in shaping emotional responses. In their experiment, saturated and bright colors were generally associated with higher arousal, while arousal increased from blue and green toward red. Their findings indicate that emotional responses cannot be explained accurately by broad color labels alone. A pale red, for example, may not produce the same perception or response as a vivid or dark red. This distinction is important because many popular explanations of color psychology assign one emotion to one color. Red is frequently described as exciting or aggressive, blue as calm, yellow as joyful, green as peaceful, and black as sad. Although these associations may occur frequently, contemporary evidence suggests that they are better understood as tendencies rather than fixed psychological rules. One color may be associated with several emotions, and one emotion may be represented by several colors. The emotional meaning of color may also depend on whether the color appears in clothing, a classroom wall, an examination paper, a digital application, a cultural symbol, or another context. The present study focuses on the basic emotions of happiness, sadness, calmness, anger, and excitement and on the commonly encountered colors red, blue, yellow, green, orange, purple, black, white, and gray. It investigates three related but conceptually different constructs. The first is color–emotion association, or the emotional meaning that students assign to a color. The second is color preference, or the degree to which a student likes or chooses a color. The third is emotional state, or the feeling reported by the student at a particular time. A student may associate black with sadness without feeling sad, and a student may prefer red without being angry or highly aroused. Distinguishing these constructs makes the study more conceptually accurate and prevents the assumption that recognizing an emotional meaning automatically means experiencing that emotion.

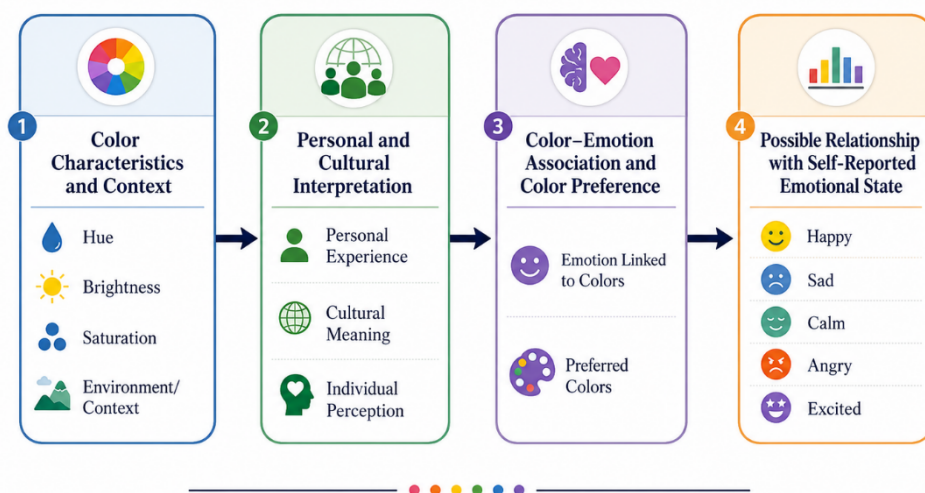
A major theme in the literature is the recurrence of color–emotion correspondences. Jonauskaite and Mohr (2025) reviewed 132 studies involving 42,266 participants from 64 countries and found systematic links between colors and affective dimensions such as valence, arousal, and power. Light colors were generally associated with positive emotions, while dark colors were linked to negative emotions. Red was connected with both positive and negative high-arousal emotions; yellow and orange with positive and energetic emotions; blue, green, blue-green, and white with positive and lower-arousal emotions; gray with negative and low-arousal emotions; and black with negative and powerful emotions. However, these relationships were many-to-many rather than fixed. A single color may communicate several emotions depending on context, so students' dominant associations should not be interpreted as the only possible meanings. Brightness and saturation also influence emotional responses. Wilms and Oberfeld (2018) found that bright and saturated colors were generally associated with greater arousal and more positive valence than darker or muted colors. This suggests that researchers should consider the exact shade, brightness, and saturation of a color rather than relying only on labels such as “red” or “blue.” Students may imagine different shades when responding, which may partly explain variations in their color–emotion associations. Standardized color samples and similar lighting conditions may therefore improve measurement consistency. Color is also relevant to learning environments. Al-Ayash et al. (2016) found that classroom color conditions were associated with emotional responses, heart rate, and reading performance, with blue producing greater relaxation and calmness and red and yellow increasing heart rate. In multimedia learning, Liew et al. (2022) reported that warm, cool, and grayscale tones were associated with different emotional and cognitive patterns, which also varied according to learner gender. These findings indicate that color may interact with individual and situational factors rather than producing the same response among all learners. Age, development, and culture may further shape color preference and emotional meaning. Baniani (2022) showed that color–emotion relationships may change according to age, schooling, social experience, and cultural exposure. Bower et al. (2022) also found that environmental color was associated with changes in self-reported, autonomic, and brain responses, demonstrating that color may be examined through both subjective and physiological indicators. Moreover, Jonauskaite et al. (2020) identified broad similarities in color–emotion associations across 30 countries, alongside meaningful national, linguistic, and geographic differences. Student responses should therefore be interpreted within their educational, cultural, and social contexts rather than treated as universal laws.

