

ORIGINAL ARTICLE

Open Access



Visual plagiarism in interior design: is it easy to recognise?

Donia M. Bettaieb^{1*} , Abeer A. Alawad¹ and Raif B. Malek²

* Correspondence: drashad@kau.edu.sa

¹Department of Interior Design and Furniture, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia
Full list of author information is available at the end of the article

Abstract

This study aims to remove some of the ambiguities of visual plagiarism in interior design (those related to the visual composition of space represented by line, form, shape, texture, time, colour, light, etc.) by examining the main detection methods, the extent of the issue, and the experiences and roles of academic interior designers. Two main methods were used: an analysis of the primary forms of visual plagiarism and an applied approach to test the effectiveness of plagiarism. Additionally, 30 academics in the Kingdom of Saudi Arabia, who majored in interior design, were surveyed using an online questionnaire. The results demonstrated that changing the light and colour while maintaining the rest of the properties and changing the line, form, and shape are considered visual plagiarism. However, the results also indicated that visual plagiarism is not always clear for academics. It is hoped that the results of this study will increase the awareness of visual plagiarism, enhance ethics in the university environment, and help academic interior designers apply scientific methods to detect plagiarism in design projects. This study can also assist regulatory authorities to manage complaints and disputes in plagiarism cases.

Keywords: Visual plagiarism, Interior design, Ethics, Academic environment

Introduction

Numerous researchers have examined text plagiarism, and programs to detect textual plagiarism, such as Ithenticate and Turnitin, have been developed and adopted by many higher education institutions. However, there have been few investigations into non-textual plagiarism, principally in the field of visual forms of communication. Visual forms of communication are related to the visual aspect and signification of physical configuration as images. Communication here is based on the aesthetic characteristics of a designed image.

Whereas the most public, visual forms of communication have some logic and copyright parameters, the specific concerns of academic visual plagiarism are much less visible (Blythman et al. 2007). Subsequently, visual plagiarism has proved much more difficult to manage, and programs to detect this form of plagiarism are not as common or effective. For example, while Google programs are often used as the main way to



© The Author(s). 2022 **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

detect visual plagiarism, these programs apply simple methods. TinEye, another example, can search by *image* or perform a *reverse image search*.

Interior design involves a complex process of conceptualisation and implementation through which space is used according to a function. Nussbaumer (2013, p. 194) mentioned that an individual's behaviour is constructed in these spaces that psychologically and physically affects people. In this context, two complementary dimensions of design space can be emphasised. The first is related to the 'implicit dimension' and includes, in terms of the theoretical orientations, conceptual thinking and an idea. The second is related to the 'visual dimension' and the results of the perceptive process, including the tangible visual-spatial design of space, line, form, shape, texture, time, colour, and light. These two dimensions are parallel in the designer's mind during the design process; the first leads to the second, yet they alternate until the space is 'formed', the project is 'designed', and the design is 'implemented' and takes its form. The second dimension only appears as the space is used as a combination of forms (outcome) that produce a 'user reaction'. The same may apply to the 'research analyst' or 'reader' who must study a space's visual aspect to access its design.

Here, the 'designed space' can be defined by its characteristics from the visual and implicit aspects. Given the bifurcation of these two aspects, each with regard to its own competence and the complexity of their interaction, this study focuses on the visual aspect in terms of exploiting the mechanisms of analysing space as an 'image'. Moreover, Alawad et al. (2020) demonstrated the necessity of combating plagiarism in students' design projects by making them aware of the primary methods, types, and causes of plagiarism. They encouraged students to confront repetition, fight stagnation, stimulate creativity, and preserve the rights of designers. Academic interior designers and educators play crucial roles in dealing with such events, particularly through their knowledge, experience, and integrity.

This study also focuses on the visual properties that represent plagiarism sites in interior design through the images that form the basis of a designed interior space by testing their effectiveness and ensuring their clarity among academics.

Introduction to visual plagiarism

Violations of academic integrity are a cumulative and widespread issue in the academic community. One of the main reasons for this spread is the development of the Internet, which has led to an increase in media (both in form and space), the multiplicity of academic resources, and the easy and permanent availability of information for students (Alawad et al. 2018; Van Heerden 2014; Park 2003; Howard 2001). However, technology can be positively exploited to support an anti-plagiarism student culture and prevent, determine, and help recognise plagiarism that cannot be identified through other means (Garrett and Robinson 2012a).

As a form of academic integrity violation, plagiarism is defined as copying the work of others in its original form or by altering its contents or slightly altering some of the contents without any appropriate or adequate recognition or citation of the original work (Caplan and Redman 2018; Starovoytova and Namango 2016). Plagiarism occurs in different media and forms, including texts, ideas, data, graphs, tables, figures, spoken words, graphics, music, pictures, poetry, art, audio clips, and video clips (Starovoytova and Namango 2016).

There are various reasons behind student plagiarism, including a lack of understanding of the meaning of plagiarism or confusion over instructions regarding acceptability (Blythman et al. 2007, Starovoytova and Namango 2016; Cleary 2017). There is also confusion regarding the difference between copying and artistic interpretation (Walker 2009); laziness (Cleary 2017); avoiding punishment in the form of not disclosing or acknowledging plagiarism (Starovoytova and Namango 2016; Cleary 2017); mitigating penalty; or lacking institutional guidance, policies, and procedures (Garrett and Robinson 2012a; Starovoytova and Namango 2016).

Other reasons for student plagiarism are easy access to online resources (Alawad et al. 2018; Hurtík and Hodáková 2015), anxiety and stress over academic work (Cleary 2017), and poor time management (Cleary 2017). Alawad et al. (2018) classified five main elements (5S) in the causes of plagiarism by students: student, supervisor, study, aspect, and society. They also explained that plagiarism threatens innovation and development in interior design and indicated that, from the academic perspective, student plagiarism could be attributed to a fear of renewal, especially when they have a successful inventory of work (Alawad et al. 2020).

Simon (2016) argued that higher education institutions should seriously consider their academic integrity and plagiarism policies (applicability and written context). Developing a plan of action focussed on preventing plagiarism is now a necessity (Walker 2009). Researchers such as Alawad et al. (2018) and Park (2003) have called for educational institutions to develop methods for managing student plagiarism. These methods are based on prevention supported by transparently and continuously applied robust detection and punishment methods that are fully consistent within the academic community (Alawad et al. 2018; Park 2003). Furthermore, Dalal (2015) emphasised the importance of how plagiarism is confronted and argued that it is not possible to reduce plagiarism without changing the behaviours that originate from opportunistic values.

In addition to text, plagiarism can occur in images, which are a vital part of implemented design projects. Ryerson University (n.d.) provides an interesting reference for this as it has many rules about visual plagiarism (e.g., photographs, maps, screenshots, graphs, charts, tables, and logos), artworks (e.g., paintings, sketches, designs, and sculptures), digital creations (e.g., graphics, illustrations, collages, and memes), videos, and animations. Alawad et al. (2018) indicated that, while there are several programs for the detection of plagiarism, most only detect text plagiarism and cannot be used with images. Therefore, academics struggle to determine the originality of visual images because images cannot be aseptically tested to detect visual plagiarism.

