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Designing Effective Presentation Boards in Industrial Design Education

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ABSTRACT
Product proposals developed within the scope of design studio courses, which are the backbone of the curriculum in industrial design education, are presented to jury evaluation through presentation boards prepared in printed or digital format. Presentation boards function as the ultimate visual communication tool between the designer and the client in professional life and between the student and the jury in educational life. In addition to the quality of the design proposal, the quality of the presentation board in terms of form and content is also effective in the final evaluations of the customer or jury. With the aim of increasing industrial design students' awareness of the importance of presentation quality, the Presentation Board Analysis Module was designed within the scope of the ENT 382 Portfolio course in the 3rd-year curriculum of Gazi University Industrial Design Department. In this module, designed as a three-week workshop, students were first asked to create a visual material pool of presentation board samples. Then, they were expected to subject this pool to content analysis in groups. This study aims to reveal the criteria that need to be considered to prepare effective and successful presentation boards in industrial design. It proposes a constructivist pedagogical approach in which the student constructs the knowledge of the criteria. As a result of the study in which a total of 156 different product presentations were analyzed, three basic categories have been reached in the criteria that should be considered to design effective presentation boards: (1) criteria arising from the context in which the presentation will be made, (2) criteria related to the components and content of the presentation boards, and (3) criteria for the visual composition established with the components.
Keywords: Design Presentation, Presentation Board, Design Criteria, Industrial Design, Industrial Design Education

1. INTRODUCTION

In their professional lives, industrial designers must possess the ability to present their product ideas effectively to various stakeholders, such as customers, managers, and business partners (Industrial Design Institute, 2014). They must also be able to influence and convince these stakeholders that the product is worth implementing. Product proposals developed within the scope of design studio courses, which are the backbone of the curriculum in industrial design education, are evaluated at the end of the product development process by design juries, which include studio executives, other academicians, and sometimes professionals from the sector. These juries are also a rehearsal of presentation experience in professional life (Toros, 2020). In design juries held to evaluate design projects and receive expert feedback, students are positioned as future professional designers, and juries are positioned as employers or managers. In this way, students are prepared for the experiences they will have in their professional life (Ilgaz and Korkut, 2013).

In design juries, the evaluation of product proposals is generally carried out through presentation boards designed to suit the presentation context and 3D scale models or prototypes. According to the study investigating design educators' expectations regarding the elements that should be included in an ideal product design presentation (Özgen et al., 2014), in product design presentations, perspective images of the product taken from

different angles, visuals describing the usage scenario and the relationship of the product with the user; technical drawings such as orthographic views and sections; scaling; visuals showing the product development process; critical details such as production details, materials, colors; expressions explaining what the problem is and what the design responds to; scale or one-to-one scale models; to verbal expressions; written statements; the product's short title and animations should be included.

Presentation boards prepared by students at different levels of competence in different classes vary in terms of both format and content. In the first years of their undergraduate education, students who have not yet or are just getting acquainted with computer-aided design programs are expected to produce multiple sheets of A3 or A2 size, generally prepared with hand drawings and sketches. At the 3rd and 4th grade levels, students are now expected to present to the jury evaluation with presentation boards produced digitally using computer-aided graphics programs, consisting of product images modeled in 3D computer-aided design programs and rendered using photorealistic visualization programs. It is possible to observe that as the grade level increases, the board sizes become larger, and the format becomes more well-defined. For example, the Gazi University Industrial Design Department Graduation Project board format has been, for many years, at least two A0-size horizontal or vertical presentation boards, one of which is a concept board and the other a technical board (Figure 1, Figure 2).