Finally, recent scholarship distinguishes associating a color with an emotion from having an emotion caused by a color. Jonauskaite and Mohr (2025) observed that much of the literature measures abstract correspondences by asking people which emotions they connect with particular colors. Such findings show that colors can communicate emotional meaning, but they do not necessarily prove that seeing the color directly produces the associated emotion. This distinction is essential for the present descriptive-correlational study. The study can determine which emotions students associate with colors and whether color preference is statistically related to self-reported emotional state. It cannot establish that a particular color caused a student to become happy, calm, sad, angry, or excited. Causal conclusions would require an experimental design in which participants are exposed to standardized color conditions and alternative explanations are controlled.

At the global level, color–emotion research shows that people from different countries often share broad association patterns while retaining culturally specific interpretations. The cross-national evidence reported by Jonauskaite et al. (2020) demonstrates that neither complete universality nor complete cultural relativity adequately explains color–emotion relationships. Instead, color meanings appear to arise from an interaction among perceptual properties, shared human experiences, language, culture, and geographic environment. At the national level, findings from other countries cannot be transferred automatically to all school populations. Educational systems differ in classroom design, school uniforms, visual

materials, language, cultural symbolism, technological access, and student experience. A nationally relevant body of evidence therefore requires studies conducted among students in actual school contexts. The present research may serve as preliminary evidence for broader investigations involving multiple public and private schools, different regions, and culturally diverse student populations. At the local level, the study involved 100 Grade 7 to Grade 10 students from a secondary school located in Barangay 311, Zone 31, Santa Cruz, Manila. This context allowed the researchers to examine how students within a specific educational community interpret the emotional meanings of common colors. The findings may assist educators and designers in evaluating the use of color in classrooms, instructional materials, posters, presentations, activity sheets, school campaigns, and digital learning resources. However, the results remain specific to the participating respondents and should not be generalized automatically to all secondary school students. The local contribution of the research lies in producing evidence from the students themselves. Decisions regarding classroom color and educational design are sometimes based on tradition, personal preference, or generalized claims about color psychology. By documenting student perceptions systematically, the study can help shift these decisions toward a more evidence-informed and context-sensitive approach. The study is anchored primarily in the Color-in-Context perspective. Elliot and Maier (2014) explain that color may acquire psychological meaning through biological predispositions, repeated learning, and situational context. Once a color has developed meaning within a particular context, its perception may influence affect, cognition, or behavior. A color therefore cannot be interpreted independently of the situation in which it appears. Red in an achievement situation, for example, may carry a different meaning from red in a romantic, artistic, cultural, or celebratory situation. The original framework also draws from Kaya and Epps (2004), who reported that light and bright colors were frequently connected with positive emotions, while darker or muted colors were more frequently linked with negative responses. This proposition remains relevant, although more recent research demonstrates that hue, saturation, and brightness interact and should be examined separately whenever possible. In addition, Wright (1998) proposed four psychological primary colors: red as related to physical stimulation, blue to the mind and calmness, yellow to emotion and optimism, and green to balance and harmony. This framework offers a simplified interpretation of commonly discussed color meanings. However, it should be used cautiously because contemporary evidence does not support treating these meanings as fixed or context-free. The study may also be understood through the affective dimensions of valence and arousal. Valence refers to whether an emotional experience is positive, negative, or neutral. Arousal refers to the degree of activation, energy, or intensity associated with that experience. Happiness and calmness can both have positive valence, but happiness may involve moderate or high arousal, whereas calmness generally involves low arousal. Anger and sadness both have negative valence, but anger is typically higher in arousal than sadness. Wilms and Oberfeld (2018) showed that color dimensions can relate differently to these affective components, reinforcing the importance of assessing more than a single broad emotional category.