Van Heerden (2014) also demonstrated that there are currently no effective detection methods for plagiarism available to photography teachers in higher education. However, Google™ SBI, which photography teachers use to detect functional visual plagiarism, was found to be relatively effective by examining whether the program could differentiate between matching images, plagiarised and original, from the Internet (Van Heerden 2014). Hurtík and Hodáková (2015) have also proposed another technical method that relies on a specific mathematical method to search for 'stolen' images in a specific database. However, such methods always require the availability of a database of images on the Internet to detect similar and identical images.

Moreover, in the world of visual arts, less research has been conducted to discover visual plagiarism compared to text-based plagiarism, largely because of this difficulty in

identifying and detecting plagiarism in visual materials. Simon (2016, p12) argued that, in 'the situation in the visual arts, there are no clear guidelines to help distinguish between plagiarism on the one hand and homage, parody, visual referencing, and related practices on the other'. Simon also suggested that the concept of visual plagiarism remains unclear because of the 'artistic and commercial practices; the perceived lack of consistency in approach between colleagues, courses and disciplinary areas ...' (2016, p 31). This context adds to the complexity academics face when recognising and verifying visual plagiarism (Garrett and Robinson 2012a).

Accordingly, the process of diagnosing and identifying plagiarism depends on the knowledge and experience of academics (Garrett and Robinson 2012b; Alawad et al. 2020). This can cause conflicts of disclosure, approaches, policies, and practices (Garrett and Robinson 2012b). Van Heerden (2014) also demonstrated that effective methods for detecting visual plagiarism need to dissect composite images by isolating their discrete features to detect the unauthorised use of these images in composite materials.

In interior design and research on plagiarism, in particular, academics at any educational level must be provided with students' past work to monitor students' development at other levels and detect plagiarism (Alawad et al. 2020). Blythman et al. (2007, p5) argued that '[w]e can do this by changing in some way that has a unique effect: scale, colour(s), juxtaposition of styles, content, meaning, lighting, feeling, materials, placement'. However, Hoepner (2021) shares his take on the issue in *Architectural Digest*: 'The Internet today is awash with shiplap-panelled walls, herringbone tile floors, and reclaimed wood either layered onto a ceiling or fashioned into barn-style doors. Are all of those rooms copies?' Timothy Corrigan, a designer, declared that '[n]o one can say that they designed something totally out of their own imagination Everything comes from an earlier source. So, it is a little tricky how you attribute ownership of design' (quoted in Hoepner 2021). Designing within any definable style, he argues, necessarily involves a degree of imitation (Hoepner 2021). It is necessary, then, to define what separates appropriate imitation in visual media from plagiarism.

Visual expression of interior design and visual reading mechanisms of space

The concept of visual expression establishes the formative dimension in interior design. It involves the methods and means of installing the various physical elements of space, line, form, shape, texture, time, colour, and light. These create expressive properties through an aesthetic formulation whose components are subject to fine creativity according to a series of interlinked relationships. As Nussbaumer (2013, p. 128) stated, these relationships are primarily perceived through vision and the interdependence of the rest of the senses, which are used to comprehend what is contained in space. In this context, the architect Abu Auf (2014) argued that architectural design is a creative cognitive science that depends on the formation of various elements that form the space, the interior spatial relations, and the relationship with the external environment. Additionally, this creativity is complemented by the external formation.

Plastic expression in building and installing the design of an interior space occurs on several levels. The first is the consistency of the aesthetic aspect in the design of interior spaces, which is crucial because it often represents a goal pursued by the interior

designer who builds an aesthetic harmony allowing the space to perform its primary function. This enables users to carry out related activities. Another consistency is the formative aspect of the interior design space, which usually represents the basis for adapting the users' attitudes, building their reactions, and forming their unconscious behaviours. Between the designer's goals and the user's aspirations, the aesthetic aspect of interior spaces represents the most important common denominator in which the physical elements of the space interact. This combination contains formative frameworks that support the desired functional mobility and establish the meanings of interaction and life in the space.

The visual reading of a space is based on several concepts. The most important of these is the 'clarity' of the physical structure of a space and the resulting sense of 'comfort and safety'. This concept is fundamentally related to the process of use and its management in an effective framework. The use process represents the essence of the relationship between the structure of the space that must be formed in this context and the user. Abu Auf (2015) argued that, regarding the visual reading of a space, design is a collection of spaces with disciplined relationships that carry all of the properties meeting the comfort and safety needs of their users and visitors. This is achieved by setting the best performance when forming entities with identities resulting from specific combinations of light, shadow, colours, and details. It can also be created using construction materials and methods that achieve the product's durability properties and provide it with engineering aspects that meet vital requirements and bear the properties of quality and sustainability.

Gosling et al. (2013) described the challenge researchers face in terms of how to aseptically record the features of places because of the difficulty of documenting space. To address this challenge, researchers must define a method that is amenable to quantitative analyses, allows comparisons across spaces, and is flexible and comprehensive enough to be applied to various spaces.

Gosling et al. (2013) further explained that this context is difficult to analyse quantitatively and cannot be easily compared across spaces. Thus, delineating design elements would be helpful. Kilmer and Kilmer (1992, p. 96) state that the traditional design process taught in schools is divided into two parts: the first summarises the seven design elements (space, line, form, shape, texture, time, colour, and light), and the second includes the eight principles of design (balance, retheme, emphasis, proportion, scale, unity, harmony, and variety).

Furthermore, Gibson (1977) argued that the environment provides a list of materials beginning with simple things and ending with complex things. Supporting this suggestion, Gosling et al. (2013) expressed that the interior environment could be conceived as consisting of materials (such as steel, wood, and glass) and surfaces (such as floors, ceilings, and walls). Within his proposal, Gibson (1977) arranged the materials, surfaces, and planning of these surfaces that the environment provides. In this way, the functions of the environment can immediately be discovered before it is realised that they are useful for a specific purpose (Gosling et al. 2013).

According to the studies mentioned above, plagiarism exists in various places. This research will focus on the visual properties that represent plagiarism sites in interior design through the images that form the basis of a designed interior space by testing their effectiveness and ensuring their clarity among academics. To the best of our

knowledge, no research has been conducted on plagiarism in interior design. Additionally, the few existing studies about visual science differ from research in interior design in terms of the data they use; therefore, they can only be used in certain and limited cases because of the specifics of the interior design field. At the level of programs, the situation is unique to interior design as the work of students or designers examined to verify plagiarism is not necessarily published. Consequently, specialists must develop their own methods to detect plagiarism.

Thus, in this study, the following research questions were developed to reveal the concept of visual plagiarism in interior design:

Q1: Is visual plagiarism evident to academics through the visual properties of interiors (design elements and principles)?

Q2: What are the acceptable limits of plagiarism from the academics' points of view?

