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Graphic references: collaborative dynamics for learning architectural communication

Referentes gráficos: dinámicas colaborativas para aprender a comunicar la arquitectura

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Abstract

The graphical representation of a project influences the first impression of an architectural proposal, making it essential for schools to teach effective visual communication. However, universities often lack structured methods for instructing these skills. This paper presents a multi-step pedagogical activity designed to foster critical reflection and enhance representation quality through self-assessment, blind peer evaluation, and asynchronous collaborative dynamics. Implemented in a fifth-year design studio, the activity consists of three phases: students first evaluate their own work, then anonymously assess their peers' work, and finally receive instructor feedback. Over two academic years, repeating the activity with the same students enhanced collaboration and sharing of peers' knowledge. By integrating reflection on action and collaborative learning, the approach reinforces key concepts and offers an adaptable framework for architectural communication education.

Keywords: architectural project representation, self-assessment, peer-review, reflective practice, asynchronous collaborative dynamics.

Thematic areas: self-regulated learning, active learning, graphic ideation, architectural design.

Resumen

La representación gráfica de un proyecto arquitectónico condiciona su primera impresión, por lo que es clave enseñar a comunicar visualmente con eficacia. Sin embargo, las escuelas carecen de metodologías estructuradas para ello. Este artículo presenta una actividad pedagógica por fases para fomentar la reflexión crítica y mejorar la calidad de la representación proyectual. Implementada en un curso de quinto, primero los estudiantes evalúan su trabajo, luego el de sus compañeros de forma anónima y, finalmente, reciben feedback docente. Tras dos cursos académicos, repetir la actividad varias veces con el mismo grupo de estudiantes fomentó la colaboración y el intercambio de conocimiento entre iguales. Al integrar la reflexión sobre la acción y el aprendizaje colaborativo, este enfoque refuerza los contenidos teóricos y ofrece un modelo adaptable para enseñar a comunicar la arquitectura.

Palabras clave: representación del proyecto arquitectónico, autoevaluación, evaluación por pares, reflexión sobre la acción, dinámicas colaborativas asíncronas.

Bloques temáticos: metodologías de autorregulación del aprendizaje (MAA), metodologías activas (MA), ideación gráfica, proyectos arquitectónicos.

Resumen datos académicos

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Introduction

Architecture relies, at its core, on graphical communication. The representation of an architectural project determines the first impression of the entire proposal: a well-conceived design may be undervalued if poorly communicated, while a less impressive design, when skillfully represented, can capture immediate attention. This initial visual impact is critical, as the success of an architectural proposal often hinges on its graphical representation. So, students' competence to communicate graphically must be cultivated from the earliest stages of architectural studies and should be developed throughout their education (Salgado De La Rosa, Raposo Grau, and Butragueño Díaz-Guerra 2020).

However, teaching graphic criteria presents unique challenges. Unlike other technical disciplines such as structural engineering or construction, graphic representation is inherently subjective and intent-driven. Each project demands a tailored visual language that aligns with its scale, conceptual intent, and intended audience (Pallasmaa 2009). The complexity of teaching such skills lies in cultivating a critical eye rather than memorizing drawing techniques: students must learn to analyze what succeeds or fails in a representation, whether in their own work or that of others, and understand the underlying reasons. This absence of uniform criteria raises a fundamental question: how can educators teach students not only to design but also to visually articulate their ideas effectively, with precision and intent?

This paper presents a multi-step pedagogy designed to (1) cultivate critical reflection through structured self-assessment, (2) enhance visual communication skills by receiving peers' feedback, and (3) connect individual and collective learning, ensuring students engage meaningfully with diverse representational strategies. Additionally, this paper presents the results of two years of application of this activity in a fifth-year design studio in *Escola Tècnica Superior d'Arquitectura de Barcelona* (ETSAB), Universitat Politècnica de Catalunya (UPC).

1. Background

A teaching of architectural design modal that has been commonly used is Donald Schön's model of reflective practice, where learning emerges through a cyclical process of doing, reflecting, and refining (Schön 1987). In this framework, students engage in hands-on design activities, receive feedback from instructors, and iteratively adjust their work based on critical reflection. While this approach fosters individual growth and deepens students' understanding of design principles, it also presents limitations. Arentsen Morales (2019) highlights that students exhibit diverse learning styles, with some thriving in reflective, self-directed environments, while others struggle without structured guidance or collaborative interaction. This variability underscores a critical gap in traditional design pedagogy: the tendency for students to focus narrowly on their projects, often missing the broader learning opportunities embedded in their peers' work.

