Microsoft Bing as an Assistive Tool in Interior Space Design Process (For Professionals and Students):A Directed Prompt Writing Strategy

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ABSTRACT:

The world of interior design is undergoing a revolution, fueled by the rise of artificial intelligence (AI), and Text-to-image tools (in specific) are becoming increasingly popular , free and available for all to use and at the same time they could be the solution to a lot of challenges facing both professionals as well as students .As an example and not limited to those mentioned (time constrains cost, limited knowledge of new technologies) which both impacts level of creativity and general outcome , the matter that pushed the author further investigate the optimum use of those tools for the best benefit to anyone who has anything to do with the interior design industry (professionals – students – educators) by answering some critical questions, The most prominent questions as: Can AI tools be used as an assistive tool in the design thinking process without impacting both professionals as well as students' creativity?, What is the best strategy to follow to achieve this ?. This paper follows a mixed methodology of quantitative, analytical, comparative and experimental method with an aim of shedding the light on the opportunities of using Text to image tools for both professional interior designers as well as interior design students and the best way to utilize them. The results included some surprising findings, like the effectiveness of Microsoft Bing (Copilot) tool with a "directed prompt writing strategy" approach in specific, the perfect implementation in interior design education and much more …

1. Introduction

The long and intricate process of interior space design forms a huge burden on all people practicing the major from professionals to students in design education where there are a lot of different as well as common challenges for each. Time factor and other challenges influencing creativity of interior designers in the market as well as students topping the list. And by the appearance of a myriad Artificial intelligence based applications that are already out there for all to use, the author question comes, why can't we as interior designers use those tools for our benefit?, As well, why do not we (as academics) allow the use of those apps, given that students will use it any way (with or without instructor's knowledge?).

Not only professionals and students face challenges, but educators as well do face huge challenges in teaching any module that is based on design thinking process (especially design studio courses) with a seemingly outdated teaching system of interior design education almost free from utilizing today's new tools (AI tools especially) for the fear of impacting students' creativity and other related skills in the process and here the author question is : Do really utilizing those tools impacts students' creativity ? Or are there any other hidden reasons that hinder the use of those tools? Is one of the reasons instructor's lacking knowledge about new technologies? Or lacking a vision of how to use those tools correctly depending on the type of unit course taught? .If the answer to those questions is yes, then there is a huge problem as by this, students will surely lose confidence in the capabilities of their instructors, the fact that encouraged the author more to dig deeper on the main reasons behind the current interior design educational system as well as evaluating the current applied one from students' perspective.

This Research assumes (as main hypothesis) that AI tools can be utilized for making the designing process easier and more enjoyable for professionals as well as students without impacting creativity only by reaching the best methodology for usage with a main aim of not impacting creativity whether for professionals or students (under close supervision from instructors) as well as Shedding the light on the opportunities of using Text to image tools for both professional interior designers as well as interior design students and reach an optimum teaching methodology using reliable AI tools to solve a lot of challenges facing all parties including educators while teaching design thinking based modules (studio / non studio modules).

By this , the research main importance appears in focusing on the capabilities of available text to image tools (as the easiest available type of tools) and how to use it the right way through author's own experiment and proposing a new updated use in general and teaching methodology in specific using available artificial intelligence tools.

To achieve this, the author followed a mixed methodology approach. The quantitative, analytical, comparative and experimental method.

-Quantitative method: through a quick survey conducted to check students' current challenges with Design thinking programmed modules and evaluating the current system followed.

-Analytical method: through analyzing previous case studies in teaching design thinking based modules and concluding the real challenges facing students' performance.

-The experimental and comparative method: through experimenting with Microsoft Bing in specific, compare results and reach the best method to utilize this tool in specific in the teaching process as well as for professionals (that was selected as an app worth deeper investigations based on Author's previous experimenting with almost all available free AI tools). And by this answering some important questions:

-What are the real challenges facing professionals in following the design thinking process?

-What are the real challenges facing students in the design thinking based modules?

-Can AI tools be used as an assistive tool in the design thinking process without impacting both professionals as well as students' creativity?

-What is the best strategy to follow in order not to impact professionals as well as students' creativity?.

All those questions and more are discussed through the paper structure shown in Table (1),p.3 as follow:

Research section	Research content
2. Challenges facing professionals as well as students in design thinking process.	This section will explore the real challenges facing both professionals as well as students in those type of courses by using a quantitative method (survey).
3. Previous experiences integrating AI in the designing process.	This section will display previous experiences of using AI in both the professional as well as Educational field if available.
4. Microsoft Bing (Co-pilot) as an assistive tool in design thinking process (An experimental and comparative study).	This section will display the authors' experiment using Microsoft Bing and the optimum prompt writing strategy to keep creative minds.
5. Suggested teaching methodology using Microsoft Bing in design thinking based modules.	This section will propose a methodology to integrate AI tools indesign thinking based Modules.
6. Conclusion, recommendations, criteria of application and future studies.	
7. References.	