Figure 1: Concept presentation board example of graduation project (M. Hanefi Gürler's project, author's archive)

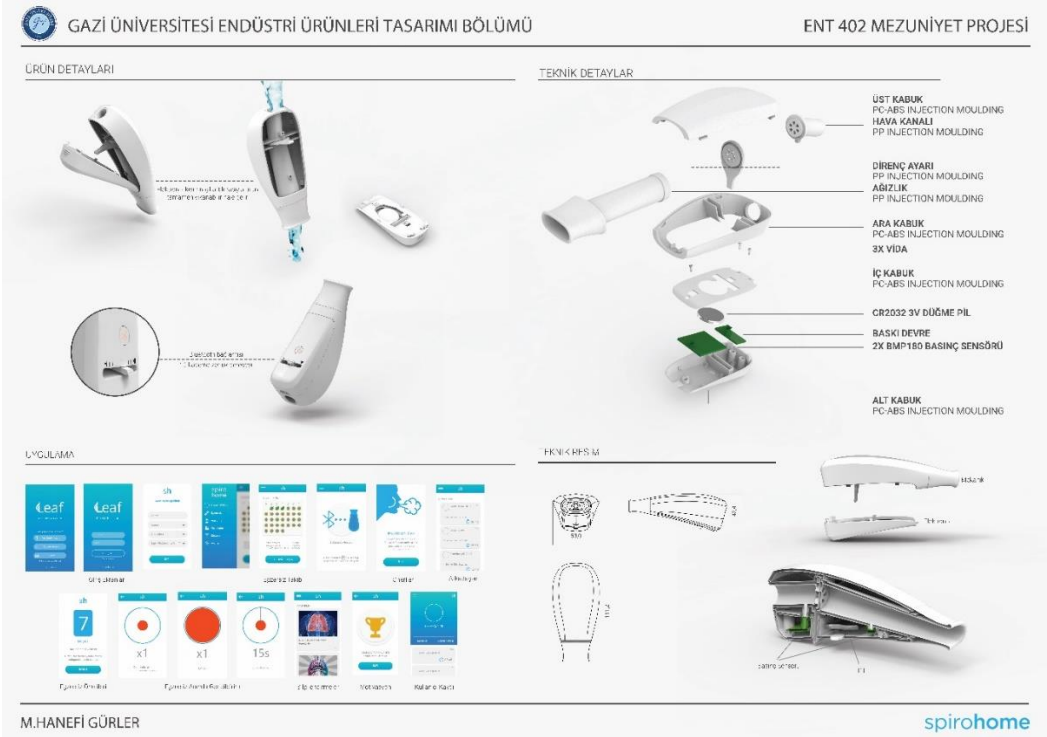


Figure 2: Technical presentation board example of graduation project (M. Hanefi Gürler's project, author's archive)

Nowadays, pixel or vector-based computer-aided graphics programs are generally used when preparing presentation boards. Adobe Photoshop, Adobe Illustrator, Adobe InDesign, and Corel Draw are among the most frequently used graphic programs in industrial design. To provide students with the competencies related to these programs, courses such as Graphic Applications in Design, Digital Product Visualization, Digital Presentation Techniques, and Computer Aided Presentation Techniques are included in the industrial design curricula. Presentation boards prepared using these programs are presented in print or digital format, depending on the type of evaluation, and are used in different formats depending on the need of the presentation.

In addition to criteria such as innovation, creativity, functionality, aesthetic quality, ergonomics, suitability for production, level of detailing, and sustainability of the design proposal, the quality of the presentation is also very effective in the final evaluation. The competencies students have gained in presentation board design throughout their education are then transferred to their personal portfolio designs. Designers/designer candidates apply for jobs by telling employers what kind of designer they are through their projects in their portfolios, and whether the job application will result in a positive or negative outcome is entirely dependent on the quality of their product design presentations. No matter how high the quality of the design proposal, it is not possible to convey it to the other party with a low-quality presentation. Based on this background, the Presentation Board Analysis Module was designed within the scope of the ENT 382 Portfolio course in the Gazi University Industrial Design Department 3rd year curriculum. Its aim is to increase the awareness of undergraduate industrial design students about the importance of presentation quality. In the module, which is designed as a three-week and three-stage workshop, a process was developed in which students will build theoretical knowledge on what they need to pay attention to create high-quality presentation boards by analyzing concrete examples. This process, proposed by adopting a constructivist pedagogical approach, aims to develop students' critical thinking skills and encourage them to learn to design effective presentation boards through their own analysis.

