AI-Powered Career Coaching: Evaluating Feedback Tools for Design Students

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Abstract: New technologies, particularly the merger with artificial intelligence, provided new instruments that can be employed to enhance the skills of designing students and getting ready for the immediate job market. Career management applications assisted by AI help address portfolios, reveal skills deficiencies, conduct imitation interviews, and introduce new tendencies in the industry to clients. Such tools enable the students to get prompt tutor feedback and move from classroom training to real market needs and expectations with less struggle. However, these tools are most useful when deployed in a manner that best meets the needs of the student. Despite the possibility of scaling the use of AI in terms of providing valuable and efficient assistance in human breaks, it is necessary to combine the AI approach with the traditional methods used in mentoring to have individual and very sensitive and balanced feedback in terms of desire or inspiration, emotional impact, and much more. In addition, the effective use of AI tools requires that no students are discriminated against by the algorithm or the tool used in the classroom by denying their requests or taking high chances of being randomized. Thus, this paper aims to analyze the strengths and weaknesses of using AI tools and applications for career Coaching in the Learning Portal for design education and understand how AI tools can help prepare students for a career but can also be used modestly and purposefully. The real representation of employees is vital to increasing AI use for career development; human contribution and creating inclusive AI systems are important.

Keywords: AI-powered career coaching, design education, portfolio analysis, skills gap analysis, automated mock interviews, industry trends.

Introduction

The fast development of AI systems has been defined as the driver for important changes in numerous sectors of human activity, including education and staff training. As design education requires richness of creativity, mastery of technique, and sensitivity to job market needs simultaneously, career coaching AI tools are developing as a revolutionary approach to enhancing student results. With implications for product, industrial, and UI/UX design, these tools offer new ways of working through portfolios and improving skills to prepare for a competitive job market. The art and science paradox in design education is the conflict between concept and execution in design, and AI's profit of giving student-specific advice directly confronts this conflict. However, that is where the potential of AI tools is: the richness of design education and its potential to be adaptive to the specific learning needs of the student as well as the continually evolving dynamics and requirements within the field.

This work aims to investigate to what extent the use of AI-based career coaching tools in design education is effective, what features are beneficial, and what problems exist with their usage (Kumar et al., 2010). Therefore, the central query guiding this study is as follows: how can AI contribute to the career exploration of design students in a way that respects their educational experience and responds to the characteristics of professional design work? Hence, the application of AI tools into design education presents an additional mode whereby

students can obtain real-time one-on-one feedback, in addition to using conventional career enhancement strategies such as critiques from instructors, portfolio reviews, and mentoring sessions. Consequently, this paper will evaluate the chances of an AI-driven revolution in career coaching by determining the capability of AI to guide on fundamental matters involving portfolio enhancement, developmental skill, trends, and mediation in interview preparation.

One of the key emphases of this paper is the focus on the kind of feedback that AI assistants can offer to design students. Such platforms can include a review of design portfolios and techniques to assess technical capabilities and various means of monitoring professional development via big data technology. Thus, AI tools can advise on particular areas, which may include color, layout, typography, user experience, and the design process, simultaneously with the proposal, and the feedback is incredibly helpful, especially if instructors can't provide individual coaching in large groups. Moreover, those or similar tools can also offer career-related advice, for instance, as a gap analysis or trends discovery; it may be a valuable resource for students who want to stay relevant in highly specialized fields like, for instance, UI/UX or product design.

AI tools can provide a personalized learning map for students and identify what is needed in the workplace because of the opportunity to see it firsthand. For instance, an AI-based system might evaluate a scholar's competency in different design tools, offer suitable enrichment programs, or include useful lessons. In summary, recognizing one's progress with authentic current industry advancements, for example, the increased need for sustainable design or enhanced generative design tool fluency, provides design students with one primary distinct factor in creating competitive employment opportunities for themselves in the specified domains.

Apart from portfolio analysis and skills gap analysis, there is potential for interview preparation, an essential aspect of career learning (Smith et al., 2009). With NLP and machine learning, AI can mimic an interview process with a student, evaluate their answers, and then provide feedback on the clarity and confidence of the student's language and observed directions in the design process. For instance, AI platforms can determine whether a student adequately explains the rationale behind selecting assets to include in their portfolio, identify how well they explain their design process, and offer better advice on how to interview. Such targeted feedback can greatly benefit the learners, especially when no one gives them one-on-one mentorship or actual career coaching sessions.