Contemporary architectural education has increasingly embraced collaborative learning models, which expand the scope of reflection beyond individual projects. By integrating peer critique and collective discussion, these models encourage students to engage with diverse representational strategies, thereby sharpening their ability to evaluate and adapt their own work (Salgado De La Rosa, Raposo Grau, and Butragueño Díaz-Guerra 2020). Research by design (R&D) further enriches this pedagogical shift by framing design as both a creative and an investigative process. When applied in studio settings, R&D transforms design into a dynamic, research-driven activity, where students document their processes, test assumptions, and contribute to broader architectural discourse (Groat and Wang 2013; García-Escudero and Bardí Milà 2024).

Yet, even within these evolving frameworks, the teaching of graphical communication often remains disconnected from core design education. Unlike technical disciplines where objective criteria prevail, graphical representation in architecture is inherently subjective, demanding specific approaches that align with a project's scale, intent, and audience. The challenge lies not in teaching drawing techniques but in cultivating a critical eye. Educators require learning tools to provide students with the capacity to not only design but also to articulate their ideas visually with precision and intent.

Collaborative and reflective pedagogies offer a compelling response. Learning communities and digital tools facilitate asynchronous collaboration, allowing students to refine their work (and learn) through iterative feedback (Rodríguez, Hudson, and Niblock 2018; Coello-Torres 2020; Negroni, Watts, and Chala 2022). These methods enhance individual skills and foster a shared understanding of representational criteria, bridging the divide between design and communication.

In this context, the need for structured activities that integrate graphical reflection into design studios becomes relevant. This paper introduces a multi-phase pedagogy designed to cultivate critical thinking in architectural representation. This approach aims to address the dual challenge of teaching students to design and to communicate their ideas effectively.

2. The activity: graphic references

The “graphic references” activity here presented is based on various pedagogical principles with the aim to cultivate critical thinking in architectural graphic representation. (1) *Active learning* ensures students engage directly with visual materials, moving beyond passive observation to critical analysis. By embedding the activity within a (2) *learning community*, students benefit from diverse perspectives, refining their interpretations through peer interaction. Finally, (3) *reflection-in-action* is explicitly structured into the process, prompting students to question not only *what* they see in graphical examples but also *why* certain representational choices succeed or fail.

The activity is structured as an individual yet collaborative exercise, emphasizing reflective and critical thinking about students' own work and that of their peers. Its multi-staged design allows for gradual development of ideas, ensuring that students have sufficient time to analyze, question, and refine their understanding of architectural representation.

The activity unfolds in three phases: (1) selection and reflection, (2) peer feedback, and (3) instructor feedback, further explained below.

2.1. First step: Selection and Reflection

The objective of the first step is to initiate a structured reflective process where students analyze graphical examples and articulate their observations through a guided questionnaire. In this phase, students are assigned a simple task that consists of selecting graphic material from either an instructor-provided set or other sources of their choice, such as works by known architects, personal projects, or other references. Instructors can limit the type of examples or sources they should use.

The instructions provided to students should be carefully designed to emphasize learning of key concepts. For example, could include descriptive analysis questions to make students practice how to read architectural drawings, make them capable of identifying elements in a technical plan, or understand how the drawing conveys spatial relationships. Questions may also spark the

critical thinking of the student, such as asking why a particular example was selected, whether it effectively communicates the project's context, whether they can properly understand different phases in the construction, or if the level of detail is appropriate for its scale.

Students then have to write a short text in response to all the questions and submit it. This step ensures that they engage individually with the material before receiving external input. By requiring students to justify their choices and interpret visual information, this phase develops their ability to assess, articulate, and defend their point of view.

2.2. Second step: Peer Feedback

The objective of the second step is to facilitate a collaborative yet structured exchange dynamic where students review each other's tasks from the first step, reinforcing learning through diverse perspectives. To prepare this step, instructors have to anonymize submissions and make them available to others. Online platforms, such as Moodle, can ease this process. Each student is then tasked with reviewing two anonymous submissions that are not theirs. This step transforms the activity from an individual exercise into a collaborative learning experience, where students intrinsically compare their own work with others' while developing critical thinking.

2.3. Third step: Instructor feedback

The objective of the third step is to provide expert validation, clarify misconceptions, and assess participation and comprehension of the activity. Instructors review all submissions, including both self-assessments and peer feedback, and add targeted observations that highlight strengths, address gaps, and offer alternative perspectives.

This step is also convenient to check that no student reviewed their own work and that contributions are equitable, serving as a basis for grading the activity. The instructor's role is crucial in providing a final layer of expertise and evaluation, which helps to solidify the learning outcomes for the students.

3. Method

To evaluate its effectiveness, the "graphic references" dynamic was implemented at the Escola Tècnica Superior d'Arquitectura de Barcelona (ETSAB), Universitat Politècnica de Catalunya (UPC). The activity was conducted fully online and outside the classroom using Atenea, the Moodle-based virtual learning environment employed by UPC. This platform facilitated the creation of a dedicated forum where students could submit their work, engage in peer discussions, and receive structured feedback, as well as a way to register the learning process. The first step (selection and reflection) was carried on with the "assignment" activity in Moodle (see MoodleDocs 2025a as a reference), while steps two and three (peer and instructor feedback) happened in a standard "forum" displayed in a "blog-like format" (see MoodleDocs 2025b as a reference).