Method

This study was conducted in the Kingdom of Saudi Arabia in the city of Jeddah in 2019 and 2020. Analysed images were used to determine the constituent methods, and an applied approach was used to test their effectiveness by applying these data to several designs and obtaining feedback through a questionnaire created and distributed to selected designer academics by e-mail.

Usually, applied research is adopted in Social Research Methods as it '*has its roots in the experimental method, but it uses scientific methodology to develop information aimed at clarifying an immediate societal problem*'. (Hedrick, Bickman and Rog 1993, p.7).

The conduct applied research from planning to execution, and the research process accordingly had 4 stages (Bickman et al., 2009):

Stage I begins with the researcher's improvement of an understanding of the important problem. In our context, it is related to the existent ambiguities of visual plagiarism in interior design (those related to the visual composition of space represented by line, form, shape, texture, time, colour, light, etc.)

Stage II concerns the development of the research design and plan. This phase requires many decisions and assessments, including selecting a design and proposed data collection strategies.

Stage III, either revising the questions to bring them in line with what can be done with the design that has been developed or reconsidering the design trade-offs that were made and whether they can be revised to be in line with the questions of interest.

Stage IV concerns Reporting/ follow-up'.

In this study, a mixed-methods study was developed: a quantitative component was used to identify if the visual plagiarism is evident to academics and a qualitative component was aborded to define what the acceptable limits of plagiarism are from the academics' points of view.

Sample

The participants were 30 faculty members in the field of interior design from different institutions in the western and central regions of the Kingdom of Saudi Arabia (King Abdulaziz University, University of Jeddah, Qassim University, and Taibah University).

Available participants were identified through colleague contacts in each region. The researchers contacted participants (online via Zoom, phone, message, etc.) before sending the electronic questionnaire via e-mail. This primary connection aimed to select participants according to a set of criteria and to explain and clarify the purpose of the study, emphasizing confidentiality and informing participants (who selected) that the results would be used only for the purpose of this research. The participants were counted according to a set of criteria, including the following:

- Teaching experience ranging from 3 to 16 years in a design field (architecture, interior design, etc.)
- Experience teaching design studios
- Experience in project arbitration as a member of a jury
- Faculty member status (lecturer to university professor)

Of the 30 academics, 66.6% were from the Western Region and 33.33% were from the Central Region; additionally, 93.33% focused on interior design, and 6.66% were architecture researchers. Furthermore, 20% of the academics were lecturers, 50.33% were assistant professors, 20% were associate professors, and 6.66% were professors. Of the total, 33.33% had 2–6 years, 23.33% had 7–11 years, 3.33% had 12–16 years, and 40% had 16 years or more of academic experience. The high number of respondents with over 16 years of experience results from the recent specialisation in Saudi Arabia and the recruitment of academics from outside of the country.

Workflow

The study was divided into many stages (Table 1).

Through the literature and the researchers’ more than eight years of experience in studio teaching and project arbitration, the primary visual methods were identified. These methods are listed in Table 2 according to the priorities of perception and the use of the senses.

Measures

The images were then processed in three stages as follows.

Table 1 Research Method

Stage	Procedure	Goal
First	Analysing the components of the designed space	Determining the initial methods for the visual dimension of plagiarism
Second	Classifying the methods into groups according to the nature of their perceptions	Prioritising the properties according to the integration of perceptions
Third	Linking the groups by considering the properties’ variables of one of the classified groups and determining the properties of the rest of the two groups	Applying the groups to package designs and excluding the initial changes due to the weakness of the rate of change and the necessity of the high rate of plagiarism to be closer to the total copying.
Fourth	Testing the method’s effectiveness	To ensure its clarity and reveal its limits

Table 2 Classification of Elements

Classification	Elements
Elements that can be perceived and described by the sense of sight	Light and colour
Elements that can be perceived and described by the senses of sight and touch	Material
Elements that can be perceived and described through three senses, including sight and touch	Line, shape, and form

First stage: adopting an image of a designed space

Several images were taken of different parts of the spaces in a researcher's house (such as the entrance, kitchen, living room, and bedroom). A set of criteria were then used to select the image, most importantly the formative richness of the design elements. Additionally, the complex functions based on visual formation in relation to spatial form were not considered because the object of the image is not the expression of function but rather the visual readings.

Then, the selected image was converted into a three-dimensional image (Fig. 1) using 3D Studio Max so that the researchers could make modifications according to the classification illustrated in Table 3.

Second stage: modification of the image elements

The second stage involved modifying the elements identified in Tables 3, 4, 5, and 6.

Third stage: testing the effectiveness of the images

The effectiveness of the new images was tested by presenting them to 30 respondents through an electronic questionnaire with specific options. Each question measured specific variable axes (based on the classification above), and this was included in the explanation of the questionnaire. This also meant that references between the images were prevented.

**Fig. 1** House entrance. Original photo by the researcher

Table 3 Determination of the variables

Classification	Variables
Colour and light	Distribution, type, lighting colour, type of colour scheme
Materials	Type, juxtaposition, proportions used, multiplicity
Line, form, and shape	Direction, multiplicity, and distribution

Study tool

The questionnaire was created to reveal the similarities and differences between the images. The questionnaire included questions about basic information (years of experience, teaching materials, and teaching levels) and contained three axes formed according to the classifications in Tables 4, 5, and 6. Three options were developed for each classification of change, and the participants were asked the following questions for each classification:

- Q1: Is the image on the left a copy of the original image? (Yes/No).
- Q2: If any are copies, are they acceptable to you? (Yes/No).
- Q3: Do you have any comments?

Results

First axis related to changing the colour and lighting

The colour and lighting were changed in four ways, and this is illustrated in images 1.1 to 1.4, as shown in Table 4. Image 1.1 was altered by changing the lighting properties (type, colour, and intensity) and colour scheme (same number of colours and distribution ratios), as shown in Fig. 2.

In response to the question on whether the altered image was a copy of the original (Q1), 28 (93.33%) respondents stated yes and 2 (6.66%) responded no. In response to the question on whether copying this image was acceptable (Q2), 6 (20%) responded

Table 4 Colour and light variable changes

Positions	Application according to positions			
Original	Image 1	Image 2	Image 3	Image 4
				
1-Original image	1-1 Changing the lighting properties by changing the colour scheme with the same number of colours and similar distribution	1-2 Changing the lighting properties by changing the distribution ratios of the colour scheme and increasing the number of colours	1-3 Changing the lighting properties by changing the distribution ratios in the colour scheme and reducing the number of colours	1-4 Preserving the lighting properties but changing the properties of the existing colour scheme (distribution and intensification)

Table 5 Raw material variable changes

Positions	Application according to positions			
Original	Image 1	Image 2	Image 3	Image 4
				
2-Original image	2-1 Changing the material type while retaining the shape and distribution	2-2 Maintaining the material type and changing the juxtaposition	2-3 Changing the materials and changing the juxtaposition and proportions of distribution	2-4 Changing the material type while retaining the proportion of the distribution and changing the form

yes and 24 (80%) responded no. The participants made the following comments about Image 1.1:

- There is a difference between the two images with a rate ranging between 15% and 25% from the general shape (only colours, walls, and ceilings). This rate is considered a very small rate that enables the process to be considered a process of copying the images.
- It is unacceptable because it is an adaptive reproduction that relies on changing the colours and material and preserves the entire structural formation of the original space in a 'hidden' manner.

