



Relationship between Interior Colour Schemes and Users' Emotional Responses in Educational Spaces

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ABSTRACT

Interior colour is considered to be a significant part of the educational environments that can affect the emotions of users, psychology of their comfort, and perception of learning spaces. The aim of the study is to evaluate quantitatively the effects of the colour conditions on the emotions of people in educational spaces. The research will focus on classrooms, studios, and other teaching rooms. The study will explore how warm and cool colour schemes, colour saturation, brightness of the colour, colour harmony, etc. are related to different emotional states of people like peacefulness and joy, comfort and being alert, stress, stimulation, etc. The research is going to use a quantitative cross-sectional research design and will involve approximately 100 students as respondents. Descriptive statistics will be used to analyze the data. The study will also employ the reliability analysis based on Cronbach's alpha as well as Pearson's correlation analysis. The results can be useful to architects, designers of interiors, educators, and planners of institutions in making colour choices based on evidence, thereby creating psychologically favorable and pleasant learning spaces.

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Introduction

The indoor environment is of great importance to the experiences of human beings, as people always encounter different spatial characteristics and factors like colours, lighting, materials, furniture, interior layouts, and visual compositions. Among various spatial parameters, colour is the most important since it is responsible not only for the aesthetic nature of the indoors, but the user perceptions of the space as well. In general, colours bring about various feelings of space, for example, heat, volume, and attractiveness, which is why colour is important for evidence-based interior design. Researches devoted to the indoor environment demonstrate that changes in colours allow influencing the people's mood, taste in interior design, and perception of space (Yildirim et al., 2011).

The role of colour psychology becomes a crucial subject when considering educational environments, where learners spend a lot of their time learning, studying and working in classrooms, studios, laboratories, libraries, and other places. The physical environment might have an impact on the overall learning and may define the level of students' comfort, emotional condition, as

well as concentration and understanding of their surroundings. Therefore, one should not see choosing the colour scheme as a solely aesthetic decision. It is more of an architectural variable with psychological consequences and behavioral effects. The perception of colour is complex and multi-dimensional influenced by such factors as hue, saturation, lightness, contrast, and colour combinations in the interior space. The different colour schemes evoke different psychological responses. Experimental studies conducted by Yildirim et al. (2011) revealed that observers exhibit differences in mood and preferences when exposed to a warm, cool, and achromatic colour scheme. Thus, warm colours receive higher scores on measures of arousal, excitement, and stimulation while cool colours are associated with perceptions of peace and spaciousness.

Recent research has provided additional evidence of a correlation between interior colour and emotional experiencing. In their investigation, Cha et al. (2020) used an immersive virtual environment to study red, green, blue, and white interior settings and found that the colour condition changed not only the emotional experiencing of participants but also their task performance. The study shows that the colour schemes used in interiors can affect the way people perceive the space. This fact is important for the designers because it allows for perceiving colour as an environmental factor instead of merely a decorative feature. Uluçay (2019) also explored the relation between colour and emotional experiencing among university students. The work focused on the choices of students in the field of interiors and their emotions in line with the colour choice. The research revealed significant correlations between spatial colour choices and emotions and demonstrated the relevance of knowledge of perceptions of users. Connected research conducted in a university residence showed relationships between the colour in interior space, the mood of students, suitability for studies, orientation in space, and colour choices, although it also indicated the difference in responses from student to student (Costa et al., 2018).

Color may have significant meaning in different educational settings as the main users are required to take part in activities that demand concentration, attention, creativity, and interaction. The right color choice may help to construct a learning place that students think about as being comfortable, stimulating, relaxing, or interesting based on the purpose of the environment. On the other hand, poor usage of colors or excess of visual elements may lead to negative feelings of discomfort and distraction. Recent studies reveal that there is a strong link between classroom color environments and students' emotional response to them. That is to say, when investigating educational spaces at colleges and universities, researchers have been able to show that there is a correlation between colors and emotions of students. According to the results of the research conducted with college students in classrooms, it was concluded that different colors give different emotional responses. Nevertheless, it is important to view the reactions towards colour in a way that does not rely on simplistic conclusions where a certain colour evokes a particular emotion. Reactions to colour in interior settings will differ due to some characteristics of the colour itself such as its luminance and saturation, the way colours are mixed in spatial context, light conditions present, personal preferences, characteristics of a person, and the activities carried out in that environment. Therefore, it is vital to use experimental studies in a specific environment before interpreting the general theories of colour into practical designs.