Conceptually, the study proposes that students encounter colors with specific physical characteristics, including hue, saturation, and brightness. These characteristics are interpreted through personal experiences, preferences, cultural meanings, and environmental contexts, producing color–emotion associations. Al-Rasheed et al. (2022) explained that color preferences may develop from the positive or negative meanings attached to objects and experiences associated with particular colors. Thus, color preference may be related to a student’s emotional state, but it should not be treated as its direct cause.



This framework recognizes that emotional meaning is formed through an interaction between the visual stimulus and the individual interpreting it.

Figure 1. Conceptual Framework of Color–Emotion Associations, Color Preferences, and Self-Reported Emotional States. Several gaps justify the study. Much of the existing research has focused on adults, university students, or laboratory participants, while evidence involving secondary school learners remains limited. Silvers (2022) identified adolescence as

an important stage in the development of emotional awareness and regulation, making it necessary to examine color–emotion relationships among younger populations. Color meanings may also vary across cultures, languages, and environments. Findings from one population should therefore not be assumed to apply universally. In addition, color–emotion relationships are complex rather than fixed. Fugate and Franco (2019) found that emotions may be associated with several colors and that these pairings vary according to the emotion and color characteristics. The present study therefore identifies dominant associations without claiming that they are exclusive or universal. Since color–emotion relationships may involve several overlapping meanings, the study allowed respondents to identify more than one emotional association for each color. This approach acknowledges that a color may represent several emotions and that one emotion may be associated with several colors. However, the instrument measured the presence of associations rather than their strength. Future studies may use rating scales to determine how strongly respondents associate each color with each emotional meaning. Finally, the study has practical value because schools regularly select colors for classrooms, instructional materials, digital presentations, and student spaces. Without local evidence, these decisions may depend mainly on aesthetic preference or generalized assumptions. The findings may provide baseline information for future experimental and multisite studies on color use in educational environments.

The study aligns primarily with Sustainable Development Goal 3: Good Health and Well-Being and Sustainable Development Goal 4: Quality Education. Its contribution to SDG 3 lies in examining students’ emotional responses and the psychological qualities of school environments, while its relevance to SDG 4 is reflected in the potential use of the findings to support student-centered classroom design and educational communication. The study does not treat color as a psychological intervention or a substitute for effective teaching, accessible materials, appropriate lighting, and supportive relationships. Instead, it provides preliminary evidence that may guide more thoughtful use of color in learning spaces and resources. The study also contributes to educational, psychosocial, digital, cultural, and institutional sustainability. Evidence-informed color choices may help schools create visually appropriate and responsive classrooms, presentations, websites, modules, and learning-management systems. By recognizing that color meanings are influenced by personal and cultural contexts, the study promotes the careful use of color rather than fixed or universal assumptions. Its findings may support school planning, learning-material development, student-wellness initiatives, and future research, provided that any application is tested and adapted to the needs of specific learners and environments.

This study aims to determine how secondary school students associate common colors with selected emotional and psychological meanings and to examine whether their primary color preferences are significantly associated with their self-reported emotional states. Specifically, it seeks to identify the dominant associations of red, blue, yellow, green, orange, purple, black, white, and gray with happiness, sadness, calmness, anger, excitement, relaxation, creativity, boredom, and clarity; describe students’ perceptions of these color–emotion relationships; determine their primary color preferences and self-reported states of calmness, stress, energy, and excitement; and assess whether a significant association exists between color preference and emotional state. The study also intends to provide baseline information for classroom design, learning-material development, visual communication, and future research on color psychology. In line with these objectives, the study investigates which colors are most commonly associated with happiness, sadness, calmness, anger, and excitement; how students perceive and interpret the emotional meanings of different colors; what their dominant color preferences and self-reported emotional states are; and whether color preference is significantly related to emotional state.

2. Material and methods

2.1 Research Design

The study employed a descriptive-correlational research design. The descriptive component was used to identify the colors commonly associated with selected emotions and to describe the respondents’ color preferences and self-reported emotional states. The correlational component examined whether a statistically significant association existed between color preference and emotional state. Since no variables were manipulated and the respondents were not exposed to controlled experimental conditions, the findings were interpreted as associations rather than causal effects.