The constructivist approach centers on the student and defines knowledge as something that is acquired, discovered, and constructed by the student rather than being owned, transferred, or dictated by the teacher (Milne and Taylor, 1995). The constructivist paradigm in design education occurs with the transition from a teaching-centered education model to a learning-centered education model, and the goal of this process is "learning to learn". Learning begins with developing ways of seeing and understanding the whole, and the parts related to the whole are detailed with the student's questions, curiosity, and interests (Aydınlı, 2015). The course lecturer acts as a pathfinder in the learning journey by creating a free learning atmosphere and dialogue environment (Milne and Taylor, 1995). Constructivist lecturers value students' perspectives, structure lessons in a way that challenges students' existing assumptions and allow students to shape and compare knowledge through discussion (Brooks and Brooks, 1999).

This study introduces the Presentation Board Analysis Module, which was designed in this context and experienced with 78 undergraduate industrial design students in two different academic years. The study aims to present a holistic reference framework regarding the criteria that should be considered in designing high-quality and effective product presentation boards.

2. METHOD

The Presentation Board Analysis Module, recommended within the scope of the ENT 382 Portfolio course conducted in the spring semester of the 2020-2021 and 2021-2022 academic years, was designed as a three-week, three-stage workshop. The stages of the workshop are as follows: (1) Creating a visual material pool, (2) Visual content analysis, (3) Presenting their synthesis. Students are first divided into groups of 5 to 6 people. They were informed about the pedagogical purpose of the study, implementation stages, and evaluation methods.

In the first stage of the workshop, students were asked to create a visual material pool. In this context, they were first expected to submit the jury presentation boards of the final product design projects they developed within the scope of the studio project of the previous semester. These boards were consciously chosen to create negative examples in the visual material pool. Since the researcher was also the lecturer of the students' studio courses, she was aware that the presentation boards were of poor quality and decided to handle them. She specifically asked the students to approach their boards with a critical eye. Afterward, they were asked to submit the high-quality examples they chose from international digital channels (e.g., Behance, Pinterest, Coroflot, Yanko Design, etc.) where industrial design board samples are shared. Visual samples were shared via Miro Board, an online whiteboard application, so everyone could access all visual materials. Figure 3 presents a section taken from the online Miro Board, where the analyzed visual material pool is created and shared.