Table 1. Research structure (Author 2024)

2. Challenges facing professionals as well as students in design thinking process.

2.1. Deep understanding of design thinking process

"Design thinking is an epistemic process that uses multiple ways of knowing, such as thinking, feeling, sensing, and intuiting, to achieve creative problem-solving" (Rashdan,2017,p.86),and this through deep observation and understanding of what people crave and dislike, this innovative process allows skilled practitioners to combine their technical skills with a strong sense of empathy , meaning feeling user's hidden thoughts , feelings and attitude and reach the best match to those factors (Chen et al., 2023,p471) and this moves us to the popular steps of design thinking process which can be summarized into 5 main steps starts with emphasizing with the user / client and finding their real needs through interviews , surveys and other methods , followed by defining the real problem that needs to be solved , moving on to the ideation phase where a myriad of sketches to solvethe specified problem are generated then create a prototype (if applicable based on module type) and test performance of suggested design. Saying this, it's worth mentioning that several models were generated for design thinking process, yet thementioned is the most popular and the most general one that can be applied to any thing as shown in (Figure 1).

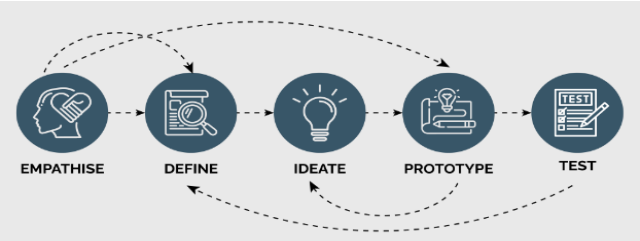


Fig 1. Summarizing design thinking process (Source: Radiant Digital, 2024)

2.2. Challenges facing professionals in design thinking process.

There are a lot of challenges facing professional interior designers in the market that no one shed the light on before despite fresh graduates (future interior designers) shaping a part of this market and despite the profession being identified as "an occupation characterized by specialized training usually acquired by formal education and apprenticeship, public recognition on the part of the community of practitioners to regulate their own standards of practice, and a commitment to provide service to the public that goes beyond the economic welfare of the practitioner" (Sullivan , 2004, p. 36) , meaning that formal education does shape the market and influence it directly , making the challenges currently facing professional interior designers were once issues not covered in the education stage in the first place . In this regard, challenges facing professional can be summarizedas follow (Figure 2):

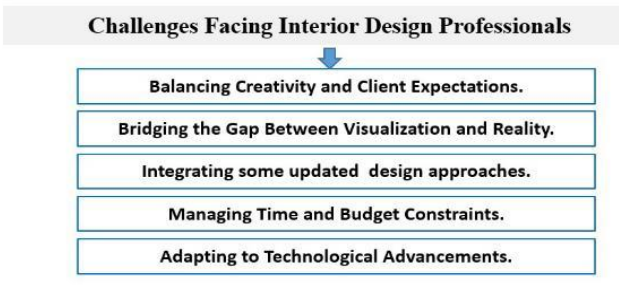


Fig 2. Summarizing challenges facing interior designers in market (Author 2024)

2.1.1Balancing creativity and client expectations

A lot of time, client needs do hold back designer's need to be creative enough, balancing both is one of the major challenges that face professional designers.

2.2.2 Bridging the Gap between visualization and reality

Sometimes designers do generate visually appealing drawings and shots that can be a source of temporary attraction to clients which completely disappears inactual implementation of design causing a lot of problems.

2.2.3. Integrating some updated design approaches

One of the challenges facing professionals is not being updated enough with new design approaches and not knowing the language of reflecting it in interior design process (e.g.: biophilia – sustainability ...etc.).

2.2.4. Managing time and budget constrains

Following the design thinking process is a long tiring process that do consume time as well as money (for those working on the project) , making it one of the top challenges facing professionals and as a result some time cutting offsome of the steps to both leading to generating not the best interior design solution .

2.2.5. Adapting to technological advancements

Same with not being updated about new design approaches goes with new technological advancements. Not being aware of using some soft wares or any other technology that can help in the designing process can be a huge obstacle and despite it being a huge matter in the field it's even worse in the educational field as lecturers not being up to date does influence students' reliability in their instructors and quality of education offered in general.

2.2. Challenges facing students in design thinking process based modules

It is worth mentioning that Design thinking based modules are any module that follow the previously mentioned steps (Fig1,p.3). This being said it is not exclusively on design studios but any module that generate a design or product in general, yet this study will focus moreon design studio course challenges in specific given the importance of this module in interior design education and given the stereotype of teaching those type of modules with the same format since the 1940s (Fotaris et al.,2016,p.1). In addition any other module does reflect at the end of the day in design studio.

By scanning the internet, it is evident that there is an existence to previous studies trying to find efficient ways to teach design studio courses and if this means something, it means that there are true challenges facing students in this aspect. The matter increased by the breakthrough of Corona virus where academics started investigating the impact of distant learning on the process making it a bit harder , given those courses' nature . Yet for an up-to-date perspective and given that there a lot of factors impacting the type of challenges specified (e.g.: students' cultural background .etc.) , A survey was conducted targeting (design studio level 2 and 3 students) taking their feedback on the current teaching system and opinions on new arising Artificial intelligence tools. The survey was designed as a short one consisting of only 10 questions so as to make sure students answer it accurately. The questions of the survey were as follow (Author 2024):

1. Do you face any challenges with unit courses that involve design thinking process? (e.g.:Design studio courses).
- (Yes / No / other).

2.If you face any difficulties with those type of courses, kindly select in which phase do you struggle the most?
-pre studies (gathering info and client's requirements).
-ideation process (start generating sketches to solve a certain design problem).
-The programming stage (generating actual drawings of your design) including rendering stage.
-other.