The activity was conducted multiple times throughout each academic year, with the same dynamic structure but applied to different graphical references.

Data collection and analysis

The learning process registered in the online platform are used in this paper as the base for the analysis. Outcomes are systematically analyzed. The data collected for this paper were (1) submissions in the first step composed of text and images, (2) text feedback obtained in the second step by colleagues, and (3) final instructor feedback to students.

The systematic analysis was conducted by manually reading and classifying each of the comments from step two (peer feedback) in multiple categories: (i) whether the comment is *objective* or *subjective*, (ii) *descriptive* or *constructive*, and (iii) if present, by the *type of suggestions* made. Table 1 shows some sample comments by category. Additionally, the length of the comments in words was computed for later statistics.

Table 1. Sample comments by category, written by the students

Objective feedback: does not show a personal opinion (opposed to *subjective*)

"This submission meets the predefined requirements. The image is square but shows the model in different ways: in plan, section, views... With a single image, it conveys the various options that the program allows you to model, which is also explained in the text."

Subjective feedback: show a personal opinion (opposed to *objective*)

"I share the opinion of my colleagues; the idea is perfectly understood using axonometry. I also agree that the immediate context of the intervention could be added to show how the new volumes relate to it. I disagree with the concept of using two axonometric drawings to explain the idea, as using two colors could reduce it to a single drawing (1st axonometry). In this way, one color would explain what is existing and the other, the proposed extension."

Descriptive feedback: explains the content of the graphic reference and does not make suggestions of improvement (opposed to *constructive*)

"I believe that the rendered image is an excellent way to explain the initial intentions of the intervention at this stage of the course. We quickly understand that a protected exterior communication circuit is proposed, supported by elements on the upper part of the façade. Furthermore, both the pre-existing materiality and the new one are understood."

Constructive feedback: makes suggestions of improvement (opposed to *descriptive*)

"I consider that the point of view used in the perspective is interesting because it allows visualizing the two volumes with their union through the walkways and their relationship with their façades. However, in that case, the façade of the second volume should be detailed with more accuracy. Additionally, doubts arise when trying to understand the connection of the walkways with their plan in the first volume. The walkways are painted the same color as a floor of the first volume, creating the impression that they are connected, but the walkways connect at different levels to the volume at the back, generating doubts about whether they are inclined walkways or if they are really not connected to that floor. If that is the case, the drawing could be accompanied by a schematic section on the side to understand those slopes."

4. Case studies

The methodology was implemented over two consecutive academic years (2022-23 and 2023-24) in a fifth-year design studio at the Escola Tècnica Superior d'Arquitectura de Barcelona (ETSAB, UPC). Specifically, this subject was a *seminar*, a complementary course to a design studio, which involved 2h weekly lessons that complemented the development of the project in the design studio with theoretical concepts, tools, resources, and activities. The role of this complementary subject was not to provide basic concepts but to settle the knowledge of students in the last year of architecture studies.

In each application of the activity, there were some differences that are explained below.

4.1. Year 2022-23

The first year implementing this dynamic was 2022-23 with a group of 34 students. The first step of the *graphic references* activity (selection and reflection) was developed in groups of 2 or 3 students, following the organization of the project they were developing in the design studio. The second step (peer feedback) was developed individually, where each student was asked to assess the submission from two other groups. This dynamic happened twice, once after the first partial delivery of the design studio and another after the second partial delivery.

The instructions given to students in each of the steps are summarized in table 2.

Table 2. Instructions given to students in the year 2022-23

First step: Selection and Reflection Select an image from the last delivery in the design studio that represents your project. Attach a brief text to the image to justify why you chose this image and why it is significant for your project
Second step: Peer-Feedback Choose two images from your colleagues [from the first step] and comment on them based on the following questions: - Which message do you interpret from the image? - The relation between the image and the text is coherent? - The graphic criteria of the image is adequate?

4.2. Year 2023-24

The second year, the activity was adjusted to correct some feedback and observations from the previous year. The instructions to students were modified with the aim to generate responses with meaningful suggestions of improvement to the authors (see Table 4). Additionally, an extra “activity 0” was added using the same dynamic but, instead, requesting external references of graphic representation instead of personal work (see Table 3). The goal was to familiarize students with the process beforehand, ensuring smoother participation in the later applications.

The activity was developed with a group of 33 students. Like in the previous year, the first step was completed in groups, while the second step was carried out individually.

Table 3. Instructions given to students for activity 0 in the year 2023-24

First step: Selection and Reflection

Select three graphic references of architectural representation. They can be drawings, plans, images, models, sketches, etc.