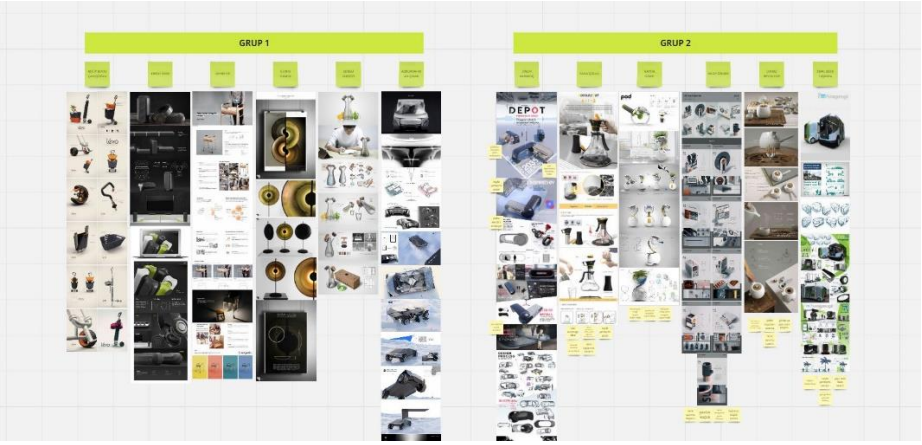


Figure 3: A section from the visual material pool

In the second stage of the workshop, students were asked to subject visual material samples to content analysis as groups and to reveal the codes and categories and the relationship between these codes and categories. It was expected that the content analysis would be shaped around two basic questions: (1) What are the qualities that enable a presentation board to be perceived as high quality? (2) What are the qualities that cause a presentation board to be perceived as poor quality? The sessions are structured so that each group evaluates the visual content delivered by the other group. Content analysis is a research method used to draw repeatable and valid conclusions from the text regarding its content (Krippendorff, 1980, 18). Here, the text is used in the sense of "things produced to have meaning for others." In addition to written texts such as printed material or the transcript of an interview, works of art, pictures, maps, sounds, signs, symbols, and artifacts can also be subject to content analysis (Krippendorff, 1980, 18). In this study, the visual material pool created by students was used as a data source. Each group carried out a qualitative content analysis on the visual material for which they were responsible in the light of the abovementioned questions. In parallel with the analysis carried out by the students, the researcher also conducted content analysis on the same visual material.

In the third session of the workshop, students were expected to synthesize the findings of the analysis and present the criteria they proposed by associating them with board samples. After cross-checking all the criteria suggested by both the students and the researcher and examining the statements, the final criteria list was reached.

3. RESULTS

The workshops were held with the participation of 78 students: 36 students from the 2020-2021 session (6 groups of six people) and 42 students from the 2021-2022 semester session (6 groups of five or six people). Within the scope of the study, 156 different product presentations were evaluated. The number of boards used for each product presentation varied from a minimum of 2 to a maximum of 12.

As a result of the study, three basic categories of criteria that should be considered when designing effective presentation boards were reached:

1- Criteria arising from the context in which the presentation will be made
2- Criteria related to the components and content of the presentation boards
3- Criteria for the visual composition established with the components

3.1. Criteria Arising from the Context in Which the Presentation will be Made

It has been observed that the context in which the presentation will be made is effective in making basic decisions regarding the presentation board. What is meant by context here are physical conditions such as where, how, and to whom the presentation will be made and how the evaluation will be (open or closed jury). In industrial design education, presentations can be made by hanging printed physical boards on the wall or panel, sharing digitally prepared boards from the computer screen, or projecting them on the physical screen. Evaluation can also take place online in the context of distance education. An online presentation allows participants and evaluators to follow the boards directly from their computer screens. Evaluation in design education is generally carried out through open juries. In open juries, students can verbally explain their projects to the jury members and have the chance to answer the jury members' criticisms and questions. However, in some cases, evaluation can also be made through a closed jury. Closed juries are juries that do not allow students' oral presentations and criticism environment, and feedback is generally provided only through grading (Tok & Potur, 2016). Closed juries are not preferred in design education because they do not allow criticism, discussion, and interaction. However, evaluations in design competitions are generally conducted through closed juries. In the boards prepared for these closed evaluations, where the jury is required to be alone with the sheets and understand the project on their own, the scope and understandability of the content and the design of the content flow in a way that can be followed correctly (as desired by the designer) gain significant importance.

Board size, orientation, number of boards, board format (digital or print), image resolution, and content flow should be determined based on the specific presentation context. For example, horizontally flowing content should be preferred when preparing a presentation to be made remotely and followed on a computer screen, considering the commonly used widescreen ratio of 16-9 instead of a vertical and long thin format. In a context where face-to-face and printed sheets will be hung on the board, the designer must decide the format, considering how far away the evaluators will view the sheets. For example, if the jury sits 3 meters away from the board, the explanatory text on the sheet should be at least 24 font size. While lower resolutions can be used in digitally prepared sheets, high resolutions should be used in the sheets to be printed. If large sizes and a limited number of boards will be used, the flow should be provided in the sheet content; if many boards of small sizes will be used, the boards should be hung or sorted according to flow. In some cases, the number of boards can be limited by the evaluators. For example, some design competitions may have a single-board restriction. In this case, it is necessary to layer the information to present rich content effectively and compactly.

3.2. Criteria Related to the Content and Components of the Presentation Boards

The expected content of a product presentation board was determined as follows:
1-Design problem definition: Answers to the questions include who the product was designed for, the context of its use, the type of problem it addresses, and the tasks it performs.
2-Product development process: Visuals that answer questions about the design process, variations, eliminations, and decisions made.
3-General views: Perspective views of the product taken from different angles and the context of use (who uses it, where, for what purpose, and in what way).
4-Product-user relationship: Describes how the product is used, what is included in the interaction, and provides a step-by-step usage scenario.
5-Technical Features: The technical drawings should include measured and scaled orthographic views, sectional views, and exploded drawings that depict the decisions about production methods and materials for the different components of the product. Additionally, details such as mechanisms, assembly diagrams, color, and surface finish should be included.