2.2 Locale of the Study

The study was conducted in Barangay 311, Zone 31, Santa Cruz, Manila, Philippines. The area provided access to the target adolescent population and served as an appropriate setting for examining the color–emotion associations, color preferences, and self-reported emotional states of Grade 7 to Grade 10 students.

2.3 Respondents of the Study

The respondents consisted of 100 students from Grades 7 to 10. The sample included 50 male and 50 female students drawn from a target population of 450 eligible learners. Twenty-five respondents were included from each grade level to ensure equal representation. Grade 7 consisted of 13 male and 12 female respondents; Grade 8 included 12 male and 13 female respondents; Grade 9 comprised 13 male and 12 female respondents; and Grade 10 consisted of 12 male and 13 female

respondents. Only eligible students who voluntarily agreed to participate, provided assent, and obtained parental or guardian consent were included in the study.

2.4 Sample and Sampling Procedure

Stratified random sampling with equal allocation was employed to select 100 respondents from the population of 450 Grade 7 to Grade 10 students. The population was grouped according to grade level and sex to ensure balanced representation. Twenty-five students were randomly selected from each grade level. The slight variation in the number of male and female respondents within each grade level was necessary because 25 could not be divided equally into whole numbers. Nevertheless, the overall sample remained balanced, with 50 male and 50 female respondents. The final sample represented approximately 22.22% of the eligible population.

2.5 Research Instrument

A researcher-developed structured questionnaire was used as the primary data-gathering instrument. The first section collected the respondents' demographic characteristics, particularly grade level and sex. The second section presented the colors red, blue, yellow, green, orange, purple, black, white, and gray and allowed respondents to identify one or more emotional meanings associated with each color. The emotional categories included happiness, sadness, calmness, anger, excitement, relaxation, creativity, boredom, and clarity. Since multiple responses were permitted, the frequencies and percentages for each color–emotion association were calculated independently and were not expected to total 100%. The third section required respondents to identify their primary preferred color. The fourth section asked them to select the self-reported emotional state that best described them at the time of data collection from the categories of calmness, stress, energy, and excitement. These mutually exclusive categories were used in examining the association between color preference and emotional state. The questionnaire was administered under similar classroom conditions to promote consistency in its presentation and completion.

2.6 Data Gathering Procedure

Before data collection, the researchers secured permission from the participating school administration and relevant local authorities. The purpose, procedures, voluntary nature, confidentiality measures, and intended use of the study were explained to the prospective respondents and their parents or guardians. Written parental or guardian consent and student assent were obtained before participation. The questionnaires were administered to the selected respondents under similar conditions. Completed questionnaires were collected, checked for completeness, coded without personally identifying information, organized, and tabulated for statistical analysis.

2.7 Data Analysis Techniques

Frequency and percentage distributions were used to summarize the respondents' demographic characteristics, color–emotion associations, primary color preferences, and self-reported emotional states. Since respondents could identify more than one emotional meaning for each color, the percentages for color–emotion associations were calculated independently based on the total number of respondents. The chi-square test of independence was used to determine whether a statistically significant association existed between primary color preference and predominant self-reported emotional state. Statistical significance was evaluated at the .05 level.

2.8 Ethical Considerations

The study complied with the ethical requirements of the participating institution and relevant local authorities. Participation was voluntary and written parental or guardian consent and student assent were obtained because the respondents were minors. Participants were informed that they could decline or withdraw without penalty. Confidentiality was maintained through coded questionnaires, the exclusion of personally identifying information, and secure handling of the collected data. The study involved only survey-based assessment of perceptions, preferences, and self-reported emotional states and did not include clinical diagnosis, psychological intervention, or experimental manipulation.

3. Results and Discussion

3.1 Profile of the Respondents

The study involved 100 Grade 7 to Grade 10 students from Barangay 311, Zone 31, Santa Cruz, Manila, consisting of 50 male and 50 female respondents. Each grade level was represented by 25 students or 25% of the total sample. Grade 7 consisted of 13 male and 12 female respondents, Grade 8 included 12 male and 13 female respondents, Grade 9 comprised 13 male and 12 female respondents, and Grade 10 consisted of 12 male and 13 female respondents. This distribution ensured balanced representation across grade level and sex. The demographic characteristics were used only to describe the sample and were not interpreted as determinants of color preference or emotional state because no additional statistical analysis was conducted to establish such relationships.