Table 6 Line, form, and shape variable changes

Positions	Application according to positions			
Original	Image 1	Image 2	Image 3	Image 4
				
3-Original image	3-1 Simple change in the type of lines, shapes, and forms	3-2 Increase in repeating lines and shapes and maintaining the form distribution	3-3 Maintaining the type of lines and shapes and repeating the forms	3-4 Change in type and increase in the distribution of lines, forms, and shapes

- I agree with drawing inspiration from the experiences of others so that personal designs can be renewed.

Image 1.2 was changed by altering the properties of lighting (type, colour, and intensity) and distribution proportions of the colour scheme by increasing the number of colours (Fig. 3).

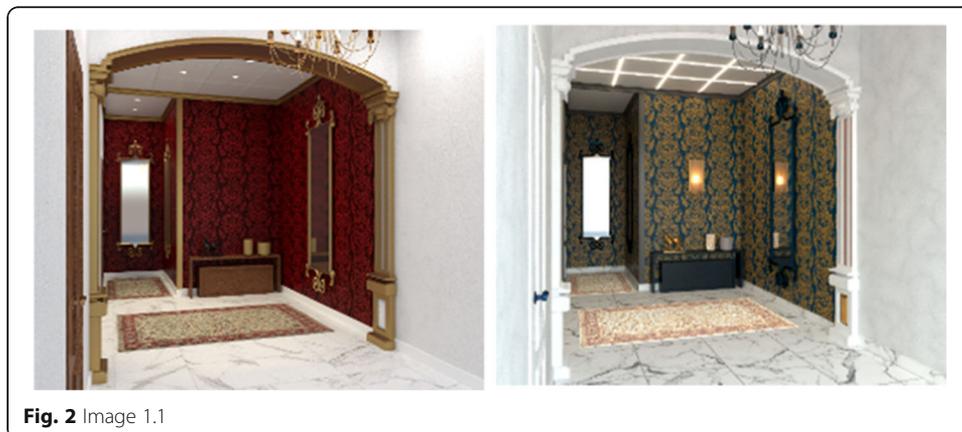
In response to the question on whether the altered image was a copy of the original, 28 (93.33%) respondents stated yes, and 2 (6.66%) responded no. In response to the question on whether copying this image was acceptable, 6 (20%) said yes, and 24 (80%) said no. Some participants stated that changing the material was not copying even when it was a copy because some elements were not repositioned, such as a mirror. Some of the comments were as follows:

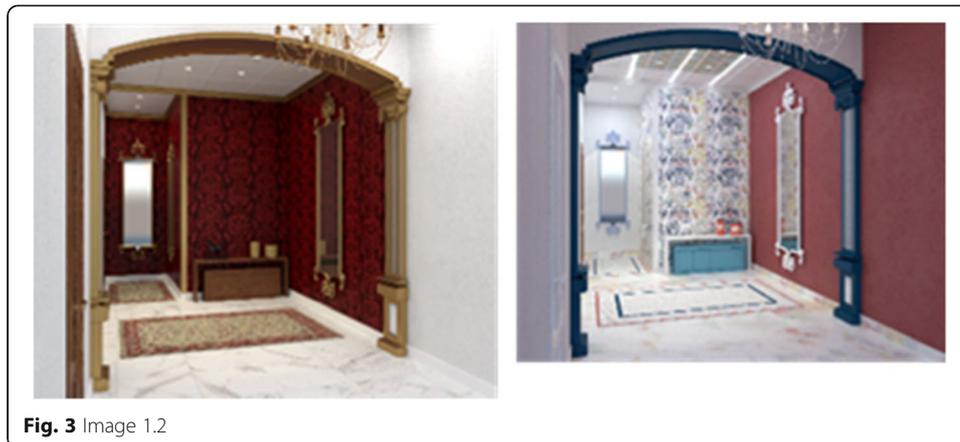
- As specialists, we see the similarity in shape and figures, but the public may not see this due to the colour difference.
- It may be acceptable in analyses of chromaticity and materials distribution, but furniture distribution remains the same.
- It is unacceptable because it is a fraudulent reproduction that relies on changing the colours and veneer of the material, and it keeps the whole structural composition of the original space 'hidden'.
- The design is still reproduced despite the change of finishing materials in the level of repetition and creativity.

Image 1.3 was altered by changing the lighting properties (type and intensity of colour) and distribution proportions in the colour scheme while reducing the number of colours (Fig. 4).

In response to the question on whether the altered image was a copy of the original image, 28 (93.33%) respondents stated yes, and 2 (6.66%) responded no. In response to the question on whether copying this image was acceptable, 6 (20%) said yes, and 24 (80%) said no. A participant commented, 'There is no innovation in the design of the space, and the matter remains at the level of elegance'.

In Image 1.4, the lighting properties remained the same while the existing colour scheme properties were changed (Fig. 5).





In response to the question on whether the altered image was a copy of the original image, 28 (93.33%) respondents stated yes, and 2 (6.66%) responded no. In response to the question on whether copying this image was acceptable, 8 (16.66%) said yes, and 22 (73.33%) said no. Some of the comments were as follows:

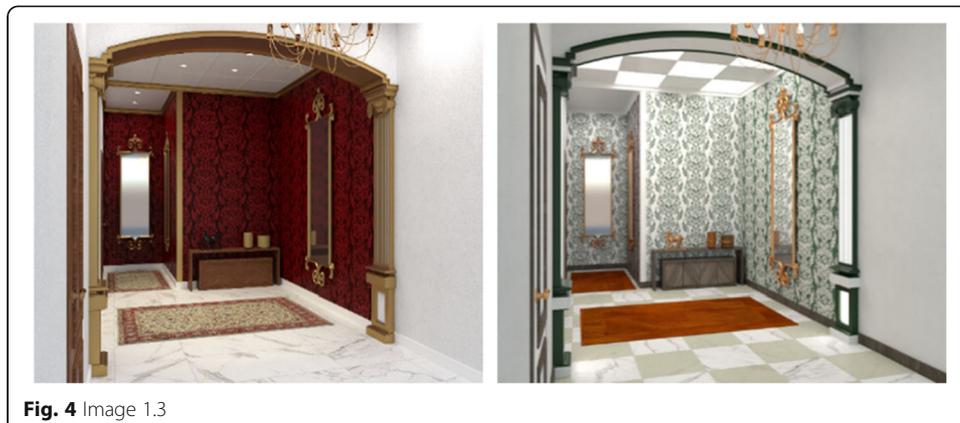
- Details on the space itself: There is only a change in the wall, floors, and ceilings.
- An acceptable step in space design and spatial identity control.