3. If you have any other struggle other than the mentioned in the question above, kindly feel free to state.
4. Rate your satisfaction with the current teaching method of design thinking process based modules (e.g.: design studio). With a scale from 1 to 5 (1 is worst / 5 is best).
5. If there is one thing you would like to improve about the current teaching style of design studio courses, what would it be and why?
6. Do you use any Artificial intelligence tool in your designing process?.
- (Yes / no / other).

7. If you use any Ai tool, which type do you mostly use?
-Text to image AI apps.
-Image to Image apps.
Sketch to image apps.
-I do not use any AI app
-Other
8. Is there any specific AI App you liked much and helped you in any design process stage?
9. Do you have any challenges or struggles from any type that impacts your performance in design-Thinking process based modules (e.g. : Design studio), you would like us to know ?.
10. If you were given the opportunity by your instructors to use AI tools to help you in the designing process? Which stage will you use and why?
- Gathering info and project requirements (pre studies).
-Generating concepts (in the first place).
- Ideation process (and generating sketches to a certain concept in your mind).
- Rendering your ideas.

Or any other usage of your choice. Kindly feel free to state.
Number of students who responded to the survey are only 21 due to the critical time of distributing the survey. Yet it can give us a good insight of students' feedback that can help in either proving or declining author's hypothesis regarding the matter that there are real challenges in addition to other methodologies which are summarized along with the most prominent results in the following table in the following table (Table 2)

Question number	Response percentage and comments
1	No. of students who confirmed facing challenges were 15 out of 21 with a total percentage of 71.42%
2	No. of students who selected difficulties in the ideation process phase as well as the programing stage both were equal 9 students with a percentage 42.8% each , while only 3 students with a percentage of 14.2% selected other.
3	Other common struggles students mentioned were as follow : -Sketching my idea. -Creating a unique design. I get told I need to get more creative with the designs and I understand that. However it's tough to create something unique with our resources. - Following up with an expert is very essential think in order to have someone to give you a feedback without a feedback or guidance the process should hard. While the rest said nothing.
4	Surprisingly most of the answers fell in the (4) Category regarding rating the current teaching system with a total number of 12 students out of 21 forming 57.14%.
5	Some students answered : -It would be more detailed feedbacks since there is new things to us. -Better guidance and less belittling of our efforts since we actually really try our best with the time we actually have which is Really limited.
6	Number of students who confessed using AI tools in the designing process were 15 students out of 21 with a total percentage of 71.42%.
7	9 students of total 21 with a percentage 42.82% selected Text to image tools as the Ones they tried.
8	Copilot. Ai image generator to help me visualize my ideas" Microsoft Bing Bing.com "CopilotLeonardo
9	Regarding the challenges facing students that affect their performance in the design thinking process , the answers received were : -Creativity. -Presenting my idea. - Not taking feedbacks so the design process could be better and devolved -Not knowing how to apply a concept to the Design So the design could reflect the concept and inspiration.

10	-Gathering info and project requirements to be aware more and access resources easily. -text to image ,generating concepts, -rendering -Rendering my ideas Ideas. -Generating sketches for the desired concept and the project in order to visualize and to know the flow that you are going to follow in your design. -Rendering ideas.

Table 2. Survey results summary (Author 2024)

By analyzing the received results it is concluded that (Author 2024):
Most of the students confirmed having challenges in design studios with almost equal results for both the ideation as well as the programming phase.

Other challenges students mentioned were creativity as well as getting enough feedback, yet despite the challenges, half the students gave a good score to the module in general. The other half is as well a high percentage that cannot be ignored. And when asked what one thing they would like to improve regarding design studios, students mostly answered more detailed feedbacks and better guidance and time being very limited, some one answered not understanding enough the meaning of concept in design and how to implement it.
-71.42% of students confessed using AI tools in the designing process with a good percentage of 42.82% using Text to image tools where most of the students mentioned Microsoft Co-pilot (Bing and Leonardo).
-Based on this , the author concluded that one of the major challenges facing students is not getting timely feedbacks which impacts their performance (mostly due to the limited time of the semester in general as well as the studio time in comparison to number of students who need it (Author 2024).
-Students need a push in the ideation process as well as the rendering phase and may be one of the reasons behind it is the time factor as well.
-AI tools especially "Text to image "tools are already used by students, which means that they find the need to save time by using them or making the designing process easier for them.
-Microsoft Bing (co-pilot) is one of the tools mostly known and used by students.

And now comes the question: Are there any previous experiences using AI tools in both the professional as well as the educational field? And by analyzing the challenges linked to professionals as well as students, it confirms the time being a common factor. And this moves us to the next section.

3. Previous experiences integrating AI in the designing process.

By scanning the internet, not enough papers are out there exploring the opportunities of using AI tools in the designing process and especially in interior space design despite the importance and despite it being a self-imposed reality with evidence, on the contrary a few more were available discussing teaching some design related courses mainly related to architecture department (which are already very similar to interior designing in the process) and can be taken as a reference analyzing all related studies. A study done by Ceylan discussed how AI can be integrated not only in design studio modules but theoretical and technical ones as well (2021, p . 1 4 0) . Other Similar few studies proposing the integration of AI tools in the teaching process are available, yet even fewer case studies of actual implementation took place. They are still mostly personal diligence from lecturers who feel a sense of responsibility and the importance of being up to date despite the development of technology putting forward new requirements for the roles of teachers in professional activities, requiring teachers to actively respond to external factors.