Literature Review

The use of colour is one of the most influential elements of an intuitive design style in the interior, and effective use of colour affects the way people perceive the space around them. In other words, colour contributes to more than just beautification; it influences people's perceptions of visual characteristics (e.g. visual comfort) as well as emotional response to the surrounding environment. Given these effects of colour, it comes as no surprise that its psychological effects have attracted much attention in studies of environmental psychology, the field of architecture, and interior design.

Discovering the colour of the interior is noticed through the collective elements and attributes rather than only through the hue. All such aspects like hue, saturation, lightness, contrast, temperature and colour harmony combine to form the perception of the interior. It means that any specific colour can lead to different perceptions if it is of different intensity, brightness, other colours in the environment, and other conditions of illumination and space. It means that colour should be treated as something complicated and multidimensional in terms of environment. In their work, Yildirim et al. (2011) found that changing the colour of the interior allows obtaining different ratings of this interior space from users despite remaining the basic parameters of the interior unchanged. Their findings show that warm colours are connected with the excitement, stimulation and energy levels of the users, while cool colours provide more relaxation than warm ones. It supports the assumption that colour is able to change the way users communicate with the interiors. Human emotions in connection with the space include being happy, relaxed, excited and other emotions depending on the colour of the environment.

The connection between colour and emotion should not be seen as a strict connection between a colour and a single emotional reaction. The colour characteristics, the surrounding environment, personal taste, prior experiences, culture, age, and gender will

determine the way the person will perceive the colour. Therefore, interior design researchers need to deal with the issue of colour in relation to any particular interior design project and users instead of applying general assumptions to colour psychology. Thus, Yildirim et al. (2011) demonstrated that the colours of the interiors can stimulate different emotional responses among people. It was revealed that warm colours create high levels of excitement while the ones perceived as cool create a calm atmosphere. However, groups of participants differ; it can be concluded that they may react differently to the same colour. Thus, the results are important for designers because they show that it's possible to study emotions caused by colour and use that knowledge in their work. This allows moving from the intuitive decision-making process concerning the colour choice to evidence-based selection.

One of the most important classifications that is widely employed in colour studies is dividing colours into warm, cold and achromatic ones. Warm colours include (the hues) of red, orange and yellow, while ice and green belong to the cold colours. Achromatic colours are based on white, gray and black. The studies show that the impression from these classifications can differ. In the study by Yildirim et al. (2011), while studying the reception of home interiors in colours, it has been revealed that warm colour combinations are associated with more 'active' impressions, while cold colour combinations evoke 'restful' sensations in participants. Cha et al. (2020) continued this research and employed a virtual reality technology. In their research, 55 students were put in a room decorated in red, green, blue or white. The process of equilibration and a number of necessary tasks were assessed alongside the heart rate of the subjects. The research shows that the colour of the interior affects the emotional evaluation, task completion and physiological responses of a person through varying levels and types of the warmth of colours perceived through colour.