It has been determined that there are four basic components in industrial design presentation boards. These are: (1) Product images, (2) Texts, (3) Other visuals (3) Empty spaces. Visual compositions created using these four basic components constitute product presentation boards.

3.2.1. Product Images

Expectations for the quality of product images used in presentations differ based on the level of education. In the first years of education, products are visualized through hand drawings and hand-colored presentation illustrations. In the following years, photo-realistic renderings taken from 3D modeling of the final product are used. Product renderings can be defined as highly realistic visuals produced on perspective views to fully understand the appearance of the product (Pei et al, 2011). The quality of the render and the quality of the rendering frame should be considered to produce qualified presentation renders.
The factors that are effective in perceiving the rendering as high quality are:

- Producing images with high resolution and correct contrast settings,
- Using realistic material, color, and texture coatings,
- Lighting the product similar to the real world and correct reflection, glare, permeability, and shadow applications.

In Figure 4, two rendering examples, one of which is considered low-quality and the other is high-quality, are given under this heading from the visual material pool.

Low-quality High-quality

Figure 4: Product images examples in terms of the quality of the render (students' projects, author's archive)

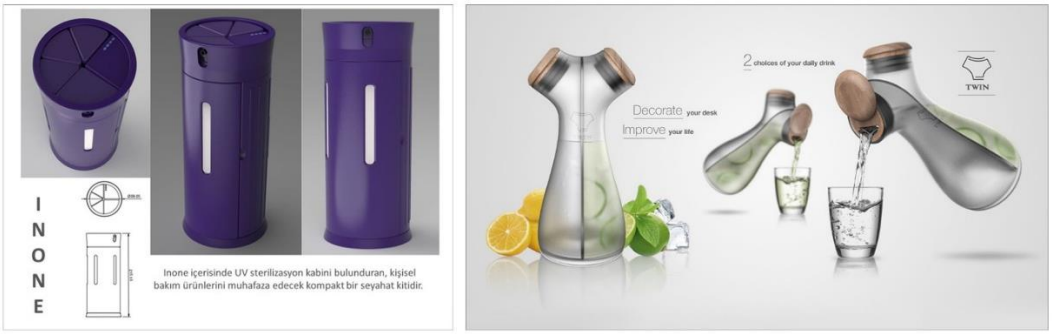
The rendering frame indicates the boundaries of the image to be created and determines how the visual elements will be included within this frame. When creating the frame, the aim should be to obtain a balanced and dynamic image that is far from monotony by ensuring that the emphasis is on the product. Things to consider when creating the frame of the render are determined as follows: (1) The rule of thirds, (2) Camera point of view, (3) Render Composition, (4) The balance between negative and positive space.

Within the scope of the analysis, it was observed that the rule of thirds was mostly followed in the product presentation renders that were found to be successful in terms of the quality of the rendering frame (Figure 5). The rule of thirds is a basic composition principle in photography, cinema, and visual arts (Präkel, 2006). It involves dividing the frame into nine equal parts with two equally spaced horizontal lines and two equally spaced vertical lines. The four points where these lines intersect are considered the points of interest in the composition. According to this rule, the main subject of the image should be placed at or near these points for a more visually appealing composition (Ankaraligil, 2013).

Figure 5: Board example: water mark dispenser (URL 1)

A virtual camera is generally used when producing product renderings in computer-aided visualization programs. The camera's perspective has been determined as another criterion that affects the quality of the rendering frame. The camera's perspective on the product increases or decreases the realism effect in the rendering. The point of view should be decided by considering the real-life size of the product and its relationship with the user. Lower angles should be used for large-scale products, upper angles should be used for small-scale products, and the eye level of a person of average height should be taken as a reference.