3.2 Color–Emotion Associations

The respondents demonstrated recurring but overlapping associations between colors and emotions. Since they were allowed to identify more than one emotional meaning for each color, the reported percentages represented independent responses and were not expected to total 100%. The findings were interpreted as dominant and overlapping associations rather than mutually exclusive emotional categories.

Table 1. Color–Emotion Associations among the Respondents

Color	Most Commonly Associated Emotion	Frequency	Percentage
Blue	Calmness	82	82%
Yellow	Happiness	78	78%
Red	Excitement	75	75%
Red	Anger	68	68%
Green	Calmness/Relaxation	74	74%
Orange	Excitement	70	70%
Purple	Calmness/Creativity	62	62%
Black	Sadness	79	79%
Gray	Sadness/Boredom	67	67%
White	Calmness/Clarity	65	65%

Table 1 demonstrated cool colors, particularly blue and green, were strongly associated with calmness and relaxation. Warm colors such as red and orange were linked with excitement and other high-arousal emotions, while darker colors such as black and gray were predominantly associated with sadness and boredom. Because respondents could identify more than one emotional meaning for a color, the percentages represent independent responses and were not expected to total 100%.

The results show that blue had the highest reported association, with 82% of the respondents linking it to calmness. Black followed at 79% for sadness, while yellow was associated with happiness by 78% of the respondents. Red showed overlapping high-arousal meanings, as 75% connected it with excitement and 68% with anger. Green was associated with calmness or relaxation by 74%, orange with excitement by 70%, gray with sadness or boredom by 67%, white with calmness or clarity by 65%, and purple with calmness or creativity by 62%. Overall, cool colors such as blue and green were primarily connected with calm and low-arousal meanings, warm colors such as red, yellow, and orange were associated with happiness, excitement, and anger, while dark achromatic colors such as black and gray were linked with sadness and boredom. These patterns are consistent with contemporary color–emotion research. Jonauskaitė and Mohr (2025) found that blue and green are commonly associated with positive, low-arousal emotions, whereas yellow and orange are frequently connected with positive and energetic emotions. They also reported that red may represent both positive and negative high-arousal states and that black and gray are often associated with negative emotions. Wilms and Oberfeld (2018) further demonstrated that emotional responses to color are influenced not only by hue but also by brightness and saturation. Thus, the students’ responses may have been shaped by the visual properties of the colors as well as by their personal, cultural, and contextual interpretations. The findings should therefore be understood as dominant associations within the sample rather than fixed or universal emotional meanings.

3.2.1 Associations of Cool Colors with Calmness

Blue obtained the highest association with calmness, as identified by 82% of the respondents. Green was also strongly associated with calmness or relaxation by 74%, while 62% linked purple with calmness or creativity. These findings indicate that the respondents predominantly connected cool colors with emotionally stable, relaxing, creative, and relatively low-arousal experiences. The findings are consistent with the broader literature showing that blue and green commonly correspond with positive, low-arousal emotions such as calmness, comfort, relaxation, and contentment. Jonauskaitė and Mohr (2025) found that blue, green, blue-green, and white were generally associated with positive and low-arousal emotional meanings across a large body of color–emotion research. Similarly, Wilms and Oberfeld (2018) observed that emotional arousal generally increased from blue and green toward red, supporting the interpretation of blue and green as comparatively less stimulating colors. The strong association between blue and calmness is also supported by Al-Ayash et al. (2016), who found that blue classroom conditions produced stronger feelings of relaxation and calmness than the other colors examined. However, the present result should not be interpreted to mean that blue universally creates calmness because its psychological meaning may change according to shade, brightness, saturation, placement, and environmental context. Green’s association with calmness and relaxation may also relate to its repeated presence in natural environments and its symbolic connection with balance, restoration, and health. Nevertheless, the findings only describe the students’ interpretations and do not establish that exposure to green directly reduced stress. Experimental evidence indicates that environmental color may influence physiological and neurological indicators related to emotional processing, but these responses depend on controlled conditions not included in the present survey (Bower et al., 2022). Purple received a lower percentage than blue and green but remained associated with calmness and creativity by most respondents. Jonauskaitė and

Mohr (2025) noted that purple may correspond with relaxation, pride, love, fear, and power, demonstrating that it cannot be classified as exclusively calming, stimulating, positive, or negative. The present finding therefore represents the dominant interpretation of the participating students rather than the complete emotional meaning of purple.