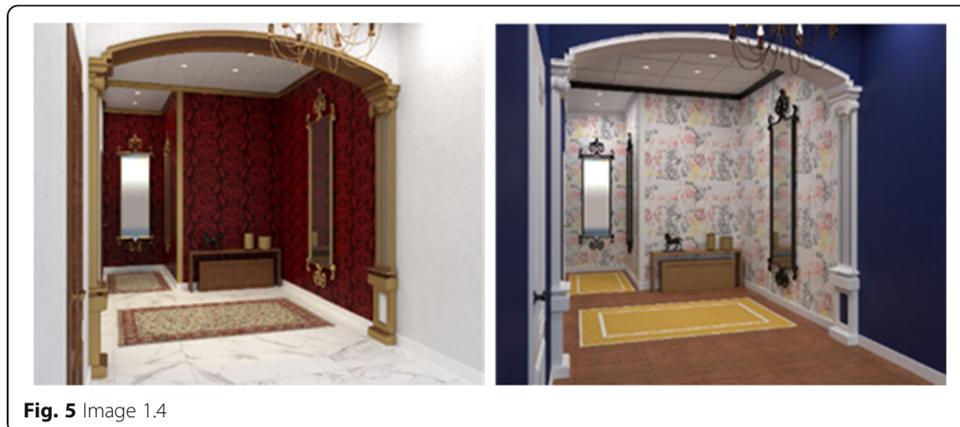
Second axis for changing the properties of the material

The material was changed on four levels, which is denoted in Images 2.1 to 2.4 (Table 5). In Image 2.1, the type of material was changed, but the number of materials remained the same (Fig. 6).

In response to the question on whether the altered image was a copy of the original image, 22 (73.33%) respondents stated yes, and 8 (16.66%) responded no. In response to the question on whether copying this image was acceptable, 12 (40%) said yes, and 18 (60%) said no. A participant commented that it was ‘an acceptable step at the level of space design and spatial identity control’.

Image 2.2 maintained the type of materials and changed the juxtaposition (Fig. 7).





In response to the question on whether the altered image was a copy of the original image, 22 (73.33%) respondents stated yes, and 8 (16.66%) responded no. In response to the question on whether copying this image was acceptable, 14 (46.66%) said yes, and 26 (53.33%) said no. Some of the comments were as follows:

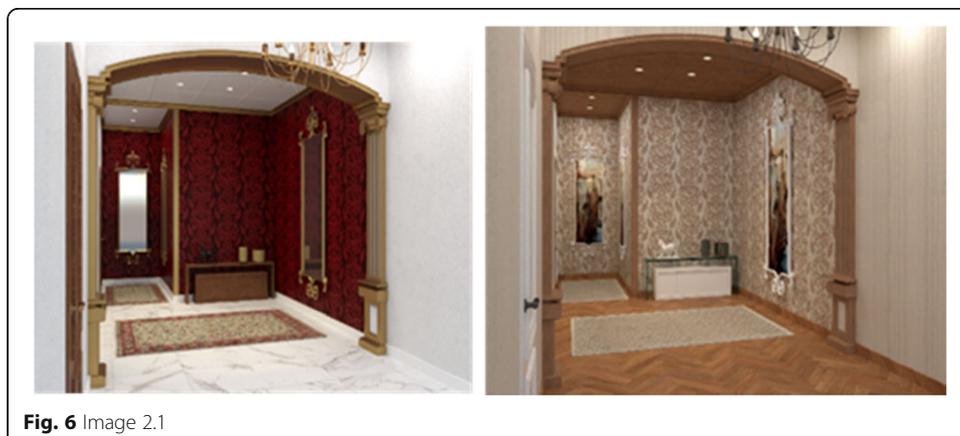
- The designer tried to change some things as the designer seems to be aware of the importance of the elements to change the space.
- There is a proportion of renewal in terms of the structuring of the space.

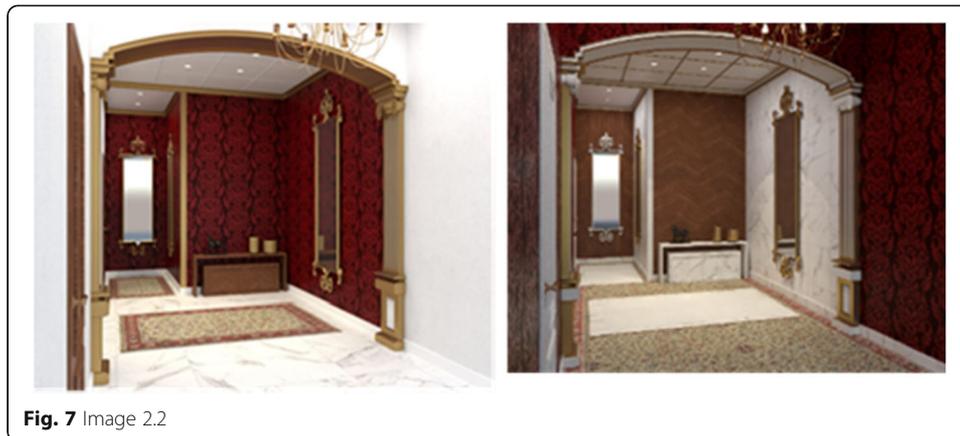
Image 2.3 had a difference in juxtaposition and area proportions (Fig. 8).

In response to the question on whether the altered image was a copy of the original image, 22 (73.33%) respondents stated yes, and 8 (16.66%) responded no. In response to the question on whether copying this image was acceptable, 14 (46.66%) said yes, and 26 (53.33%) said no. One participant commented as follows: 'Adopted the colours element and makes an addition in the design'.

Image 2.4 maintained the type of materials while the number of materials increased (Fig. 9).

In response to the question on whether the altered image was a copy of the original image, 26 (86.66%) respondents stated yes, and 4 (13.33%) responded no. In response to the question on whether copying this image was acceptable, 8 (26.66%) said yes, and





22 (73.33%) said no. One participant commented as follows: ‘There is a distinctive demonstration of the depth of space’.

Third axis related to the change of line, form, and shape

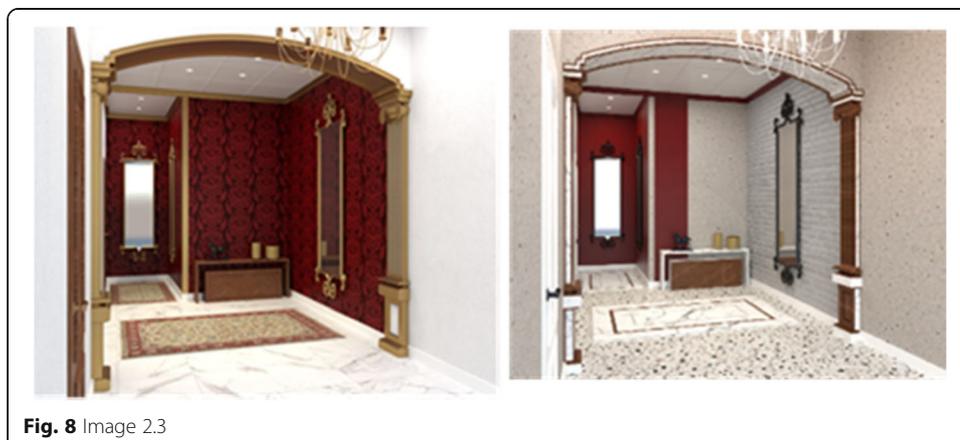
The line, form, and shape were changed on four levels in Images 3.1 to 3.4 (Table 4). Image 3.1 was altered by changing the direction of the lines and forms and the distribution of the shapes (Fig. 10).