These findings are important because they imply that colour-based responses are not limited to aesthetic preference. They may also be linked to emotional, behavioural and physiological aspects of human experience. Therefore, the key issue for educational interior design is which colours are suitable for spaces used for concentration, creativity, communication or relaxation. While interior colour research often focuses on various shades of colour the hue itself does not explain the responses of users. In fact, the brightness and saturation of the shade play an important role in psychological aspects of colour. Highly saturated colours may provide a stronger impact whereas less saturated shades provide a quieter atmosphere. Similarly, lighter colours can influence people's perception of openness and brightness while darker colours can change their perception of space and density. That is why studies of the colour environment in educational institutions have recently taken into consideration a range of colour parameters rather than one particular hue. Tao et al. (2022) studied colour environments in classrooms and emotional reactions among students at universities. They were particularly interested in how colours affect the educational process. The research results showed that different colours in classroom environments have an effect on how students perceive the learning content, which contributes to the claim that colour choice should be taken into consideration by interior designers. Research carried out in the field of colors in the interior design should pay attention to more variables than simply asking people if they like red or blue or some other colour. Rooms that can be associated with educational activities should be treated with special care in terms of colors being applied. The uniqueness of educational rooms is that they host people for longer periods of time and provides them with an opportunity to interact with others while learning. Educational rooms from classrooms to laboratories and design studios should be treated differently because different types of educational activities require different Tao et al. (2022) conducted a study to ascertain the effect of classroom colour environments on the emotions of college students. Their work highlights the potential psychological significance of colour in the learning milieu and shows how classroom colours can be analyzed in relation to student emotions.

This connection is particularly relevant in tertiary education, where students often spend at least a few hours in a row sitting in classrooms or studios. Architecture, art, and design students might spend a substantial proportion of their day in studio contexts. As a consequence, the conditions of the visual environment may well become a critical aspect of the overall spatial experience.

Educational interior design must consider whether the use of colour serves the functional and psychological needs of its users rather than simply choosing a colour palette that reflects institutional identity or appeal.

It is especially relevant for college students who often spend more than several continuous hours in a classroom or a studio. For design students, such time spent in a workspace may be even more significant, as the courses often require the attendance of the studio classes. Therefore, it is important to consider how such interior spaces may affect the students' emotions.

As such, the design of such learning spaces should be carefully considered, as they often occupy a significant amount of time by their users. It is important to choose the color scheme that would best comply with the users' needs rather than following generic rules or brand guidelines.

Comfort is an essential element of users' experiences and evaluations of interior environments. Psychological comfort can include feelings of safety and relaxation, visual pleasure, familiarity and a lack of overstimulation.

Cooler color palettes have often been linked to comparatively restful spatial evaluations. Yildirim et al. (2011) showed that interiors with cool colors were associated higher ratings of restfulness and spaciousness compared to warm colored environments. This suggests that there may be a link between psychological comfort and perceived color temperature.

Tao et al. (2022) explored the impacts of classroom color environments on the emotions of college students. The focus of their study highlights the potential psychological importance of color within teaching environments and shows that classroom color can be examined in relation to students' emotional states.

This is especially important in higher education as students often spend several consecutive hours within classrooms or studios. Architecture, art, and design students can spend particularly long periods of time in studio environments. As such, visual environmental conditions can become an important element of their overall spatial experience.

Educational interior design should therefore evaluate whether color palettes support the functional and psychological requirements of users rather than selecting colors based on institutional identity or aesthetic considerations.

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Cooler colour schemes are frequently associated with relatively restful spatial assessments. Yildirim et al. (2011) found that interiors with cool colours were more positively evaluated in terms of being related to restfulness and spaciousness than warm-coloured environments. These findings indicate a possible connection between the perception of colour temperature and psychological comfort.

Tao et al. (2022) explored the impact of the colour environment in classrooms on the emotions of college students. Their research underlines the potential psychological significance of colour in teaching settings and demonstrates that classroom colour can be examined in relation to students' emotional states.

This relationship is especially important in higher education, where students frequently spend several consecutive hours within classrooms or studios. Architecture, art, and design students may spend particularly long periods in studio environments. Consequently, visual environmental conditions may become an important component of their overall spatial experience.

Educational interior design should therefore consider whether colour schemes support the functional and psychological requirements of users rather than selecting colours purely on the basis of institutional identity or aesthetic preference.

Comfort represents an important dimension of users' responses to interior environments. Psychological comfort may involve perceptions of safety, relaxation, visual pleasantness, familiarity, and freedom from excessive environmental stimulation.