Upload the three images, and, for each one of them, answer the following questions:

- Why did you choose this image as a reference?
- Who is the author? Which project is it related to? When was this image made?
- Is there indicator for north? Is the context represented?
- Can you easily identify the existing parts of the project from the new constructions?
- Which is the idea behind this representation?
- Is the idea properly communicated? Why?
- Which graphic resources do authors use to communicate the idea?
- Is there any aspect that could be improved?

Second step: Peer-Feedback

Choose at least 2 references from groups besides yours. Read again the instructions from the first step and try to answer them. Write and submit a brief comment explaining whether you agree or disagree with the authors.

Table 4. Instructions given to students for activities 1 and 2 in the year 2023-24

First step: Selection and Reflection

The purpose of this activity is to critically think about how we communicate ideas in an architectural project. Specifically, we will work on the drawings you created in the previous submission in the Design Studio.

Spend 10 minutes discussing with your work group the following questions:

- Select the best and the worst drawing you created for the previous project submission.
- Insert a screenshot of each of the drawings.
- For each of them, prepare a brief text that answers the following questions:
 - Why did you choose this drawing as the best/worst?
 - What is the concept you want to explain with this graphic representation?
 - What format did you choose to represent it?
 - Is there an indication of orientation? Is the context represented? Is it easy to identify what is pre-existing and what is the project proposal?
 - Is the idea behind the drawing correctly conveyed? Why?
 - Is the representation style the most suitable for expressing the idea? Why?
 - How could it be improved?

Second step: Peer-Feedback

This activity consists of learning from your peers.

1. Choose one "worst drawing" and one "best drawing" from other groups. In total, you must comment on a minimum of two drawings. You cannot comment on your group's submission.
 2. Re-read the instructions for the submission [in the first step of the activity] and try to answer the same questions individually.
 3. Finally, write a brief comment explaining the viewpoints you share and those you disagree with.
-

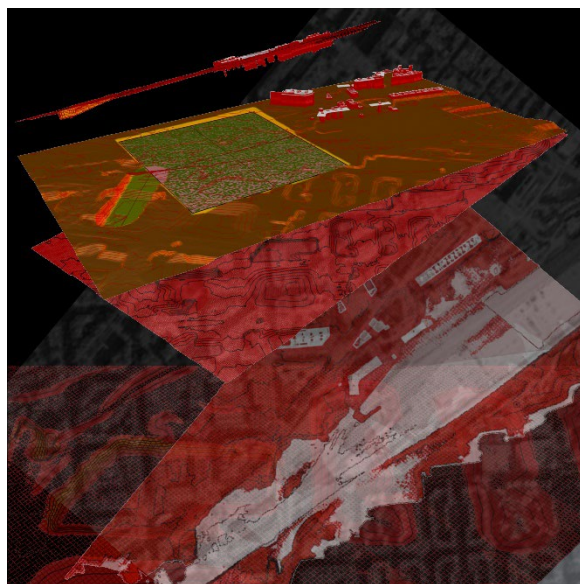
5. Sample results

Some sample results are presented in Tables 5 to 9. Samples are grouped in a sequence of first, second, and third steps to simplify the comprehension of the exercises. All comments were translated into English from their original language, which was Catalan or Spanish.

Table 5. Sample submission from the year 2022-23, activity 1

First step: Selection and Reflection

Students: Ariadna Juan, Federico Marchese, Margarita Ripoll



“Using the Rhinoceros and Grasshopper programs, it is possible to import a real area of a desired terrain, allowing us to study its contour lines and modify it through planes and lines. It also allows us to model and control the existing buildings on the same terrain, helping to generate a fit very close to reality.”

Second step: Peer-Feedback

Anonymous student A: *“The idea of the collage is very interesting for understanding the topography and the environment from different points of view. I find the text lacking a more explicit explanation of what they are teaching us, but I have taken the time to observe and try to understand, and that is positive.”*

Anonymous student B: *“Visually, it is an image that seems quite interesting and attempts to explain the different layers of a specific area. However, it does not explain the key concept you aim to convey in a direct and clear manner; it is essential to read the text to understand everything. This might be due to the overlap of many layers and the orthophoto background, which actually doesn't explain as much as the other layers do. It would also be convenient to have a legend to interpret what each layer represents, because right now it causes confusion.”*

Anonymous student C: *“The way the images are arranged does not help in reading or understanding what they explain. The fact that they are all so monochromatic does not help to understand the different layers of information that the image contains.”*