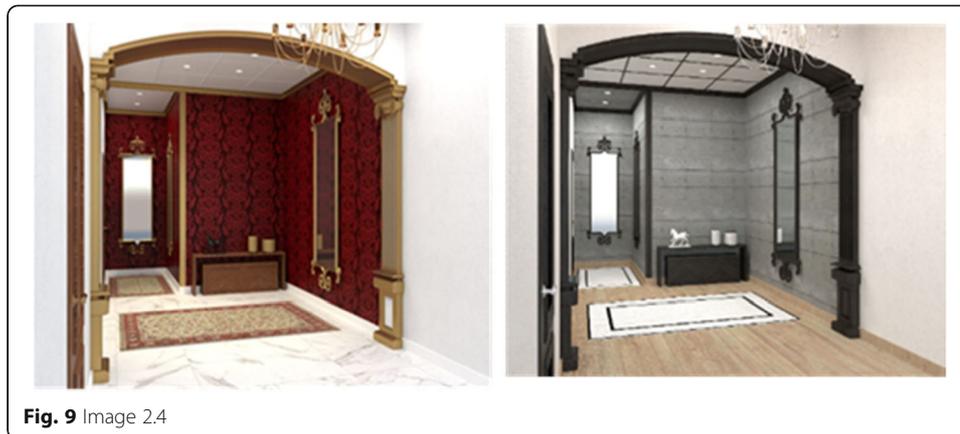
In response to the question on whether the altered image was a copy of the original image, 22 (73.33%) respondents stated yes, and 8 (26.66%) responded no. In response to the question on whether copying this image was acceptable, 8 (26.66%) said yes, and 22 (73.33%) said no.

Image 3.2 was altered by increasing the repeating lines and shapes and maintaining the distribution of the forms (Fig. 11).

In response to the question on whether the altered image was a copy of the original image, 30 (100%) respondents stated yes, and none (0%) responded no. In response to the question on whether copying this image was acceptable, 4 (13.33%) said yes, and 26 (86.66%) said no. A participant commented as follows: ‘Full copying with no renewal’.

The direction of the lines and shapes were maintained in Image 3.3, and the forms were repeated (Fig. 12).



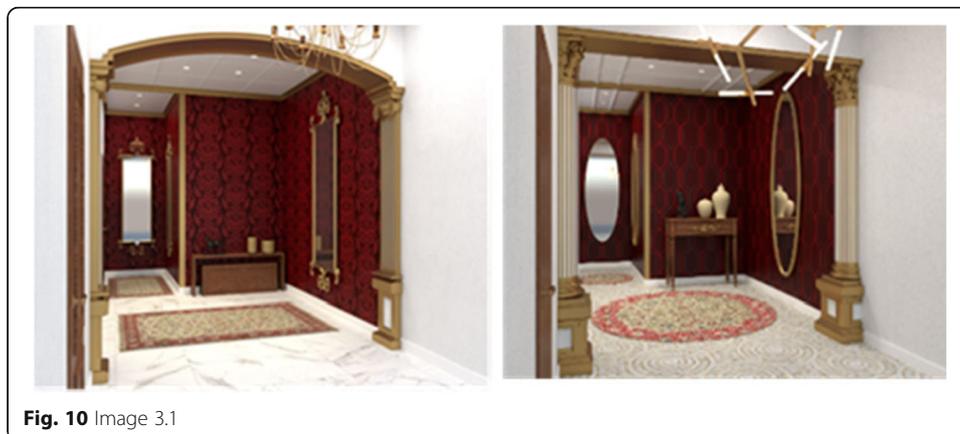


In response to the question on whether the altered image was a copy of the original image, 30 (100%) respondents stated yes, and none (0%) responded no. In response to the question on whether copying this image was acceptable, 2 (6.66%) said yes, and 28 (93.33%) said no. Some of the comments were as follows:

- The locus function varies, resulting in completely different spatial content and thus spatial complements.
- The change is fundamental to the structure of depth, distribution, and furnishing as well as a comprehensive range of visual components of colours and materials.
- The spatial output differs from the original.

Image 3.4 was altered by changing the type, density, and distribution of the lines, forms, and shapes (Fig. 13).

In response to the question on whether the altered image was a copy of the original image, 16 (53.33%) respondents stated yes, and 14 (46.66%) responded no. In response to the question on whether copying this image was acceptable, 6 (20%) said yes, and 24 (80%) said no.



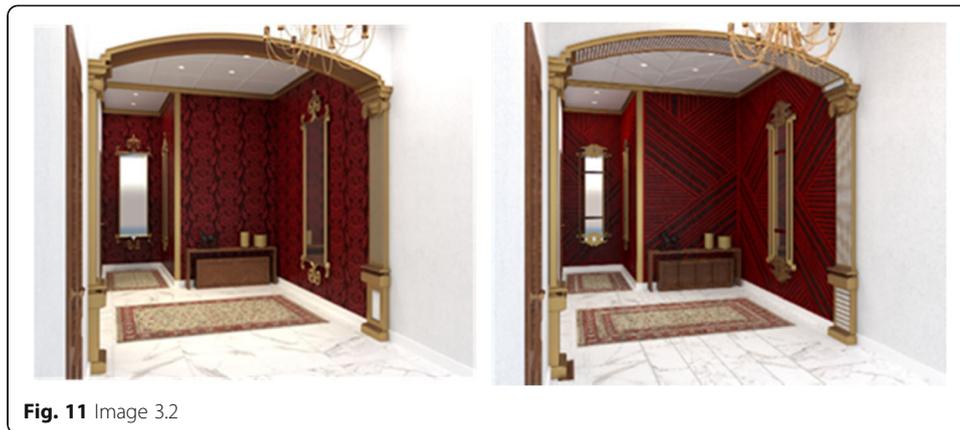


Fig. 11 Image 3.2

Discussion

In the first axis of colours and lighting, a high number of academics agreed that changing the colours and lighting while retaining the other elements was plagiarism. This was true even if the lighting properties were changed (type and intensity of colours), the colour scheme was maintained with the same number of colours and distribution ratios (Fig. 3), the number of colours was changed (Fig. 4), the lighting properties were maintained, and the properties of the existing colours scheme were changed (Fig. 5).

The responses were not consistent in terms of what constituted plagiarism for the participants. The highest number of respondents who agreed that the copy was acceptable reached 93.33% while the highest number of respondents who thought that the copy was unacceptable reached 80%. In Fig. 5, the lowest rates were recorded for nonacceptance.