Using an isolated image of the product from a single angle or repetitions of isolated images from different angles in presentations has been evaluated as one of the problems encountered in the board samples. Multiple product placements, which allow the product to be seen from different angles in a single rendering frame; rich compositions that allow the product to be seen together with other components (e.g., packaging, other products it is associated with, etc.); and visualizations that allow different use cases of the product to be presented together has been observed that it creates a more dynamic visual perception. In Figure 6, two rendering examples are given, one of which is evaluated as low-quality and the other as high-quality, examined under this heading from the material pool.



Low-quality High-quality

Figure 6: Presentation board examples in terms of render composition (low-quality: student project, author's archive; high-quality: URL 2)

Another thing to consider when adjusting the rendering frame is the balance between negative and positive space. Examples of this criterion are given in Figure 7. When establishing a balanced rendering frame, empty space and the visual stain of the product are needed. Otherwise, the images produced will create a stifling and cramped perception.

Low-quality High-quality

Figure 7: Presentation board examples in terms of the balance between negative and positive spaces (low-quality: student project, author's archive; high-quality: URL 3)

3.2.2. Texts

Although presentation sheets are visual communication tools, written communication is also needed through explanations regarding the product, the context of the product, and the design problem definition. The relationship between the visual spots created through the texts on the sheet and the other components of the sheet directly affects the total composition. The criteria to be considered under this component are determined as (1) the density and distribution of the texts, (2) font selection, (3) font size selection, (4) color selection, and (5) the alignment of the text.

To create distraction-free compositions on presentation boards, text density should be kept at an optimum level, and the texts should be distributed on the board in a balanced and

regular manner. The very dense text should be avoided, and the texts should be placed by establishing visual proximity, considering their relationship with product images.

Readability should be taken into account when choosing the font to be used on the layout. It is recommended that fonts with high calligraphic features should not be preferred except when creating a corporate identity. Low serif and minimal, neutral fonts increase readability (Yum, 2020). As a result of the analysis, the following were determined as examples of fonts recommended to be used: Helvetica, Open Sans, Avenir Font, Futura, Lato, Gill Sans, and Gotham. It has been concluded that including more than one different font in the same sheet has a negative impact on visual consistency. In cases where more than one font is needed, it may be recommended to include different versions of the same font family (light, regular, italic, bold, etc.).

The size of the texts should be chosen based on their readability in the context in which the presentation will be made, and real-size typography scales should be used when making this selection. Texts in different hierarchies, such as headings, subheadings, and descriptions, should be visually separated. To achieve this, it is recommended that other members of the same font family use different font sizes proportionally (Kürşad, 2020).
The contrast of texts with the background color affects readability. When choosing text colors, colors that will convey the information in the best way and will not tire the viewer should be preferred instead of eye-catching and assertive colors.

Aligning text blocks to the right, left, or both sides ensures that the visual stain created by the text is perceived more clearly. Aligning the text block or blocks with other visual elements of the layout helps the presentation look more organized and professional (Figure 5).

3.2.3. Other Visuals
All visual elements except product images can be examined under this heading. Hand sketches of the design process, vector product drawings or technical drawings; drawings or photographs of the user or the context of use; drawings produced for the usage scenario; product name and logo; icons, symbols, and pictograms describing functions and tasks; operational charts or diagrams showing the relationships between components; charts used for data visualization; mock-up or prototype photographs; arrows, frames, lines; web or mobile app graphical interfaces are other visual elements encountered in industrial design boards.

3.2.4. Empty Spaces
Empty spaces should be considered and used as a visual component while preparing presentation boards. Negative areas that should be considered as part of the board layout allow other elements to breathe and help establish the visual hierarchy, increasing the readability of the sheet and obtaining a more aesthetically balanced and orderly presentation.

3.3. Criteria for the Visual Composition Established with the Components
In industrial design, basic design principles should be used when designing presentation sheets to effectively convey the product proposal to the other party and create a strong visual impact. The basic design principles that are expected to be observed in visual compositions established by organizing the basic components aesthetically can be listed as follows: Balance, order, harmony, hierarchy, contrast, proportion, part-whole relationship (Gürer, 1998; Öztuna, 2007).