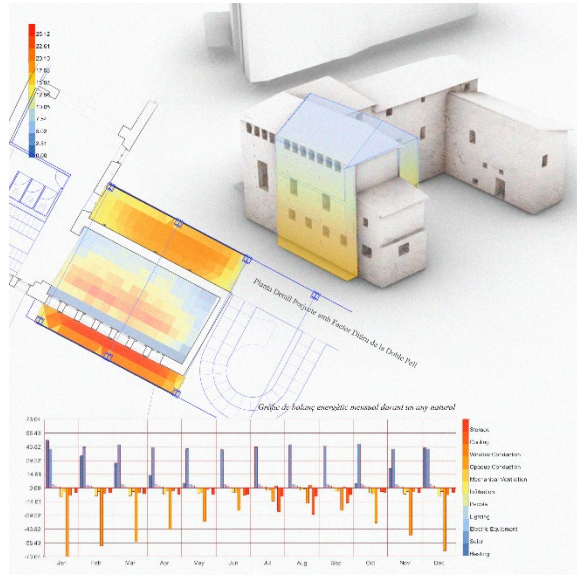
Third step: Instructor Feedback

Instructor: *“The image is interesting and represents the various concepts you describe in the text. It would have been good to take advantage of the exercise to represent some project intervention, for example, a topographical modification.”*

Table 6. Sample submission from the year 2022-23, activity 2

First step: Selection and Reflection

Students: Sebastián Barahona, Yago Fernández, Andreu Ramírez, Joan Sardà



"Our strategy will consist of enveloping the existing spaces with a lightweight climatic double skin. The graph indicates high solar exposure throughout the year, which will help to condition the living spaces. The losses during the winter months will be solved by mobile elements with incorporated insulation."

Second step: Peer-Feedback

- Anonymous student A: "I think both the image and the text are very accurate. I like that they can exemplify an intervention strategy and that they can rely on more reliable tools to demonstrate feasibility and define an appropriate solution based on the analysis. The only thing is that I don't know if I would have added the graph in the image because the text and the rest of the image are already explanatory enough."
- Anonymous student B: "The square image itself hits the message it wants to convey at all times. It presents us with a very well-distributed composition where, together with a piece of the plan and a volumetry, it perfectly situates the analyzed volume and its functioning."
- Anonymous student C: "The composition of the image is VERY GOOD because the axonometric schema is accompanied by a plan and graphics that, complementing each other, perfectly convey the idea. Regarding the text, the concept 'climatic thin double skin' is not technical... It could be replaced with the idea of seeking a strategy that includes a double skin to help climatize the building, which will, in turn, consist of a light structural composition to avoid further overloading the existing structure. Mainly to also refine the way we speak and the vocabulary we use."

Third step: Instructor Feedback

- Instructor: "The image you show explains very well the intervention and the purpose for which you do it. However, in the image, I would take care not to overlap information, especially the titles and the legend."

Table 7. Sample submission from the year 2023-24, activity 0

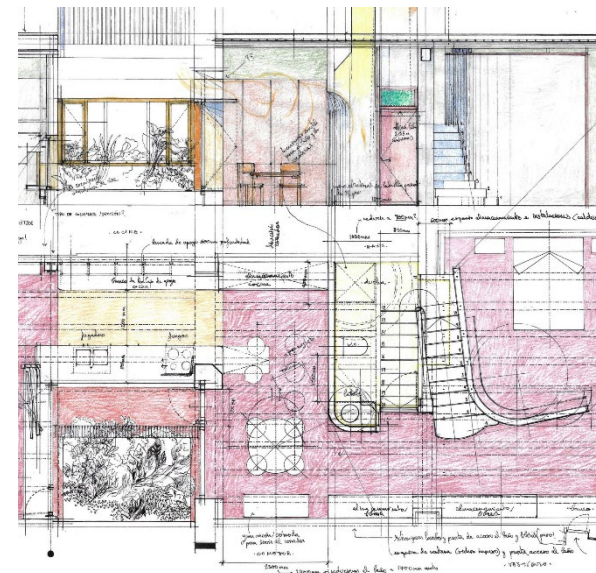
First step: Selection and Reflection	
Students: Biel Graset, Silvia Sierra, Marta Martín	
Reference from: Casa de la Alberca, Bona Fide Taller	
	<i>"This reference is the sketches by the Bona Fide studio for the Alberca House (2022). We like the graphic way of representing the architecture of this Valencian architect, particularly the way he designs thinking about light and the scale of small details. These are very colorful drawings that convey a great deal of sensitivity in how the users inhabit the spaces, representing the atmosphere of each project. We think that this is also achieved thanks to hand drawing. In this case, the surroundings and orientation do not appear either, but they are considered to represent the different environments."</i>
Second step: Peer-Feedback	
Anonymous student A:	<i>"I also find it a very fun way to represent a project, and I agree that using so much color and being hand-drawn gives it a certain sensitivity that couldn't be achieved by representing it differently, on a computer and in black and white. It helps to give depth to the drawing and to better understand the different materials used, because even though it doesn't represent the material exactly as it will be, it is clear which materials are different from each other. I think it manages to make you delve into the project and understand the sensations that each space conveys, simply by adding color and texture."</i>
Third step: Instructor Feedback	
Instructor:	<i>"This reference is attractive and captures the attention of the observer. Notice that the plan and elevation are in correspondence, which facilitates the reading of the architectural space. Also consider that, although it looks like a sketch, the architecture must have been very well defined beforehand to achieve a representation like this."</i>