Most of the respondents considered that the rate of difference between the original image and the images with different levels of light and colours was low, and they found it unacceptable. This confirms that, for interior design academics, changing the properties of the physical structure of a space in terms of light and colours while maintaining the rest of the properties is a form of visual plagiarism.

For the second axis of materials, the number of respondents agreeing that the copy was acceptable reached 73.33% while the number of respondents who found the copy unacceptable reached 26.66% in the first three figures. In the last figure, Fig. 13, the

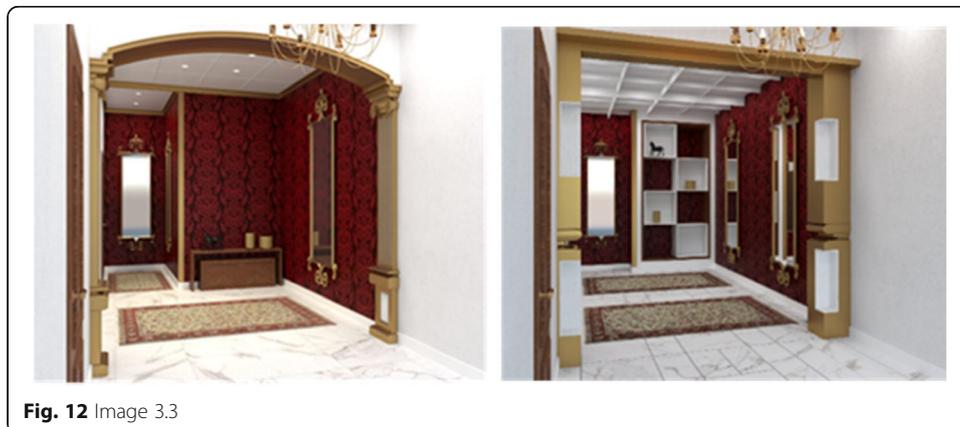


Fig. 12 Image 3.3



acceptance rate was higher at 26.66% whereas the respondents agreed that the lack of acceptance of the copied work was the first in the rise in the whole axis.

In other images, the visual composition of the space in terms of the properties of the material (distribution, shape, and type) were changed while maintaining the rest of the properties. However, the type of materials was changed while the distribution proportions were maintained, and the form was changed. In these images, the respondents could recognise the copies; however, the views converged between nonacceptance and acceptance, confirming that visual plagiarism was not evident for the participants.

Line, form, and shape were manipulated by changing the direction of the lines and forms and the distribution of the shapes (Fig. 10). The dependence of density in repeating the lines and shapes and preserving the distribution of forms is illustrated in Fig. 13. The direction of the lines and shapes and the repetition of forms were maintained, as illustrated in Fig. 11. The type, intensity, and distribution of lines, forms, and shapes were also changed, as illustrated in Fig. 13. The respondents agreed here that these were copies but accepted them at a rate of 73.33%. When the repetition of lines and shapes was changed and the distribution of the forms was maintained, all the respondents agreed that the image is a copy. This was the only agreement in all stages with the highest acceptance rate at 93.33%. In this axis, the respondents agreed that the altered image was a copy; however, the rate of their acceptance of the work was higher than for the other axes.

The rates for applying variables at the level of line, form, and shape properties appear to be affirmative in terms of whether the participants considered the altered images to be copies (except the position of simple change, position 1). However, most of the respondents accepted the copied work at relatively high rates. The rate of nonacceptance of copying in this way was also relatively high (position 2), confirming that visual plagiarism was not evident to the interior design academics and that it is not possible to affirm the property changes of the visual composition of space in terms of line, form, and shape properties (distribution, intensity, and type) while maintaining the rest of the properties. This confirms Garrett and Robinson's (2012a) view of '[t] he perceived lack of consistency of visual plagiarism in approach between colleagues'. This context simply adds to the complexity facing academics when recognising and verifying visual plagiarism.

Conclusion

The visual reading of a space is based on several concepts, most importantly the visual composition of space represented by line, form, shape, texture, time, colour, and light. In this context, those managing the design process can 'consciously or unconsciously' copy from images of others' works. However, as Hoepner (2021) argues, designing within any definable style necessarily involves a degree of imitation. Plagiarism can involve an element, several elements, or parts or several visible parts of the spatial components that appeal to designers, inspire them, or express their ideas. In general, the processes of transcription and their interpretations are complex and may reach degrees in distinction in the private situations revealed by this study. As Corrigan explained, 'You don't physically take something from someone else and exactly copy it; you re-interpret it for a new situation' (Hoepner 2021).

The study findings can be summarised as follows:

- (1) Changing the properties of the visual composition of space in terms of light and colours while preserving the rest of the properties is considered visual plagiarism.
- (2) Applying the variables at the level of material properties despite the high number of respondents regarding them as copies converged between acceptance or nonacceptance, confirming that visual plagiarism is not apparent to interior design academics and that it cannot be confirmed with regard to changing the properties of the visual composition of the space in terms of materials (distribution, shape, and type). Changing the type of materials while adopting the same proportions of distribution and change in shape can be considered plagiarism.
- (3) When applying the variables at the level of the properties of the lines, forms, and shapes, despite the affirmative rate (100%) indicating that the respondents consider them copies, relatively high rates of unacceptance were observed, which also confirms that visual plagiarism in the field of interior design from this angle is not evident to academics. Additionally, this cannot be confirmed with regard to changing the properties of the visual composition of the space in terms of lines, forms, and shapes (distribution, intensity, type) while maintaining the rest of the properties.

Accordingly, the possibility of plagiarism is reflected at multiple levels, and the impressions varied according to the visual effects produced by the property manipulated. There has been no in-depth research on plagiarism in interior design, and the few studies pertaining to visual sciences use data unrelated to interior design and can only be used in certain and limited cases because of the specificities of this field. This demonstrates the necessity of this research.

This study provides the basis for future research on visual plagiarism in the field of interior design, which has a deterministic relationship with the content and classification of plagiarism. Using this approach, it would also be possible to study the classification and assignment of penalties that can be imposed. This study has limitations, specifically regarding the level of simplicity of the project; it would be difficult to use this method with more complex studies. It is also necessary to examine the context of higher education institutions and consider their academic integrity policies or plagiarism policies.

Given this context, the researchers recommend the following to educators (designers in the academic sector of architectural and interior design)

- Adopt visual plagiarism as a fundamental concept that must be dealt with, not as an incidental element of students' projects.
- Frequently use the primary methods for detecting visual plagiarism in interior design student projects (e.g., Google image, TinEye, ...) to help identify the mechanism of plagiarism and give more specific knowledge and experience.

The researchers recommend the following to the concerned authorities (at the level of program coordinators, colleges and universities, and professional profile)

- Create committees to activate the role of the academic interior designer in studying projects by considering plagiarism through the available tools as a necessity, not a luxury. It should be related to all student projects for all levels of specialization in interior design departments.
- Consider the necessity of defining procedural policies and a clear increase within the requirements for considering acquisition, especially as it enhances the concept of integrity.
- Conduct future in-depth studies of plagiarism in the field of interior design.
- Organise many workshops on plagiarism, especially how to use technology to identify plagiarism in interior design projects.