One of the recent actual experiments done by an instructor was in the year 2022 within an architecture design course where 34 students utilized AI programs in the conceptual designphase to produce original content images from narratives to help students generate concepts for their buildings.

The designs of the experimental student groups were compared to another control group of 50 students which use more traditional conceptual design methods on a similar project in the same semester.
This study statistically concluded that this method enhanced the final design outputs for architecture students, yet not the best results and the author Stated the reason for the matter as students still not getting used to using those tools and that it needs further investigations (Sadek, 2023,p.11).

Other further experiments were done by the author herself in some non-design studios example, a course named Design future(DSN472) which is an elective course taught to level 4 interior design students at the author's university , where students were required to generate a futuristic design to an element related to interior design (e.g. : table ..Etc.) , It was permitted for them to use it in the ideation process which speeded up the designing process due to the limited time of the semester.

Another experiment was done by the author as well in a core theoretical interior course named (Contemporary design for housing and interiors / Contemporary interior design –Course code: INTR361/INTR441) where students study contemporary styles in interior space design and as a part of one of the assignments students were required to generate interior spaces inspired from a certain painting (that belong to a certain contemporary era using any Text to image tool of their choice then analyze and criticize what of the general characteristics of this era was rightfully achieved in the generated shots (based on what have they previously studied and learnt).

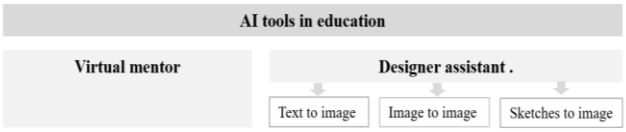
Fig (3) _ Sample of student's poster in INTR441 (Author 2024)

The Author's experiment kept in consideration that the intended learning outcomes of this unit course is achieved by making students evaluate and criticize based on gained knowledge.

4. Microsoft Bing (Co-pilot) as an assistive tool in design thinking process (An experimental study)

4.1. AI tools in the design and educational field (Generally)

It's worth mentioning that AI tools are starting to be part of the professional and educational designing field in various ways .Same goes with the design education field where those tools can be used in different ways and type of modules, accordingly tools can be classified as shown in (figure 4)



5. Fig (4) _ classification of AI tools in education (Author 2024)

4.1.1. As a virtual mentor:

The word "mentoring" is a process in which a more knowledgeable person (the mentor) assists a less-knowing person (the mentee) in achieving a learning objective (Klamma et al., 2020,p.1).

In this case , AI tools can help students as well as professionals by asking it questions and guide users in differentaspects (e.g. : Google bard , chat GPT …etc.) , those tools can offer guidance for any question user is looking for an answer to provide recommendations for material that needs to be re-studied like a teacher or tutor.

In the design educational field, it can help in theoretical modules where students' minds aren't organized enough to put a structure to research and sometimes gather info about those structures as well which will lead to speeding up the process(which can be implemented but with a strict ban and under instructor's supervision) to ensure achieving the learning outcome related to the modules (Author 2024). Supporters of AI believe it's here for the long haul, urging educators to teach students responsible AI use to get the most out of it. (Rudolph et al., 2023,p.13). A term that will spread widely in the coming period, as the focus will shift more on the ethical part of usage since we won't be able to control the usage unless serious regulations are set.

AI tools can assistant lecturers as well in the teaching process by generating tests and correct itself known as automatic assessment (Fitria, 2021, p.136).

By thinking about it, it would decrease the load on instructors to pay attention to other details or manage time better with feedbacks and other important aspects that are previously mentioned as points that need improvements by students (Author 2024)

It can also help instructors in designing inclusive curriculums tailored to cover a lot of different student needs which is another positive point to using AI tools and a point of investigations already from some researchers **(**Ruiz et al., 2023,p.2).

4.1.2. As designer assistant:

There are a myriad of AI tools out there that work as designer assistant and that can generally be classified as:

4.1.2.1. Image to image tools

This is a tool where the designer upload an image and asks AI tools to either make enhancements or generate options from it. (e.g.: Architect GPT – Room sketcher – an option in dream studio).

4.1.2.2. Sketches to image tools

Where the designer input sketches and the AI tool transforms it into rendered scenes.

4.1.2.3. Text to image tools

Where the designer imbed fully descriptive prompts of the desired design and the AI tool generate the required.

By investigating the three available types , it is clear that both Image to Image as well as sketches to image are based on designer's idea in the ideation process which means it won't affect or stop professional / student creativity and can be used as a very good assistance tool .

On the other hand, Text to image tools are based on inputting prompts andletting the apps generate ideas (which means that this tool can impact person's creativity) by stopping their minds and making the toolsgenerate ideas and the bad news is that those tools are the most used and the most widespread in comparison to other tools being freely available toeveryone. Yet so as not to be over dramatic, the good news is that till now the generated shots from those tools are expected not to be completely original as Generative artificial intelligence systems based on pre-existing images available in their databases.

In this, the AI is not unlike most, if not all, human creativity (Florent et al., 2023, p.474) to further investigate this logical theory, the author undergone a deep investigation and experiment within the pool of tools availableon the scene to evaluate it from an expert's point of view and investigate the potential and limitations of the best out of there.