Cooler colour schemes have frequently been associated with comparatively restful spatial evaluations. Yildirim et al. (2011) found that cool-coloured interiors were rated more strongly in relation to restfulness and spaciousness than warm-coloured environments. Such findings suggest a potential relationship between perceived colour temperature and psychological comfort.

The impact of colours in the classroom upon the feelings of students was examined by Tao and colleagues (2022) in their study, thus indicating the presence of some significance of colour in psychological terms and displaying a possibility of exploring classroom colours against emotions of students. The link between colours and emotions is especially important in higher education, where many hours are spent in classrooms, especially for students of art and design, as they are making use of studio space for a long time. For this reason, when creating interior designs for educational institutions, one should think about whether the colour scheme used will serve the practical and psychological purposes of its users rather than choosing the colour purely from institutional identity and aesthetic preferences points of view. Comfort is one of the dimensions in the user's response to the interiors. Psychological comfort may be understood as a feeling of security, relaxation, attractiveness, familiarity, and absence of hyper stimulation. Cool colours are usually associated with more restful evaluations of spaces. The authors Yildirim et al. (2011) reported that people evaluated areas with the cool shades of blue much more positively with respect to the characteristics of being restful and spacious compared to those painted in warm colours. This leads to the conclusion that there exists a possible link between colour temperature and feelings of comfort. However, the ideal learning space does not necessarily have to be one that is featured by lower levels of stimulation. For the purposes of educational activity learning environment should be stimulating,

engaging, and energizing. This concept of balance is useful in this study since it allows for measuring emotional responses from different perspectives such as comfort level and stress. Another variable that must be noted in relation to the study of colour is visual simulation. Warm colours can create an active visual environment due to their appeal with respect to the attention of people.

Yildirim and his colleagues (2011) claimed that warm colours were related to positive evaluations of excitement and stimulation. Likewise, Cha et al. (2020) found that different shades of red resulted in much more positive ratings in terms of excitement and tension. These findings point to the fact that the design aspect of stimulation is important because stimulation may not be positive or negative. Moderate stimulation increases awareness and helps people obtain involvement. However, a high level of stimulation may be interpreted as tension. Therefore colours may be appropriate depending on the type of educational space and the response we want to elicit. For example, creative studios may require certain characteristics of colours than quiet study areas.

Apart from emotional responses, the effect of internal colour conditions on the quality of work has been studied. Cha et al. (2020) studied proofreading performance in terms of four main interior colour conditions in immersive virtual environments. The data obtained demonstrate differences in performance in the tested conditions with fewer errors made in the white space compared to the green interior. The study emphasizes the colour-related differences discovered in emotions and heart rate. Despite the fact that the obtained results do not demonstrate that there is a colour proving to be effective in proven academic performance, this indicates the relationship between colour conditions being influential on one's psychological and behavioural experiences. This is of great importance in educational institutions because students need to perform their cognitive tasks and focus on their work while gaining knowledge. Nevertheless, the present research is aimed at studying emotional reactions mainly rather than academic success.

No two users look at colours in the same way. Race, culture, psyche and experience all have a bearing on understanding and liking colours.

Yildirim et al. (2011) indicated, for instance, that there were differences in respondents' opinions in terms of their gender, which signifies that users' characteristics may affect their interpretations of colour environments.

This is why it is important to take demographic factors into account during quantitative studies of interior colours. For instance, gender, age, field of studies, or educational level may feature in statistics in order to determine whether some groups have different opinions.

Thus, ANOVA and independent samples tests may supplement correlation and regression analysis to examine whether emotional reactions of people differ with regard to the groups they belong to.

Color studies make use of several methodological techniques, such as physical rooms, photographs, computer-generated images, and virtual reality simulations.