Acknowledgements

The researchers thank everyone who contributed to the development of their work and facilitated of data collection.

Authors' contributions

Dr. Donia Bettaieb has designed the methodology. She collected and analyzed the data with the contribution of all other authors. Dr. Abeer Alawaad have helped in literature review, discussion and making the questionnaire with interview format with the contribution of all other authors. She also has read the manuscript with the help of Prof Raif Malek. Prof. Raif Malek contributed for the initial literature review, design methodology and discussion. The author(s) read and approved the final manuscript.

Funding

The authors did not receive any financial support from any person or institution for this work. The study was carried out as a collaborative effort amongst the authors.

Availability of data and materials

The literature review is based on analyses of published peer-reviewed research using standard word processing and annotation. Images, as an additional data, were produced and analysed by the authors. No custom software or codes were used to conduct analyses. Google™ SBI is an effective visual plagiarism detection function on Google™ Search by Image that permits the user to initiate a Google™ search using an image. 'Google™ uses computer vision techniques to match your image to other images in the Google™ Images index and additional image collections' (Google 2012). It is aptly referred to as a content-based image retrieval system tool (Van Heerden 2014).

3D Studio Max program is a professional 3D computer graphics program for producing 3D images, animations, models, and games.

Declarations

Competing interests

The authors have no relevant financial or non-financial interests to disclose.

Author details

¹Department of Interior Design and Furniture, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia.

²Department of Architecture, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia.

Received: 12 May 2021 Accepted: 12 January 2022

Published online: 29 March 2022

References

- Alawad AA, Bettaieb DM, Malek RB (2018) Plagiarism: the main reasons for its widespread use amongst students theoretical framework behind students' plagiarism. *Int J Current Res* 10(2):65235–65239 https://www.researchgate.net/publication/332275491_PLAGIARISM_THE_MAIN_REASONS_FOR_ITS_WIDESPREAD_USE_AMONGST_STUDENTS_THEORETICAL_FRAMEWORK_BEHIND_STUDENTS%27_PLAGIARISM
- Alawad AA, Bettaieb DM, Malek RB (2020) Self-plagiarism in students' interior design projects from an academic perspective. *Int J Manag* 11(10):1370–1382 <http://www.iaeme.com/IJM/issues.asp?JType=IJM&VType=11&IType=10>
- Auf A (2014) Abou of Tarek, site analysis 2014. Sky Publisher
- Auf A (2015) Abou of Tarek, design concept 2015. Sky Publisher. https://ia903103.us.archive.org/5/items/content_4/content_4.pdf
- Bickman L, Rog DJ, Hedrick TE (2009) Applied research design: a practical approach. *Handb Appl Soc Res Methods* 2:3–43. <https://doi.org/10.4135/9781483348858.n1>
- Blythman M, Orr S, Mullin J (2007) Reaching a consensus: Plagiarism in non-text-based media. https://cpb-eu-w2.wpmucdn.com/blogs.brighton.ac.uk/dist/7/3977/files/2018/03/Reaching_A_Consensus_Plagiarism_In_Non-T-v0k6k9.pdf. Accessed 27 May 2021
- Caplan AL, Redman BK (2018) Plagiarism. In: Caplan AL, Redman BK (eds) *Getting to good*. Springer, Switzerland, pp 261–370. https://doi.org/10.1007/978-3-319-51358-4_7
- Cleary MN (2017) Top 10 reasons students plagiarise and what teachers can do about it (with apologies to David Letterman). *Phi Delta Kappan* 99(4):66–71. <https://doi.org/10.1177/0031721717745548>
- Dalal N (2015) Responding to plagiarism using reflective means. *Int J Educ Integr* 11(1):4. <https://doi.org/10.1007/s40979-015-0002-6>
- Garrett L, Robinson A (2012a) Spot the difference! Visual plagiarism in the visual arts. *Br Comput Soc (BCS)*:24–33 <https://core.ac.uk/display/9427953>. Accessed 27 May 2021
- Garrett L, Robinson A (2012b) Spot the difference! Plagiarism identification in the visual arts. *Electron Vis Arts* 2012 (EVA 2012):24–33
- Gibson JJ (1977) The theory of affordances. In: Shaw R, Bransford J (eds) *Perceiving, acting, and knowing: toward an ecological psychology*. Lawrence Erlbaum Associates, Hillsdale, pp 67–82
- Gosling SD, Gifford R, McCunn L (2013) The selection, creation, and perception of interior spaces: an environmental psychology approach. In: Brooker G, Weinthal L (eds) *The handbook of interior architecture and design*. Bloomsbury Academic, London, pp 278–290. <https://doi.org/10.5040/9781474294096.ch-020>
- Hedrick TE, Bickman L, Rog DJ (1993) *Applied research design: a practical guide*. Sage Publications, Newbury Park, CA. <https://doi.org/10.4135/9781412983457>
- Hoepner K (2021) What does it mean to plagiarise in the design world? *Architectural digest*. <https://www.architecturaldigest.com/story/what-does-it-mean-to-plagiarize-in-the-design-world>. Accessed 27 May 2021
- Howard RM (2001) Forget about policing plagiarism: just teach. *Chronicle* 11(16):1–4 https://abacus.bates.edu/cbb/events/docs/Howard_ForgeT.pdf
- Hurtik P, Hodáková P (2015) FTIP: a tool for an image plagiarism detection. In: 7th international conference of soft computing and pattern recognition (SoCPar). IEEE, pp 42–47
- Kilmer R, Kilmer WO (1992) *Designing interiors*. Wadsworth, Cengage Learning
- Nussbaumer LL (2013) *Human factors in the built environment*. Bloomsbury Academic, London
- Park C (2003) In other (people's) words: plagiarism by university students-literature and lessons. *Assess Eval High Educ* 28(5): 471–488. <https://doi.org/10.1080/02602930301677>
- Ryerson University (n.d) Best practices: Preventing visual plagiarism. <https://www.ryerson.ca/content/dam/academicintegrity/for-faculty/educational-tools/VisualPlagiarism.pdf>. Accessed 27 May 2021
- Simon S (2016) Academic integrity in non-text-based disciplines. In: Bretag T (ed) *Handbook of academic integrity*. Springer, Singapore, pp 763–782. https://doi.org/10.1007/978-981-287-098-8_61
- Starovoytova D, Namango SS (2016) Viewpoint of undergraduate engineering students on plagiarism. *J Educ Prac* 7(31):48–65 <https://files.eric.ed.gov/fulltext/EJ1122526.pdf>
- Van Heerden L (2014) Detecting internet visual plagiarism in higher education photography with Google™ search by image: proposed upload methods and aspect evaluation. Central University of Technology, Free State, Dissertation
- Walker B (2009) New twists on an old problem: preventing plagiarism and enforcing academic integrity in an art and design school. *Art Doc J Art Libr* 28(1):48–51. <https://doi.org/10.1086/adx.28.1.27949510>

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.