Table 8. Sample submission from the year 2023-24, activity 1

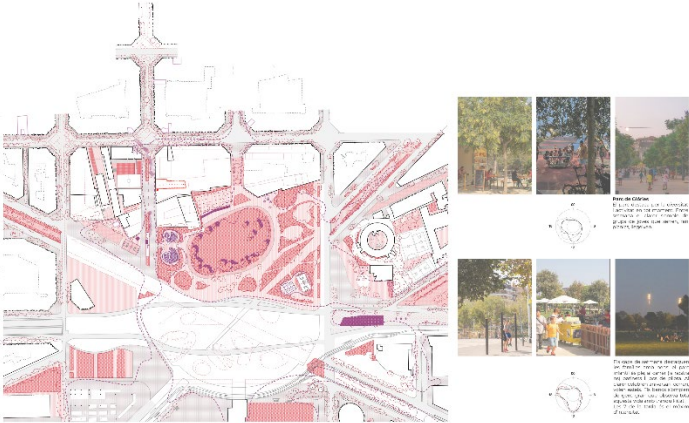
First step: Selection and Reflection	
Students: Biel Graset, Silvia Sierra, Marta Martín	
	
<i>"We like this layout because, beyond the information of the various layers (ground floor activity, public space, photographic legend, etc.), the overall composition of the drawing is well-balanced, both graphically and chromatically. The concept we sought to represent was the activity observed during the analysis of the behavior of the public space in the Parc de les Glòries and its surroundings.</i> <i>The chosen format is a plan with a small legend of photos. The drawing includes an indication of orientation, thanks to which we see the north and the shadows, projected onto the urban context. The drawing uses different line values for the current state of the urban ensemble and for the future proposal (marked with dashed lines). Within the group, we consider that thanks to the layering, it is easy to understand the purpose of the drawing.</i> <i>To represent all the diversity of movement on physical paper, we believe it is the most effective way. Nevertheless, it could be represented with a video. An easy improvement would be to indicate the specific points from which each of the photographs was taken."</i>	
Second step: Peer-Feedback	
Anonymous student A:	<i>"I have selected this drawing as the best, since it is a very complete site plan with a lot of intentionality. Visually, it is very attractive, but above all, it captures the context of the Glòries square very well, this duality between the existing and the proposal. I think that the use of various layers to explain different things greatly favors the drawing and its understanding."</i>
Anonymous student B:	<i>"I'm choosing this drawing as the best; at first glance it is very pleasant due to the use of colors maintaining a global coherence. It is understood that they want to explain the urban context, which is accompanied by some images of green spaces for better understanding. They also explain the movements through the use of discontinuous lines and line values."</i>
Third step: Instructor Feedback	
Instructor:	<i>"I agree with you that the first drawing is visually attractive. You have worked on it and highlighted what interested you about the project. However, the location of your project does not take prominence next to the Gran Clariana in Glòries."</i>

Table 9. Sample submission from the year 2023-24, activity 2

First step: Selection and Reflection

Students: Neus Cardona, Xavier Luquin, Joaquim Mercader, Arnau Jaume Parés



"We chose this document as the best of our delivery because it quickly allows us to see which part represents the Casa del Sucre and the impact of the new building. We wanted to express it in a physical model to explain the intervention in three dimensions from different viewpoints. There is no orientation (North, South, East, or West), but you can quickly locate yourself, and you can also understand the context and the intervention. We believe the concept is correctly explained, as the materiality given to the neighboring blocks and the context help in understanding. We believe it is the best format since, as we mentioned, the model can be viewed from different angles. Nevertheless, regarding the buildings we keep from the surroundings of the project, instead of adding labels about their use, it would be better to model the volumes."

Second step: Peer-Feedback

- Anonymous student A: *"I think it is a simple but very explanatory document regarding the interaction with the surroundings. Highlighting the elements of the environment this way seems a good idea to me, and well executed, although it is not entirely clear what is new and what is being maintained."*
- Anonymous student B: *"I think it is a well-chosen document for the submission because it explains how the intervention affects its closest surroundings through the model. Perhaps there is a lack of intention when differentiating the new from the existing."*
- Anonymous student C: *"Even though it may not express as much detail as other line drawings, it does help a lot in understanding many project values, such as the environment, location, intention, occupation... It's not just what the image helps to express, but also the process of its creation, which also clarifies ideas and often makes us see things that we wouldn't notice if we went directly to the drawing. This type of representation also ends up being the image that represents the project and can function as an icon of the concept."*
-

Third step: Instructor Feedback

- Instructor: *"Your observation and reflections on your own work are appropriate, and I share them. I don't understand why some context building is built in wood and others in expanded polystyrene. The selection of the material should be done carefully to emphasize the idea behind the model."*
-

6. Analysis of the results

There were a total of 51 submissions in the first step (summing up both years) and 170 comments written by students to their peers in the second step, among both years of application. There were an average of 3.33 comments in the second step for each submission in the first step.