Each element on the board has a visual weight, and the placement of elements on the boards determines how the weight is distributed. Certain layouts, particularly symmetrical and radial ones that prioritize a balanced composition, may seem monotonous. Establishing asymmetrical balance is recommended to break the monotony (Seylan, 2023).

Asymmetrical balance can be established by creating a dynamic perception by using different visual elements in proportion to each other.

The elements must be arranged and aligned in a regular manner to maintain order on the board. To achieve this and transfer the elements to multiple sheets similarly, designers may use invisible grid systems as a reference.

The visual hierarchy established among the elements guides the viewer through the rich content presented on the boards. The elements' position, size, and proportional relationship determine where emphasis will be placed and the order in which the layout will be followed.

Where and how the audience will be introduced to the product should be considered. Here, contrast in terms of color and size can be used to create dominance. The first renderings that the viewer encounters with the product proposal should be prepared to contain as much dominant and detailed information as possible. Distracting background images and colors, incompatible and very bright colors in text and graphics, overly detailed graphics, and intense use of text should be avoided.

Repetition in the content should be avoided, and each visual should be prepared and positioned to provide different information. If details are to be shown by zooming in on the product, the zoomed-in part should be clearly marked on the whole to convey the part-whole relationship to the viewer. It should be important that each element of the composition is in harmony with the others and that unity and integrity are achieved on the overall board. If more than one board will be used in presentations, the harmony and consistency of the boards with each other should be considered. To establish visual unity between boards, it is recommended to use the same size and orientation, common color schemes, common grid schemes and layouts, and common fonts.

4. DISCUSSION AND CONCLUSION

Industrial design presentation boards are the ultimate communication tool, where designers or design students present, evaluate, and test design proposals. In addition to the quality of the design proposal, the form-content consistency, visual aesthetics, readability, and understandability of the presentation board and the layout and organization of the composition are effective in the final evaluations of the jury or customers. Prospective designer students should gain awareness of the importance of presentation quality during their undergraduate education.

In line with this goal, a three-week Presentation Board Analysis Module was designed for the ENT 382 Portfolio course, which is part of the Gazi University Industrial Design Department's third-year curriculum. This module examined presentation boards within the curriculum and tried to reveal what should be considered when designing high-quality presentation boards. In the first stage of the 3-stage workshop designed to do this, students were expected to create a visual material pool. In the second stage, they were expected to subject the sheets in this pool to visual content analysis. In the last stage, they were expected to present their synthesis by associating it with examples. In parallel with the workshop, the researcher analyzed the same content, and the final criteria were revealed through cross-checks. The criteria detailed in the results section were basically presented under three categories:
(1) Criteria arising from the context in which the presentation will be made,
(2) Criteria related to the content and components of the presentation boards,
(3) Criteria for the visual composition established with the components.

The criteria resulting from the study constitute a reference framework for industrial design students. The reference framework for designing high-quality product presentation boards is summarized and visualized in Figure 7.

It is recommended that decisions regarding the number of boards, size, resolution, orientation, and sheet content flow be determined according to the medium and manner of the presentation and how the jury evaluation will be conducted. The study revealed the components and content of the presentation board. A standard industrial design presentation sheet should include the design problem definition, product development process, general appearance of the product, product-user relationship, and technical specifications. The basic components of presentation sheets are product images, texts, other visuals, and empty spaces. Criteria to consider regarding the components for a successful and effective presentation include the quality of the render, the framing of the render, the camera's perspective and the balance between negative space and positive space in the render, the density and distribution of the texts used, font selection, font color selection, font size selection, and the alignment of the text, the quality of other images produced, and the need for negative space. Balance, order, harmony, hierarchy, contrast, proportion, harmony-harmony, part-whole relationship, and consistency between boards were determined as the things to consider when creating a visual composition.