Yildirim et al. (2011) made use of digitally produced interior images while controlling for spatial parameters and applying different colour situations. Cha et al. (2020) made use of virtual environments with the purpose of allowing participants to perceive more than just one out of the four interior scenarios that are coloured differently, thus giving an opportunity to record physiological, psychological, and other resulting reactions. Yildirim et al. (2011) indicated that moods differed in the environments that were warm, cool, and achromatic, while Cha et al.'s (2020) investigations provided the data that indicate emotional reaction caused by the usage of red, green, blue, and white colours in interiors. The investigations that focus on classrooms show the importance of the interior colours for the emotions of university students (Tao et al., 2022).

Research Methodology

Research Approach

This research utilizes a quantitative research methodology in order to study the connection between interior color schemes and people's emotional response in educational settings. A quantitative method is suitable for the research because it aims to numerically measure people's perception of the interior color and study relationships between some interior color properties and emotional responses.

In this research, the properties of the interior color that can be measured are examined: color temperature, brightness, intensity/saturation, color harmony, contrast, and visual comfort and their relationship with emotional responses such as calm, comfortable, happy, alert, stimulated, stressed.

Quantitative data is obtained via a questionnaire that is processed with statistical methods.

Research Design

The method used is cross-sectional survey research design. The data is collected once from the participants to determine the opinions of the individuals about the color characteristics of educational interiors and their emotional reactions to them. The complete research methodology consists of the following steps:

Literature Review → Identification of Variables → Questionnaire Development → Data Collection → Data Screening → Reliability Analysis → Descriptive Analysis → Correlation → Regression/ANOVA → Interpretation of Findings

Study Setting and Population

The focus group includes students from universities who use educational facilities such as classrooms, lecture rooms, studios, labs, libraries, and other learning environments on regular basis.

Students are selected as they spend significant amount of time in educational interiors and can thus give reliable judgement about the qualities of the design and the feelings that such environments provoke.

Different kinds of students are involved in the research to include different opinions and facilitate generalization of data obtained within the Antonian context. Currently enrolled university students.

1. All are 18 years of age or older.
2. Regularly use the educational spaces being evaluated.
3. Have sufficient experience of the selected space to evaluate its interior environment.
4. Participated voluntarily in the study.

Sampling Technique

The recruitment of the subjects is done via the non-probability convenience sampling method which allows for the inclusion of subjects easily available at the educational establishments selected for the study. Wherever feasible, the study attempts to gather the responses of students coming from various educational spaces, programs, and semesters as it is crucial to avoid over-representation.

Sample Size

The study targeted approximately 100 valid respondents. This sample is considered adequate for the proposed statistical analyses, particularly descriptive statistics, correlation analysis, multiple regression, and group comparisons. To account for incomplete questionnaires and unusable responses, approximately 110–150 questionnaires were initially distributed, with the objective of obtaining at least 100 complete and valid responses for final analysis.

Study Variables

The conceptual model consists of two primary groups of variables.

Independent Variables: Interior Colour Scheme Characteristics

The proposed independent variables are:

1. Colour Temperature
2. Colour Brightness
3. Colour Intensity/Saturation

4. Colour Harmony
5. Colour Contrast
6. Visual Comfort

Dependent Variable: Users' Emotional Responses

Emotional response is assessed through dimensions including:

1. Calmness
2. Comfort
3. Happiness
4. Alertness
5. Stimulation
6. Stress/Tension

The primary conceptual relationship is therefore:

Interior Colour Scheme Characteristics → Users' Emotional Responses

Research Instrument

The data collection has taken place through structured questionnaires that were self-administered and created based on the landscape, previous works, and studies related to interior colors perception and emotional reactions. The questionnaire was filled out in a systematic way, with five choices offered to respondents.

Data Collection Procedure

After obtaining the necessary institutional/ethical permission, the questionnaire is distributed among eligible university students. Participants were given a brief explanation regarding:

- Purpose of the research
- Voluntary nature of participation
- Confidentiality of responses
- Approximate questionnaire completion time
- Right to discontinue participation

The questionnaire was distributed through a secure online survey platform.

After data collection, responses were coded and transferred into SPSS, for statistical analysis.