4.2. Author's experiment with AI tools

Based on a previous experiment the author has conducted for almost a year (10 months specifically from 2023 to 2024) evaluating available Text to image tools and the accuracy of results generated, it was concluded that Microsoft Bing (Co-pilot) was the best free available Text to image tool that has proved to be improving consistently despite it generating some errors after testing its understanding of different design principles, styles as well as design approaches (Author 2024). For instance, when testing the apps understanding of a design principle (e.g : Asymmetrical balance) by using the prompt : "Ideas for A modern manager office of color palette (whites ,beiges and blues), An asymmetrical balance approach should be applied in the office design through interior elements distribution and wall treatments" , The results showed a good trial for applying asymmetrical wall treatments , yet major errors in circulation and furniture where found as shown in (figure5)

Fig(5)_ Microsoft Bing prompt results (Author 2024)

The same prompt was tested and repeated after weeks and the results showed improvements in treatment as well as almost no errors in circulation and orientation of furniture except for the direction of desk drawers as shown in (Figure 6).

Fig(6)_ Retesting results using same prompt (Author 2024)

The same experiment was tested on other directions (e.g.: styles-Victorian as a sample). The prompt used was “Ideas for a Victorian style manager office of a corresponding color palette and wall treatments to the mentioned style. The office shall include only one main desk, wall library and sitting area for clients ."

The results showed that the first images were generated as illustrations and not real images as shown in Figure (7).

Fig(7)_ Testing Victorian style (Author 2024)

By trying the same prompt weeks after a real image was generated, yet there were clear errors in the style implementation despite it issuing the general spirit of the style of being an overly decorative style without diving into the details as shown in (figure 8).

Fig(8)_ Testing same prompt after weeks(Author 2024)

The previous experiment proved that Microsoft Bing (Co-pilot) is in constant improvements despite it generating different types of error that can only be recognized by an expert (professional interior designer) and can be a reliable source.
By observing the previous prompts used by the author based on a previous prompt writing guideline strategy concluded by the author before summarized as (starting with the style name, type of space and then a short description to each element without writing in detail lengthy prompts) It is evident that the option was kept open to Microsoft Co –pilot (Bing) to generate ideas (without guidance from the designer’s side). Despite Microsoft Bing (co-pilot) generating overall good quality sources for inspiration by leaving it generating ideas openly , By trying to direct Microsoft Bing to generate images based on designer’s vision, it has proved to generate better design options that can be used as they are by simple modifications from the designer’s side (Author 2024) .
This was proved through the author experiment to use Microsoft Bing(Co- pilot) as an assistive tool to generate designs for a booth for a company specialized in packaging , branding and printing where the two options were tested as shown in (figure9)

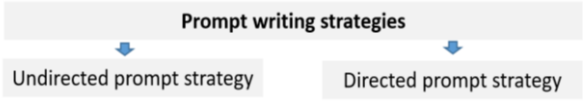


Fig (9) _ classification of prompt writing styles (Author 2024)

In the undirected prompt strategy approach: The prompt was written in a way giving space to Microsoft Bing generated ideas.

E.g.: for the prompt used in this approach was: “A (line booth type design) for a packaging industry related company .The booth design should be made of sustainable materials. It shall include a small meeting table, space forcirculation and displaying areas”. The results are as shown in (Figure 10).

Fig (10) _ showing results generated from undirected prompt (Author 2024)

When Analyzing (F.g.10), it is evident that the results are acceptable and applicable, yet the design is of no special character and not fully reflects the company’s other activities and general spirit with a logo of the following design (Figure.11)

Fig (11) _ Company’s logo (Author 2024)

On the other hand when using a directed prompt strategy based on designer’s point of view using the following prompt “A booth interior with corrugated carton material mainly used .The booth should be a formation of original colored corrugated carton boxes and black ones with text graphics for a company specialized in packaging , printing and branding”. The results were as shown in (figure 12).

Fig (12) _results by following a directed prompt strategy

By analyzing the results generated in(Fig.12) , it is evident that the design matches more the company’s spirit and reflects its activities and can be applied almost as it is making “ Directed prompt strategy” the better way to utilize Microsoft co-pilot (Bing)as a tool ,in other words an assistant to generate designer’sidea and may be generate options from designer’s(already there) point of view making the ideationprocess a lot quicker and easier and it can be considered as a rendering program for designer’sidea (the only problem is customizing the dimensions and generate related drawings) .
Using this tool can help in solving a lot of challenges that face professionals in the field especially the limited time frame to show concepts to a client , not only clients but students as well which suffer from the time aspect (proved through the survey results) as well as other studies by following the previously mentioned prompt writing style .

Now, when it comes to students there are important questions that should be answered, Do using those tools impact student’s level of creativity? In which phase should be permitted for students to use? And how?

4.3. AI tools impact on student’s creativity

There is no doubt that creativity and critical thinking are core skills needed to be achieved through designing (Tang. et al.,2020,p.2) and despite this, current education programs have sometimes been criticized for not focusingenough on these and sometimes even stifling student Growth in creativity .

Before blaming AI tools in killing individuals' creativity (Generally) and student's creativity (in specific it is worth mentioning that there are other hidden factors that impact's creativity and that few academics drew attention to already .One of those most powerful factors are intrinsic motivation (even more than Extrinsic factors as per studies).This , in addition to student's personal style preference and personality (Kasof et al., 2007,p.105, Sara & Burhan, 2014,p.163) and while instructor can work on motivating students through Extrinsic factors more , he/she can still contribute through creating a general positive classroom environment. .However this study will focus on AI tools influence (in specific).