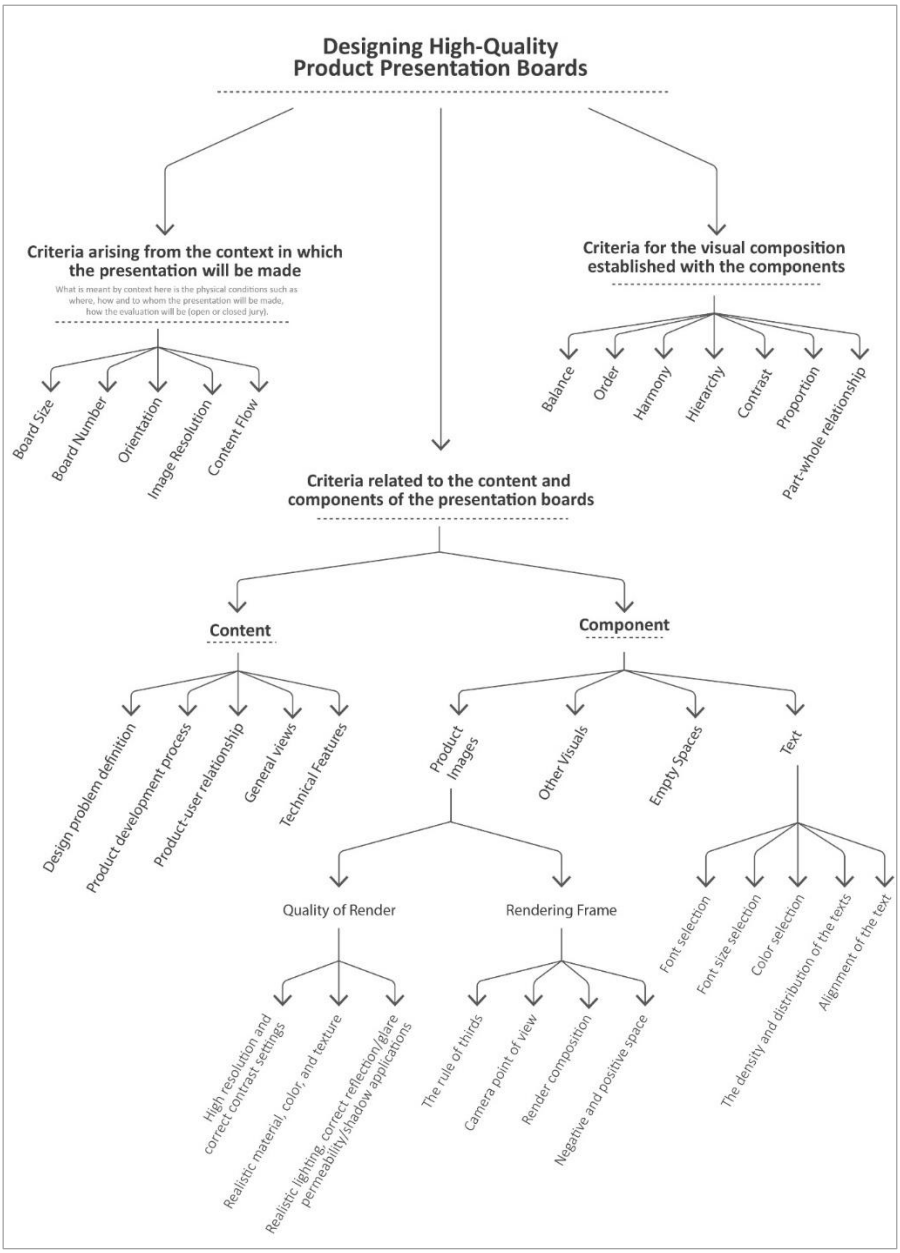


Figure 8: Reference framework for designing high-quality product presentation boards

The method applied in this study adopted a student-centered pedagogical approach, and students were encouraged to work in groups interactively and with active participation. Students who analyzed the visual material pool they produced assumed the role of researcher and constructed the knowledge regarding the reference frame revealed at the end of the study. This process, designed with a constructivist approach, encouraged students to develop their critical thinking skills. The researcher observed that after this three-week workshop, there was a visible improvement in the students' product presentation quality.

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