Data Analysis

The collected data was analyzed in several stages.

Descriptive Statistics

In this study, descriptive statistics were used to summarize the demographics of the participants and their responses to the questionnaire. Various statistics were analyzed including frequency, percentage, mean, standard deviation, and minimum and maximum. The results provided an overview of the participants' views and feelings towards the colours used in interiors.

Reliability Analysis

Cronbach's alpha assessed the internal consistency of the multi-item measurement scales.

Pearson Correlation Analysis

Using Pearson's r correlation coefficient (r), investigators examined the strength of the connection between various interior color attributes and variables measuring emotional response, assuming that the relationship assumptions were met. The study assessed the following relationships:

Colour Harmony $\leftrightarrow$ Comfort

Brightness $\leftrightarrow$ Alertness

Colour Temperature $\leftrightarrow$ Calmness

Colour Intensity $\leftrightarrow$ Stimulation

Visual Comfort $\leftrightarrow$ Positive Emotional Response

Ethical Considerations

Ethical principles are followed throughout the research process.

Methodological Framework

The complete methodological framework of the study is summarized in the form of following diagram.

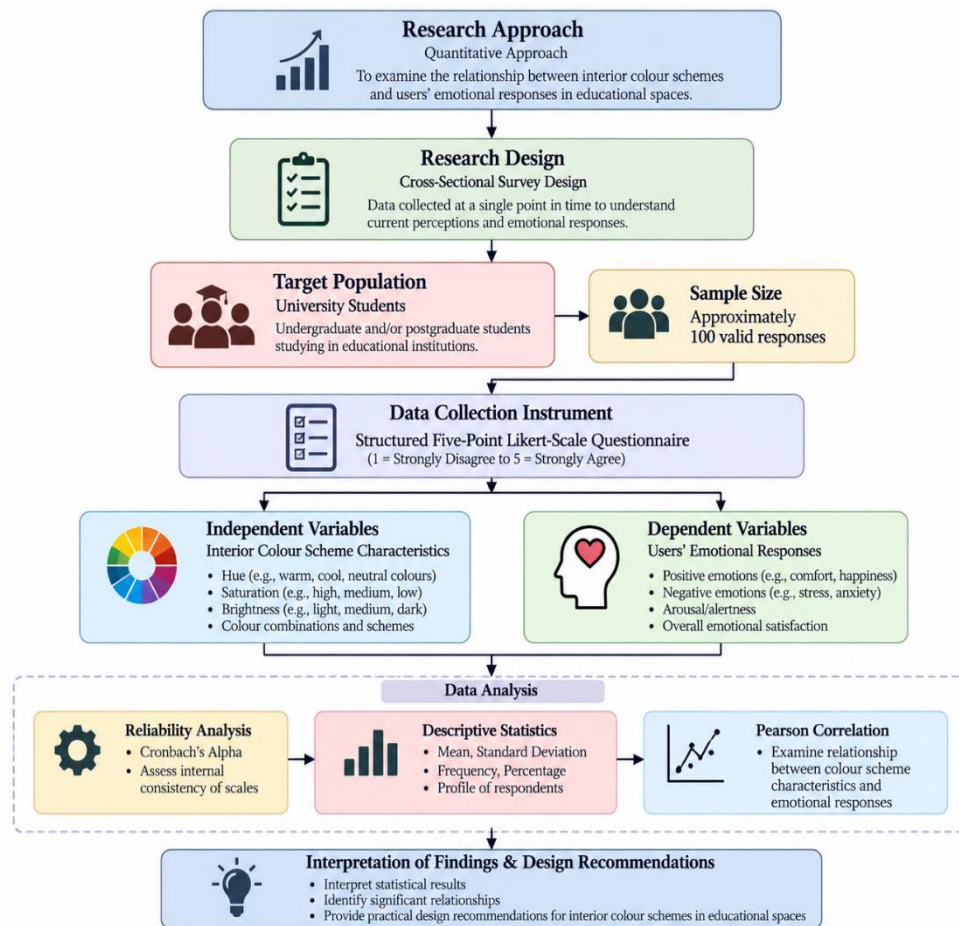


Figure-01: Showing the Complete Methodological Frame Work of the Study

Descriptive Statistics

Descriptive statistics were calculated for the study variables using a synthetic sample of 100 participants and a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Overall, participants demonstrated relatively positive perceptions of the interior colour environment and associated emotional responses.