How AI can influence creativity is a topic already starting to grab the attention of a lot of scholars, in a study done in 2024, some scholars discussed four major scenarios how AI systems can influence creativity as follow (Ivecevic and Grandinetti,2024,p.1)
Human-AI co-creation: where AI becomes a tool (for human creativity).

1. Human only creativity: where full creativity is based on human yet they are influenced by the availability of tools that can help some with the creative process that can cause anxiety and frustration for some.
2. Plagiarism concerns.
3. AI diminishing human creativity in some individuals by weakening motivation and self-concept of creativity.

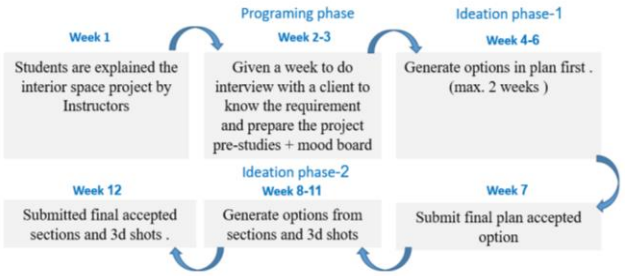
Now the biggest horror is the realization of this point with students.
And this moves us to the risks and concerns of using AI tools by when it comes to the education field .Mentioning this, one of the top major concerns are students becoming overly reliant on AI for tasks like writing or problem-solving. This can hinder development of critical thinking and independent creativity which are core learning out comes in a lot of modules based on design thinking process and which form 2 of the most important skills of the 21th century in addition to communication and collaborations known as the 4Cs (Thornhill-Miller et al., 2023,p2) ,making Thinking of a usage methodology a priority.

5. Suggested teaching methodology using Microsoft Bing in design thinking based modules.

5.1Current system in teaching design thinking based modules

5.1.1. Regarding design studio modules

Most of the modules that are based on the design thinking based modules including design studio modules follow the structure shown in (Figure 13)

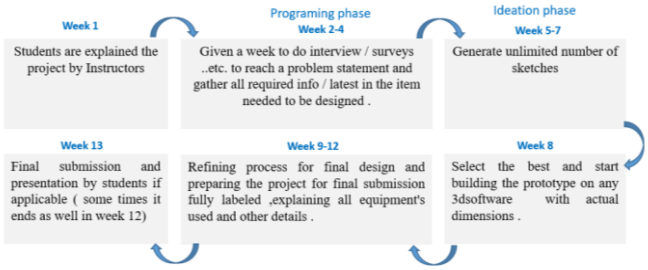


Fig(13)_ Design studio teaching structure (Author 2024)

which starts with the programming stage where students start making interview with clients , gather info about the project and start generating mood boards and concept which maximum lasts for 2 weeks due to limited time of the semester , moving on to the ideation phase of generating options and sketches to plans (most of the current applied systems in teaching design studios start with plans /bubbling and zoning) which lasts for 2 weeks as well (max .3) then submitting theplans and moving on to another ideation stage for sections as well as 3d shots which unfortunately (and most of the time) takes less or equal number of weeks for both in comparison to plan phase then submission phase.

5.1.2. Regarding other design thinking based modules

In other design thinking based modules it starts with instructors explaining the project moving on to the programing stage (as it is) which can include info about the product needed to be generated, A historical overview of previous designs for the product and all the necessary equipment for the product then ideation phase (un-limited number of sketches generated),selecting the best option ,start building the prototype on any 3d software, moving on to the refining stage ending up with final rendered product fully labeled with all details (Figure.14-P.12).



Fig(14)_ Design thinking based module teaching structure (Author 2024)

Now the question how and where to integrate the usage of AI tools in those structures so as to keep students' performance.
Generally and based on previous studies about using Generative AI tools, human role are mainly at two key moments of the creative process: at the beginning and at the end.

At the beginning: the human must engage in problem finding—identifying and exploring questions and fine-tuning them to get a desired output (Glaveanu et al., 2013,p.16).
At the end: the human takes on the role of the estimator who evaluates the merits of the AI-generated productions and then refines, modifies, and ultimately validates them.

This moves us to an important conclusion is that the best benefit cannot be achieved from using AI tools unless There is a strong education background that can help both students as well as professionals rightly evaluate the outcome , spot out the errors and utilize the good points in their design and that was clear in the author's previous experiment where the generated shots by Microsoft Co-pilot (Bing) appeared to be perfect and can really dazzle any Non-specialist ,yet errors were spotted by the author (Author 2024)

But before trying to reach the optimum implementation method of AI to update the old teaching systems for student's sake, further investigations on student's performance following the previous teaching structures were needed and if they were really following the right design thinking process.

5.2. Investigating student's performance to old Teaching methods

By observing Student's way of following design thinking process and understanding of different internal terminologies through the years , student follow the design thinking process till the programing phase and not accurately followed as well, they do not necessarily define a problem as they search for client needs , translate to mood boards (which is mostly of student's own convince and style preference) and start generating options accordingly (sometimes even without having a concept) , while other students define their concept by using a certain style (which is a popular option of applying concept between students) and of course this is inaccurate , raising another question, which is to what extent do students really understand the process and related internal terminologies including concept? (Author 2024)
The author's observation was proved even more, through a study done by a group of instructors based in turkey on their students, the study found that many students didn't fully consider the design problem. They skipped necessary research and focused on fitting furniture and decorations they found in pictures into a layout, without thinking about how the space would actually be used by people. Among the students surveyed, nearly 70% fell into this trap when designing their final projects (Kaya & Bilgic, 2020,p.278) which is another strategy followed by the author's students as well.