3.2.2 Associations of Warm Colors with Happiness, Excitement, and Anger

Yellow was associated with happiness by 78% of the respondents, making it the color most strongly connected with a positive emotion. Red was linked with excitement by 75% and anger by 68%, while orange was associated with excitement by 70%. These findings show that warm colors were generally interpreted as energetic and emotionally stimulating. Red displayed the clearest ambivalent pattern because it was associated with both excitement and anger. The strong association between yellow and happiness agrees with Jonauskaite and Mohr (2025), who found that yellow and orange were consistently related to positive and high-arousal emotions such as happiness, joy, pleasure, fun, excitement, and surprise. The students' association of yellow with happiness therefore reflects a pattern documented across different populations and research methods. Orange was similarly interpreted as lively, energetic, and exciting. Although yellow and orange were both positively evaluated, their connection with excitement indicates that positive emotions should be differentiated according to arousal. Happiness, excitement, and relaxation may all have positive valence, but they differ in emotional intensity. Yellow and orange may therefore be understood as positive, high-arousal colors, while blue and green are more commonly associated with positive, low-arousal experiences. Red demonstrated emotional complexity because it was associated with both excitement and anger. Wilms and Oberfeld (2018) found that red was related to greater arousal than blue and green, while Jonauskaite and Mohr (2025) concluded that red commonly corresponds with highly arousing positive and negative emotions, including excitement, passion, love, anger, rage, and hostility. Red should therefore not be interpreted as inherently positive or negative; rather, it appears to communicate intensity and activation, with its specific meaning shaped by context. The dual interpretation of red may also reflect learned cultural and situational meanings. Red can signify warning, danger, anger, celebration, love, status, or success depending on how it is presented. Kawai et al. (2023) found similarities and differences in implicit color-valence associations across cultures, indicating that red does not carry an identical emotional meaning in every population. The respondents' interpretations may therefore have been influenced by personal experience, media exposure, school materials, local practices, and cultural symbolism.

3.2.3 Associations of Achromatic and Dark Colors with Sadness, Boredom, and Clarity

Black was associated with sadness by 79% of the respondents, while gray was linked with sadness or boredom by 67%. In contrast, white was associated with calmness or clarity by 65% of the students. These results show a marked difference between darker achromatic colors and white. Black and gray were predominantly interpreted negatively, whereas white was viewed as emotionally lighter, calmer, and clearer. The association of black with sadness is supported by Jonauskaite and Mohr (2025), who found that black commonly corresponded with negative and powerful emotions, including sadness, fear, anger, hatred, and evil. Their review identified black-sadness as one of the most frequently observed color-emotion correspondences. The present finding therefore reflects a widely documented association rather than an isolated perception among the respondents. Gray was similarly connected with negative but relatively low-arousal emotional meanings. Jonauskaite and Mohr (2025) reported that gray was frequently associated with sadness, disappointment, tiredness, boredom, regret, and fear. Unlike black, which may communicate stronger negative meanings, gray tends to convey emotional dullness, reduced energy, and low stimulation. This distinction helps explain why respondents associated gray with both sadness and boredom. White produced a contrasting pattern because most respondents connected it with calmness and clarity. Existing research generally associates white with positive, low-arousal emotions such as relaxation, relief, hope, and happiness. Its connection with clarity may also reflect meanings related to cleanliness, simplicity, openness, and order. However, white is not universally positive because it may signify mourning, emptiness, or loss in some cultural contexts. The differences among black, gray, and white emphasize the importance of lightness in emotional interpretation. Since these colors are achromatic, their emotional meanings cannot be explained by hue alone. Instead, their associations appear to be influenced by how light, dark, clear, or muted they are.

3.3 Overall Patterns in Students' Perceptions of Color

The overall pattern showed that yellow had the strongest association with positive emotions, followed by orange, green, blue, and white. Black had the strongest association with negative emotions, followed by gray, dark red, and dark purple, while light blue and light green were regarded as comparatively neutral colors.

Table 2. General Patterns of Color-Emotion Associations

General Pattern	Color-Emotion Results	Interpretation
Calm or low-arousal associations	Blue-calmness, 82%; Green-calmness/relaxation, 74%; White-	Cool and light colors were generally associated with

	calmness/clarity, 65%; Purple–calmness/creativity, 62%	calm, balanced, or reflective meanings.
Positive or energetic associations	Yellow–happiness, 78%; Orange–excitement, 70%	Warm and bright colors were associated with happiness, enthusiasm, and energy.
Mixed high-arousal associations	Red–excitement, 75%; Red–anger, 68%	Red carried both positive and negative high-arousal meanings.
Negative or low-energy associations	Black–sadness, 79%; Gray–sadness/boredom, 67%	Dark and muted colors were associated with sadness, boredom, and reduced emotional energy.