Table 1. Descriptive Statistics of Study Variables (Synthetic Data, N = 100)

Variable	Mean	SD	Minimum	Maximum
Colour Temperature	3.61	0.68	1.75	5.00
Colour Brightness	3.78	0.64	2.00	5.00
Colour Intensity	3.43	0.72	1.50	5.00
Colour Harmony	3.91	0.61	2.00	5.00
Colour Contrast	3.49	0.70	1.50	5.00
Visual Comfort	4.06	0.58	2.25	5.00
Calmness	3.84	0.65	2.00	5.00
Comfort	3.98	0.60	2.25	5.00
Happiness	3.73	0.66	1.75	5.00
Alertness	3.65	0.68	1.75	5.00
Stimulation	3.54	0.71	1.50	5.00
Stress/Tension	2.36	0.77	1.00	4.50
Overall Positive Emotional Response	3.80	0.55	2.25	4.90

The variable of visual comfort achieved the greatest average among the other variables of interior colors ($M = 4.06$, $SD = 0.58$), with colour harmony following it ($M = 3.91$, $SD = 0.61$) and the variable of colour brightness with a lower score ($M = 3.78$, $SD = 0.64$). In terms of emotional reactions, the parameter of comfort distinguished itself with the highest mean score ($M = 3.98$, $SD = 0.60$), followed by the parameter of calmness with a lower score ($M = 3.84$, $SD = 0.65$) and the parameter of stress/tension having the lowest average score ($M = 2.36$, $SD = 0.77$). Thus, the overall interpretable descriptive pattern indicates mostly positive perceptions of educational interior colors and the majority of interior colors are associated with acceptable emotional responses of individuals.

Reliability Analysis

The internal consistency of the study constructs was assessed using Cronbach's alpha (α). The results indicated satisfactory to high reliability across all constructs, with alpha coefficients ranging from 0.76 to 0.90.

Table 2. Reliability Analysis of Study Constructs (Synthetic Data, N = 100)

Construct	No. of Items	Cronbach's Alpha	Interpretation
Colour Temperature	4	0.79	Acceptable
Colour Brightness	4	0.82	Good
Colour Intensity	4	0.77	Acceptable
Colour Harmony	4	0.86	Good
Colour Contrast	4	0.76	Acceptable
Visual Comfort	4	0.88	Good
User's Emotional Response	6	0.90	Excellent
Overall Instrument	30	0.92	Excellent

The analysis of reliability showed good internal consistency for the study constructs with the obtained Cronbach's alpha values from 0.76 to 0.90 and the overall reliability coefficient $\alpha = 0.92$. These values surpass the generally acceptable reliability minimum threshold of 0.70 (Nunnally & Bernstein, 1994; Tavakol & Dennick, 2011). The constructs visual comfort ($\alpha = 0.88$), color harmony ($\alpha = 0.86$), and color brightness ($\alpha = 0.82$) had good internal consistency while the constructs color temperature ($\alpha = 0.79$) and intensity/saturation ($\alpha = 0.77$) and color contrast ($\alpha = 0.76$) are within the limits of acceptable reliability. According to previous methodological studies the reliability coefficient values that exceed 0.70 are considered satisfactory for the research instruments while the values of 0.80 and above are regarded as indicators for high reliability (Nunnally & Bernstein,

1994; Tavakol & Dennick, 2011). The emotional-response scale had $\alpha = 0.90$ thus indicating very good consistency among the items composing the scale. However, the reliability coefficient measured via Cronbach's alpha should not be taken as a proof of construct validity or unidimensionality and these qualities require other proofs such as factor analysis (Cortina, 1993; Tavakol & Dennick, 2011).