The systematic analysis of the feedback from the second step shows that there are some key differences between the first year and the second year of implementation of the activity, but there are no significant differences between both activities happening in the same year. Figure 1 shows that the length of the comments increased from 46-60 words on average in the first year to 100-107 words in the second year. This drastic change could be related to the change of the instructions that provided more detailed focus on key aspects of the course, and students were asked to reason about a larger series of questions.

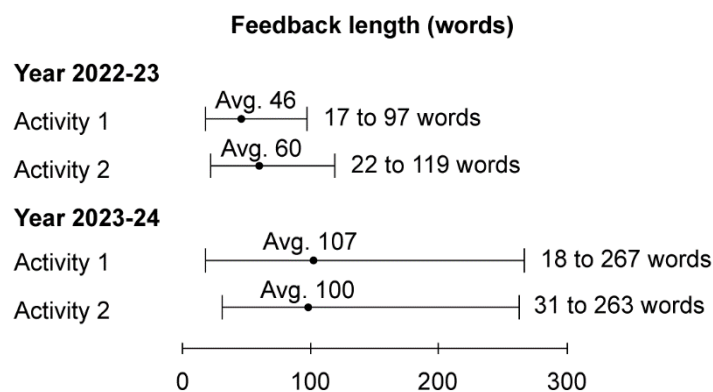


Fig. 1 Length of the feedback in the second step. Source: Own work

Also, the content of the comments shows some differences between the first and the second year. While in the first year they are mostly subjective (avg. 27%, see Figure 2) and evenly descriptive and constructive (avg. 43%, see Figure 3), in the second year they are quite subjective (avg. 65%, see Figure 2) and mostly constructive (avg. 89%, see Figure 3).

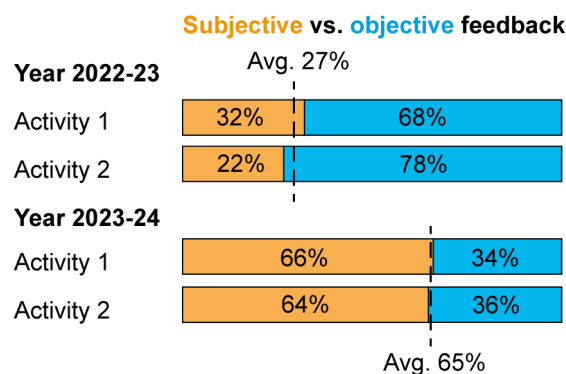


Fig. 2 Proportion of subjective and objective feedback. Source: Own work

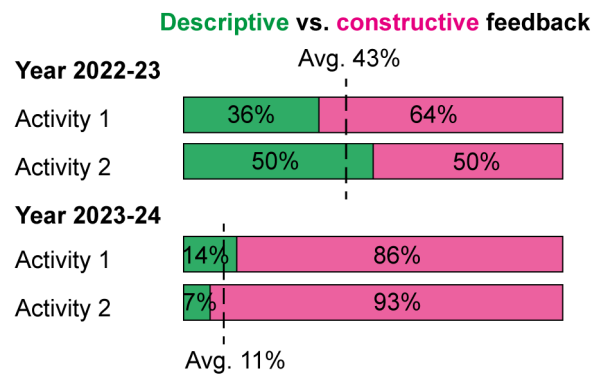


Fig. 3 Proportion of descriptive (no suggestions) and constructive (with suggestions) feedback. Source: Own work

The extraction of the *suggestions of improvement* made in the comments was exhaustive. This means that there were no predefined categories, but any new type of suggestion created a new category. The extraction of suggestions returned a total of 12 categories that were repeating among different comments. Most of the categories are common between the first and the second year.

The outcomes of this categorization are depicted in Figure 4. The most repeated suggestions for improvement were (i) emphasize the project, (ii) change the representation style (such as changing from a rendered image to a topography plan, avoiding overlapping too many layers of information, or drawing a schema instead of a plan), (iii) change the colors, (iv) add more detail to the drawing (such as adding annotations, drawing the surroundings of the project, or complementing the drawing with actual images of the existing buildings), and (v) be more intentional.