The findings reveal four general patterns in the students' perceptions. Blue, green, white, and purple were associated mainly with calm, low-arousal, or reflective meanings. Yellow and orange were connected with positive and energetic emotions, while red showed mixed high-arousal associations involving both excitement and anger. Black and gray were linked with negative or low-energy meanings such as sadness and boredom. These patterns are consistent with Jonauskaitė and Mohr (2025), who found that lighter colors are commonly associated with positive emotions, darker colors with negative emotions, and red with both positive and negative high-arousal meanings. Wilms and Oberfeld (2018) similarly demonstrated that emotional interpretation depends not only on hue but also on brightness and saturation. The findings should therefore be understood as dominant patterns within the participating group rather than fixed psychological meanings. Cultural experience, personal memory, school practices, media exposure, and environmental context may also influence how students interpret colors (Jonauskaitė et al., 2020).

3.4 Relationship Between Color Preference and Self-Reported Emotional State

The chi-square test produced a probability value of .021, which was below the .05 significance level. The null hypothesis was therefore rejected, indicating a statistically significant association between color preference and self-reported emotional state.

Table 3. Association Between Color Preference and Self-Reported Emotional State

Statistical Indicator	Result
Statistical test	Chi-square test of independence
Probability value	$p = .021$
Level of significance	$\alpha = .05$
Statistical decision	Reject the null hypothesis
Interpretation	A statistically significant association existed between primary color preference and self-reported emotional state.

The chi-square test produced a probability value of $p = .021$, which was below the .05 level of significance. The null hypothesis was therefore rejected, indicating a statistically significant association between primary color preference and self-reported emotional state. This result suggests that the two variables were not statistically independent within the participating sample. Baniani (2022) similarly found that children and young people connect color preferences with emotional meanings and that such relationships may vary across educational and developmental levels. Nevertheless, color preference should not be interpreted as a direct indicator of psychological condition. Preferences may be influenced by personal experience, identity, fashion, peer groups, cultural meanings, school practices, and media exposure. Although the relationship was statistically significant, its strength could not be determined because the complete chi-square statistic, degrees of freedom, expected cell frequencies, and effect-size measure were unavailable. The result should therefore be interpreted only as evidence of association and not as proof that color preference caused the respondents' emotional states. This cautious interpretation is consistent with Liew et al. (2022), who found that the emotional effects of color may vary according to learner characteristics, instructional tasks, media, and environmental context.

3.5 Educational and Environmental Implications

The findings provide preliminary evidence that color may contribute to the emotional character of school environments and educational materials. The strong associations of blue and green with calmness and relaxation suggest that moderate use of cool colors may be appropriate in spaces intended for reading, focused work, reflection, or rest. Yellow and orange may be used as accent colors to communicate happiness, energy, and enthusiasm, while red may be applied selectively for emphasis or warning because excessive use may become visually demanding or highly stimulating. These implications are supported by Al-Ayash et al. (2016), who found that classroom color conditions were associated with students' emotional responses, heart rate, and aspects of performance. Cha et al. (2020) likewise reported relationships between interior color

schemes, emotion, task performance, and heart-rate changes in immersive virtual environments. Llinares et al. (2021) further showed that classroom wall colors influenced students' arousal, attention, and memory under virtual learning conditions. Llorens-Gómez et al. (2022) emphasized that the physical and visual characteristics of learning spaces may affect attention and memory, although color should be considered together with lighting, ventilation, noise, spatial arrangement, and other environmental features. The results may also inform the development of presentations, electronic modules, learning-management systems, posters, classroom displays, and school communication materials. Shangguan et al. (2020) found that visually attractive and interactive emotional designs supported positive emotions among middle school students, although their effects on motivation and learning were not always consistent. Wang et al. (2021) similarly reported that colorful emotional design could support retention, transfer, and appreciation under certain learning conditions. Color should therefore be selected according to the instructional purpose, learner characteristics, and visual context rather than generalized assumptions about its emotional meaning. Effective design requires balance, contrast, readability, accessibility, consistency, and appropriate intensity. Schools should not treat color as a substitute for effective teaching, counseling, mental-health support, appropriate facilities, and positive relationships. The findings are best used as contextual guidance rather than fixed design prescriptions.