Pearson Correlation Analysis

Pearson correlation analysis was conducted to examine the relationship between interior colour-scheme characteristics and users' overall positive emotional responses. The results indicated that all interior colour variables were positively and significantly associated with emotional response.

Table 3. Pearson Correlation Between Interior Colour Characteristics and Emotional Response (Synthetic Data, N = 100)

Variable	Pearson's r	p-value	Interpretation
Colour Temperature	.34	<.001	Moderate Positive
Colour Brightness	.46	<.001	Moderate Positive
Colour Intensity	.29	.003	Weak Positive
Colour Harmony	.58	<.001	Moderate Positive
Colour Contrast	.27	.007	Weak Positive
Visual Comfort	.65	<.001	Strong Positive

The strongest positive correlation was observed between visual comfort and emotional response ($r = .65$, $p < .001$), followed by colour harmony ($r = .58$, $p < .001$) and colour brightness ($r = .46$, $p < .001$). Colour temperature also demonstrated a moderate positive relationship ($r = .34$, $p < .001$), while colour intensity/saturation and colour contrast showed weaker but statistically significant positive relationships. Overall, the results suggest that more favorable perceptions of interior colour characteristics are associated with more positive emotional responses in educational spaces.

Conclusion

This study explored the connections between interior colour schemes and people's emotional reactions in educational environments by focusing on factors such as temperature, brightness, intensity, harmony, contrast and visual comfort. The findings suggest that interior colour features positively correlate with people's emotional experiences; among these features, visual comfort and colour harmony are determined to be the most powerful ones, with brightness and temperature following. What these findings imply is that emotional experience depends on the colour composition as a whole rather than on the choice of separate colours.

The results of the study further imply that designs in education should go beyond the assumption that colours cause specific emotional responses. Colours should be approached as a part of a bigger interior environment influenced by such factors as brightness, saturation, harmony, contrast or light.

In general, the study offers a quantitative approach to investigating emotional reactions and interior colour schemes and can be regarded as a basis for the application of evidence-based strategies in the use of colours in the education sphere.

Practical Implications

The results of this research have significant implications for the work of interior designers, architects, educators, and space planners. Color selection for educational spaces should not rely solely on aesthetics, branding of relevant institutions, or the designer's personal taste. More attention needs to be paid to how the users feel and think.

In this regard, it is essential for designers to take into account aspects such as visual comfort, color harmony, and brightness while developing education systems. For instance, colors that are highly saturated or contrasting should only be used in some places and should not dominate particular premises.

Different types of educational activities are likely to necessitate different approaches to color selection. Thus, calm and visually balanced environments are recommended for quiet studying, while more stimulating designs can be used for creative collaboration.

Recommendations

Educators and designers are advised to utilize user-oriented and research-based principles while choosing the colour schemes for interior spaces. Educational institutions must consider students' perceptions while planning the layout of their premises and carrying out renovations, especially for places where students spend a lot of time.

While measuring colour schemes, designers must use both natural and artificial illumination since lighting has a tremendous impact on the way people see colours. Aspects such as the colour of walls, ceilings, floor coverings, equipment, and others must also be considered while designing the interior space.

After the renovations, the post-occupancy evaluation has to take place to assess users' perceptions.

Limitations

This research has several drawbacks. The first limitation is that because it used a cross-sectional design which assessed users' impressions at a single point in time it does not allow one to make conclusions about the causes and consequences of colour and emotional reaction.

Second, the responses were gathered mainly using self-report questionnaire method which creates the risk of bias in responses because of individual preferences.

Thirdly, findings in regard to colour perception might be influenced by uncontrolled variables such as daylight, artificial light sources, material finishes, spatial arrangements, cultural background, past experiences, and individual preferences.

Finally, it is important to keep in mind that findings obtained from a small sample of institutions do not apply to the majority of educational institutions.

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