Incorporating AI applications in design education has its downsides, as discussed next. However, one major issue is keeping the feedback human-friendly where AI provides input. Being an art-related profession, design education is a personal area of study, and comments that help one person may not help another. Thus, AI tools have to be introduced as flexible and can address as many specific needs of the students as possible, their technological, creative, professional, and other individual features, as well as the type of design they are engaged in. This is doable by having AI structures that can accommodate learning from the individual user as the data keeps being fed into the system (Poole &Mackworth, 2010).

Then, there is the question of how AI could be incorporated into the current design education paradigms that harm direct human interactions with mentor/teacher-student feedback. For all the scalability and productivity that AI integration promises, it will still lack one unique advantage of human mentors – a deeper specialized understanding and the ability to factor in emotions. Mentoring in design education has moved beyond providing instructional feedback on generating design concepts. Also, it encompasses assistance in bolstering one's character strengths, the psychological well-being of a design learner, and general education on how best to deal with the intricacies of the design world. AI can, therefore, be believed to stand as a complementary measure to the mentorship process without adequately displacing it. Another is the question of bias, including from the designers, developers, and sources from which such systems learn. DAsAI models are only as disappointing as the data sets used to train the models (McCarren et al., 2011). Suppose these tools are taught on a limited data set or an improper sample. In that case, these tools' feedback may be limited to a certain aesthetic appeal, design methodology, or demographics. This leads to some pertinent questions regarding how those who are designing qualitative education for design are addressing the question of the diversity of learners and the accessibility of design education. To ensure that the AI tool is helpful to ALL students, the authors must ensure that their algorithm works for students with diverse backgrounds and those from different areas of design.

1. The Role of Feedback in Design Education

Feedback in the design discipline forms a foundational aspect within design educational systems, about a fundamental concept coined by David Nicol and DeWitt Baldwin as a powerful learning activity that helps learners evolve from beginners to experts. It needs to be noted that, unlike other disciplines, design is often an iterative process without any definite set of solutions; therefore, feedback is not only common but essential for a designer. They use it to judge the effectiveness of their work, meet user requirements, and refine their projects. Historically, feedback in design education has been provided orally through critiques, portfolio reviews, and mentoring by teachers, other students, and professionals. Nevertheless, as design programs grow and the number of students in each course rises, the problem of delivering timely and individualized feedback becomes crucial.

An intelligent feedback tool that can deliver timely and personalized feedback to a large number of students without being a hindrance to efficiency is needed (Wang et al., 2009). Such instruments can be used to evaluate the quality of the completed design, review portfolios, and even forecast potential developments in the industry. Based on the large volumes of data that AI tools can analyze within a short period, they can also pinpoint recurring patterns and issues in design and inform students on the general relativity of their work to market needs, among other things. Such applications provide instantaneous feedback and alter the result of the student's work, hence offering efficient feedback.

The availability of large quantities of AI feedback tools enables one to get a more personalized approach, especially in a field where personal style and creativity are crucial. By leveraging artificial intelligence, centers can get to grips with an understanding of each student and utilize the analysis to determine desired career paths and further recommendations for each student. These tools suggest areas for improvement when there is a need to upskill a team or check the understanding of design concepts for an upcoming project, especially when time for conjecture is limited. Moreover, these authors pointed out that students will be able to receive multiple inputs from various sources, including job markets and the expectations of the ever-changing industry.

A peculiarity of most AI feedback tools is their ability to offer real-time feedback, unlike in conventional classrooms, where students must wait for their turn to interact with tutors (Sarrafzadeh et al., 2008). Thanks to AI assistance, students get timely feedback and modify their portfolios, as well as the strategies used in designing, which contributes to learning. This is perhaps because of the relatively short time required to receive feedback on this method, thus enhancing quick skills improvement and adopting an emerging trend. This is particularly important because students can obtain independent and accurate evaluations from the AI tool, which indirectly creates a more equitable feedback system in personal student work.

AI is still equipped to evaluate the design elements and provide a business perspective from market analysis and updated demands for the design field (Kumar, 2019). These tools can be used to parse through big data that are gained from sources such as job boards, websites that promote design, and social media sites, to name but a few, to glean what is new in the design world. In so doing, they can inform students of recent skills and design methodologies that should be adapted to meet current market demands since their work indicates the current trends within the job market. Reflected in the examples above, this ability enables the program to predict trends and suggest areas of focus to the student, making it easier for the student to come to the class well-prepared, given the dynamic and evolving nature of the field (Darling-Hammond & Bransford, 2007).