3.6 Synthesis of Findings and Research Implications

Overall, the study identified clear but overlapping patterns in students' color–emotion associations. Blue and green were predominantly linked with calmness and relaxation; yellow and orange with happiness and excitement; red with excitement and anger; black and gray with sadness and boredom; and white with calmness and clarity. Because respondents were allowed to identify more than one emotional meaning for each color, these findings represent dominant and overlapping associations rather than mutually exclusive categories. Stress, calmness, energy, and excitement were assessed as self-reported emotional states, while creativity, boredom, and clarity were treated as subjective meanings associated with particular colors. None of these responses was interpreted as a clinical or diagnostic indicator. The findings support the view that emotional meanings arise through an interaction between the visual characteristics of color and the individual interpreting it. Hue, brightness, saturation, personal experience, cultural learning, environmental context, and preference may jointly influence how students understand and respond to colors. Color meanings should therefore not be treated as permanent or universally applicable. The statistically significant association between color preference and self-reported emotional state provides a basis for further investigation, but it does not establish causation. Wong and Adesope (2021) found that emotional design generally supported affective, motivational, and learning outcomes, although its effects varied according to learners, design elements, and instructional conditions. Mutlu-Bayraktar (2024) similarly reported generally positive effects on emotion and motivation but inconsistent effects on learning. These findings reinforce the need to avoid assuming that color alone determines emotional or academic outcomes. Future studies should report the complete chi-square statistic, degrees of freedom, expected cell frequencies, and effect size; use standardized color samples; distinguish color preference from color–emotion association; and employ validated measures of emotional state. Larger multisite samples, cross-cultural comparisons, qualitative interviews, and controlled experiments may further determine whether the observed patterns remain consistent across populations and whether exposure to particular colors produces measurable changes in emotions, attention, memory, or learning.

4. Conclusion & Recommendations

The study concludes that colors function as a recognizable yet flexible language of emotion among secondary school students. Blue was most commonly associated with calmness, black with sadness, yellow with happiness, red with excitement and anger, green with calmness or relaxation, orange with excitement, gray with sadness or boredom, white with calmness or clarity, and purple with calmness or creativity. These overlapping patterns indicate that color meanings are influenced by hue, brightness, saturation, personal experience, culture, and environmental context. A statistically significant association was found between primary color preference and self-reported emotional state; however, the available statistical results did not establish the strength of that association. The findings therefore describe relationships within the participating group and do not demonstrate that particular colors directly cause specific emotional states.

Schools and educational designers may consider the balanced and moderate use of cool colors in spaces intended for focused work or reflection and the selective use of warm colors as accents for energy, emphasis, and visual engagement. Color choices should also consider contrast, readability, accessibility, lighting, instructional purpose, and learner characteristics. Color should not be treated as a substitute for effective teaching, counseling, appropriate facilities, or supportive relationships. Future researchers should use standardized color samples, validated measures of emotional state, complete chi-square reporting, effect-size measures, larger samples, and multisite or experimental designs to clarify the relationship between color preference, emotional interpretation, and actual emotional experience.

The study was limited to 100 Grade 7 to Grade 10 students from a secondary school located in Barangay 311, Zone 31, Santa Cruz, Manila. It examined nine colors—red, blue, yellow, green, orange, purple, black, white, and gray—and selected emotional meanings involving happiness, sadness, calmness, anger, excitement, relaxation, creativity, boredom, and clarity. Self-reported emotional states included calmness, stress, energy, and excitement. The study relied on self-reported

responses and did not include clinical assessment, diagnosed psychological conditions, rare colors, complex emotional disorders, or controlled experimental exposure. Since it employed a descriptive-correlational design and involved one educational setting, the findings cannot establish causation or be generalized automatically to all secondary school students.

Compliance with ethical standards

The study complied with applicable institutional and local ethical requirements. Written parental or guardian consent and student assent were obtained because the respondents were minors, and participation was voluntary. Confidentiality was maintained through coded questionnaires, secure data handling, and the exclusion of personally identifying information. The authors declare no conflict of interest, acknowledge the cooperation of the participating authorities and respondents, and accept responsibility for the accuracy, originality, and integrity of the research. Copyright and licensing arrangements shall follow the journal's publication policy.

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