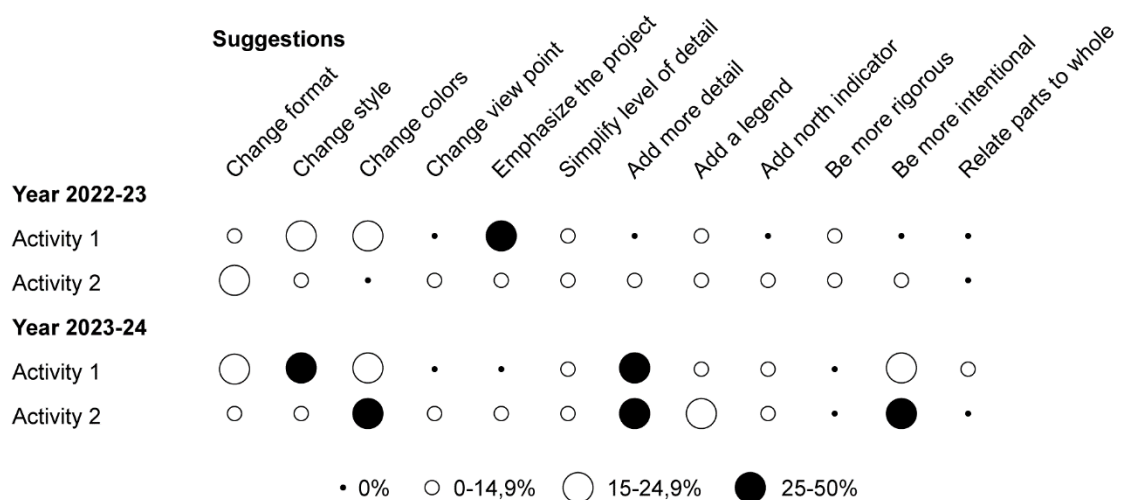


Fig. 4 Distribution of suggestions extracted from the feedback in the second step. Source: Own work

7. Discussion

The learning dynamic presented in this paper shows diverse results from the first and second years of implementation. The key difference between these years was the instructions guiding the first and second steps, which proves that these instructions are essential. A more guided set of instructions (second year), including key questions to answer in their feedback, provides more *constructive* comments. However, generic instructions (first year) returned more descriptive comments, avoiding providing suggestions of improvement to colleagues.

The experience of implementing this dynamic shows that the repetition of the activity multiple times is useful for students to get used to the dynamic and achieve more significant feedback. Nonetheless, time is a key aspect in this activity and must be carefully considered. Each iteration of the three steps implies some days or weeks, since a step must be completed by everyone to move to the next step. Moreover, the anonymization and preparation of the online environment to develop the activity in Moodle take time for the educators. None of the implementations of the activity could happen after the final submission of the project since it is usually scheduled at the end of the school year, and this activity would require some extra days or weeks. However, it would be interesting to apply this dynamic in final deliveries to provide students with final feedback from peers that would help them to settle their knowledge.

Even if the primary focus of this activity is on graphic material, the same methodological framework could be adapted to other sources. For instance, the activity was once implemented in another subject by asking students to write a definition for “parametric architecture” in the first step. Then, in the second step, other students wrote a brief text comparing colleagues definitions with theirs and writing a new definition that combined interesting concepts among different definitions. This is just an extra example of a variation of the dynamic in different contexts.

The “graphic references” dynamic is also valuable as a way to keep track of the learning process. This iterative approach, especially if happening online, enables the tracking of students’ progress from the beginning to the end of the course. By analyzing the interactions within the online forum, this gives the educator a broad view of the learning of their students, and they can adjust their lessons to reinforce weaknesses.

The value of this activity was assessed through a voluntary survey at the end of the course. However, this survey was not added in the main body of this paper because few students answered, and the results are not meaningful. Nevertheless, I'd like to remark on the following feedback from a student who really valued the help obtained from the comments and reinforces a key value taught in the course: that a project not only needs to be correct but also well represented.

“I imagined it would be much more focused on 'how to represent and design.' The last comment before our final project submission was VERY useful. It is greatly appreciated. Learning that the project not only needs to be good but also well represented is something that today we perhaps still lack. I would have liked there to be more time to comment on all of this and to learn.”

Anonymous survey comment from a student in the year 2022-23
translated into English from the original language (Catalan)

8. Conclusion

The “graphic references” activity is a multistep learning dynamic designed to foster critical reflection and enhance representation quality through self-assessment, blind peer evaluation, and asynchronous collaboration. The results demonstrate that the activity effectively cultivates a collaborative learning environment, where students engage with diverse perspectives and refine their graphical communication skills through structured peer feedback.

The documented interactions and iterative process provide evidence of its pedagogical value, enabling instructors to identify patterns in student learning and adapt teaching strategies accordingly. This approach confirms that integrating reflection and peer engagement into design studio courses can strengthen both individual and collective learning outcomes in architectural education.

However, the results presented here are only a record of specific applications of the activity. Since the activity can be adapted to different contexts, its outcomes may vary depending on the learning environment. The core strength of the activity lies in the dynamic created with students interacting and exchanging knowledge. The clarity of its instructions is key for a good development of the activity. I encourage educators to implement this methodology in any learning setting where graphical representation is a key component of the final output.

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