5.3. Proposed system in teaching design thinking based modules.

5.3.1Stimulate creativity

Before concluding the best scenario to AI implementation. Deeper investigation on students' minds during the designing process and how to increase creativity level in the outcome (as one of the previously mentioned challenges) was required.
There is much evidence suggesting that students' creativity declines with years in formal education (Alencar et al., 2017, p.555). The reasons are many and there were different views regardingimpact of instructor on stimulating creativity. A study evaluating engineering instructors which have to address creativity as well where evaluated by their students whom clearly stated that they are doing an insufficient job of passing on creativity inducements to students (Kazerounian& Foley,

2007, P766). Another study stated that the issue is with students fearing of making mistakes and expressing new ideas (Alencar et al., 2017, p.556). The sure information is that unfortunately even if some instructors are trying ,there is almost little to no information on how to teach creativity, where instructors mostly rely on the teaching methods they were once taught by when they were students as reference years ago. Believing in the matter's importance, availability of some papers discussing how to enhance creativity in teaching are already there. A paper discussed techniques and other hidden reasons impacting the process like moods and emotions (Newton, 2013, p.34) .An even more recent study in 2024 concluded that the right approach to enhance student's ability is to generate unique and innovative concepts is to engage in mental imagery and visualization exercises which has been proved to enhance designer's creativity when mixing with emotions as well (Edge comb et al., 2024). This can confirm that Microsoft Bing (co-pilot) can really enhance students' creativity by helping in the matter and confirming the paper's hypothesis when empathy from designer's side is activated as well.

When thinking in deep about "Mental imaginary",it is a powerful tool that allows student to visualize design solutions before actually creating them. Microsoft Bing will help students visualize their mental imaginary state and this by following a "directed prompt strategy" like previously explained (Author 2024) and to enhance this strategy. Working on interior designer's individual perception is a must (which is definitely based on education first). In this regard, it is worth mentioning that designer's perception is based on:

-Visual awareness: which is related to perceiving spatialrelationships regarding (color, texture, light and scale) and directly related to the knowledge of interior design principles.
-Spatial reasoning and the ability to imagine spaces in 3d dimensions.
This aspect can be enhanced to students through observation studies mainly ,where students are given case studies to observe and analysis based on previous education , making the best application of AI tools in level 3 and not level 2 (Author 2024).

5.3.2Proposed system in teaching design thinking based modules.

5.3.2.1Regarding design studio modules

In addition to different AI tools that can be used and help students in the design think process starting with the emphasizing stage and identifying the problem statement, Microsoft Bing (co-pilot) can be utilized as an assistive tool mainly in the ideation process after students already having done their research, have a clear problem statement and a clear concept to follow in order to solve. This should be translated by students following the (directed prompt strategy) and use Microsoft Bing (co-pilot) in the ideation phase where several options can be generated in seconds , then students' role come again to analyze and criticize the generated outcome (which can be already a part of the assignment's requirement and graded to enhance analytical and critical thinking skills and test their knowledge in the major) and choose the best option based on their knowledge and start modifying the errors and reflect it in the sections as well as generated shots to scale and per dimension based on the previous structure simultaneously (fig14-p.12).

Following this strategy can make the teaching process more enjoyable to students. In addition it can help some students overcome some challenges that limit their creativity and that theymentioned themselves in the structure above .For example , their sketching quality and not being able to express their thoughts as well as the time barrier. The suggested model by the author suggests start thinking as 3d interior spaces while furnishing the plan simultaneously as opposed to the traditional way of teaching those courses that starts with the plan and mood board alone (Fig. 15.)

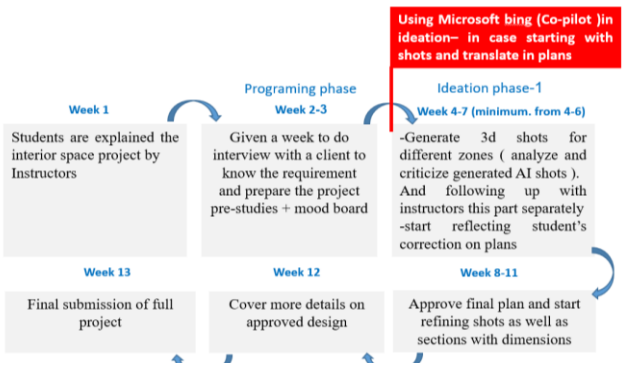


Fig.(15)_suggested structure for teaching design studiocourses (Author 2024).

5.3.2.2Regarding other design thinking based modules

With the same concept, Microsoft Bing (co-pilot) can be used in the ideation process where un limited number of options to a certain product (furniture ...etc.) can be generated , evaluated through student's / professional experience , select the best option and start refining , modifying and drawing all related details with dimensions and to scale (Fig.16).

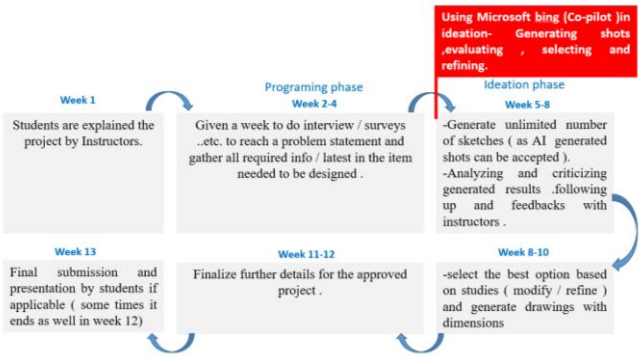


Fig.(16)_suggested structure for teaching non-design studio courses (Author 2024)

6. Conclusion, recommendations and future studies.

■ Regarding conclusion and most prominent results, it is worth mentioning that:

▪Most of the challenges facing professionals as well as students (especially time and budget constrains) can be solved using AI tools.

▪Microsoft Bing (co-pilot) is the most used by students and one of the best and reliable text to image tools available there (by experiment) that generate acceptable designs whether directed or undirected. Yet directed prompt writing strategy (based on designer's point of view and perception) generate the better outcomes.

▪Microsoft Bing (Co-pilot) can be a great assistive tool to both professional designers as well as students in the ideation process to translate designer's mental imaginary to save time which leads to increasing levels of creativity in addition to increasing (Junior / senior)'s motivation levels.

▪AI tools (generally) can be used in different phases of the design thinking process including the programming phase, while when it comes to Microsoft Bing (co-pilot) it can be used starting from the ideation process (based on the old design thinking based modules teaching strategies (design / non design studio) explained above .

■According to the concluded results , the author recommends some actions to improve interior design education service as follow :

▪ getting rid of old design thinking based modules teaching strategies (design / non design studio) modules and replacing with new teaching strategies that are based on starting with 3d shots using AI and working in parallel to modify all other drawings (and not submit part by part) , in addition to specifying a part of the assignments to be based on students analyzing and criticizing of results generated by Microsoft Bing co- pilot based on prior knowledge of (Interior space design styles, principles ...Etc.) Which makes the author recommends using it starting from second year in the major (level 3) and not the first year to ensure student's covering all the required knowledge to analyze and criticize the right way , get benefit and cover learning outcomes successfully and enhance both analyticaland critical thinking skills and use that to generatetheir own ideas. And to ensure student's innovation and creativity during the education process, regulations should be specified by instructor on level of intervention allowed using Microsoft Bing (co-pilot). For instance, fixing a certain percentage of getting inspired by generated images where part of the grade will be specified accordingly. And when it comes to integrating AI tools generally in interior design programs, the author suggests the map shown in (Figure 17) showing suggested AI course that can be added to interior design programs in different years .

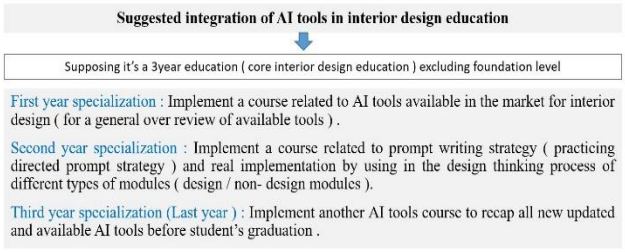


Fig.(17)_suggested structure for implementation of AI tools in interior design education (Author 2024)

▪Another suggestion is related to educators where offering sufficient training to instructors and how to use those tools to overshoot students already there knowledge is a must.
▪As for a general criteria to follow when using Microsoft Bing tool for (Educators, students and professionals, it is recommended the following:
-**First**: for Educators:
- Ensure using the tool in order to align with the curriculum objectives and intended learning out comes.
-Integrate Microsoft Bing (Co-pilot) in a creative way to increase engagement, interaction and as a result encourage creativity. (It can be even used to make a quick activity during the lecture time itself to make sure students understand).
-Use Microsoft Bing (co-pilot) along with manual sketches to facilitate feedback and give timely ones without weakening students' sketching.
-Directed Prompt writing strategy workshop or a lecture is a must in order to ensure best usage of the tool before actually using it .
- In design thinking modules : Use Microsoft Bing as previously mentioned after the phase of actually developing students' own idea to save creativity using the directed prompt strategy (as a must) and Specify grades in the assignment's rubric related to extent of AI integration in the project.
-In theoretical modules: Use AI tools as an assistant tool to gather references and info in a quicker way, yet it has to be revised by students as tools do errors. It can be utilized in putting research outline as well while checking plagiarism percentage on an official platform.

▪**Second**: For students
-Resource accessibility: By making sure AI tool is accessible for all as a first step (which till now is, as it is free for use) .
-Ethical use: which can be achieved by using it in a responsible way as previously mentioned with a certain percentage and in a certain phase under instructor's supervision.
▪**Third:** For Professionals:
-Quality output: by ensuring high-resolution, professional-quality images suitable for client presentations.
-Credibility with clients: By informing clients that the images generated are just to check the main concept and mood in a timely manner, but there will be changes based on actual space dimensions and inputs unless Microsoft bing is updated with new features in the near future.
■ For future studies, more experiments and trials for implementation of AI tools in education should be investigated where the impact of usage on creativity levels between ordinary teaching ways and those new ways should be tested and investigated more to ensure making the most of the tools that are already available to everyone and no escape.

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