Over the last few years, the use of AI in design education has begun to grow, with feedback tools being an example of its benefits. These tools give students immediate feedback on what they are doing right and wrong, thus aiding in improving the design process, critical thinking, and achievement of course goals. In the case of design education, the benefits of using AI feedback tools are presented in Table 1 as easier access, enhanced efficiency, and the possibility of delivering personalization in the learning experience.

Table 1: Key Benefits of AI Feedback Tools in Design Education

Aspect	Description	Benefit
Real-Time Feedback	AI tools provide immediate feedback on student work, eliminating the waiting time typically required in classrooms.	Enhances quick learning, immediate adjustments, and efficient skill development.
Personalized	AI tools analyze individual student work to	Supports unique creative expressions,

Aspect	Description	Benefit
Feedback	provide tailored suggestions for improvement based on personal style.	helping students grow in their individual design style.
Market Relevance	AI tools assess design work in relation to current market trends and job demands, drawing insights from big data.	Prepares students for real-world job markets, ensuring their work aligns with industry needs.
Efficiency in Feedback Delivery	AI can handle large volumes of data, providing feedback to many students simultaneously without loss of quality.	Increases efficiency, especially in large design classes, allowing for timely, consistent feedback.
Equity in Feedback	AI tools offer unbiased, standardized evaluations, ensuring every student receives the same quality of feedback.	Promotes fairness, eliminating the inconsistencies that can arise in traditional feedback methods.
Forecasting Industry Trends	AI tools track design industry trends through analysis of social media, job boards, and other platforms.	Enables students to anticipate upcoming design trends and prepare accordingly.

2. Types of AI-Powered Feedback Tools for Design Students

A career coaching system utilizing Artificial Intelligence is intended to provide a variety of forms of feedback that meet the diverse needs of design students (Lewis, 2010). These tools are useful because they apply a multiform concept in preparing the students' career-ready portfolios, skill self-appraisal, and other strategies. These tools offer feedback: portfolio review, skills gap assessment, automated role-plays, and trend analysis, among others.

Feedback-providing technologies are especially handy to design students as they get to receive a plethora of different feedback they need. An advanced human AI profession coaching system can help offer suggestions on several essential elements, including portfolio critiques, skills lacking, computerized coach role play, and trend examinations. All these tools aim to improve students' career preparedness by guiding them in areas such as portfolios, skills, and application in a professional context. As presented in Table 2, the various forms of feedback aids that incorporate artificial intelligence for students Majoring in design will assist them sharpen their technical and interpersonal communication and remain relevant in the labor market.

Table 2: **Types of AI-Powered Feedback Tools for Design Students and Their Benefits**

Tool Type	Description	Benefit
Portfolio Evaluation and Improvement	AI systems review portfolios, assessing aesthetic quality, innovation, coherence, and alignment with industry standards.	Helps students refine portfolios, enhancing competitiveness in the job market by ensuring relevance to industry expectations.
Skills Assessment and Career Suggestions	AI tools analyze competency in design software and suggest areas for improvement or emerging trends to pursue.	Guides students on where to focus their learning and helps them stay updated on industry demands.
Automated Mock Interviews	AI-driven platforms simulate interview scenarios, evaluating responses on both technical content and soft skills like communication and confidence.	Prepares students for real job interviews, improving their performance in both content and presentation.
Forecasting Techniques and Industry Data	AI tools analyze trends from job boards and design reports to predict the future needs of the design industry.	Keeps students informed about future design trends, helping them align their portfolios and skills with market demands.

2.1 Portfolio Evaluation and Improvement

Portfolio is one of the most important aspects of a design student's professional development. Describing the set project, it is possible to state that a portfolio demonstrates the student's creativity, discreet and practical skills, and problem-solving skills, which are also the major means of finding a job in design. Software applications developed through artificial intelligence determine different features of a student portfolio and the suitability of what the student presents to employment organizations. These tools apply machine learning to assess portfolios by considering similarity with successful portfolios of industry specialists and previous graduates.

The AI systems can review various parameters of a portfolio of designs, such as its aesthetic aspect, the skills level exhibited, the production coherence of the offers, and the level of innovation. These systems also determine whether the portfolio conforms to the design process, including research, concepts, mock-ups, and implementation. This feedback is generally given concerning standards in one's field of study, so students are well aware of those design aspects most valued in their professions. In addition, AI tools can assist a student in advising changes in portfolios focused on altering particular job descriptions or appeals to design sectors, ultimately making portfolios more suitable for potential employers.

Other important features include recommendations for improving portfolio design by increasing the implementation of AI-based color theory, typography, layout, and user experience (Guo et al., 2011). These tools can assist learners with details on their portfolios that inform them of how they can improve the aesthetics of their pieces to be competitive in the design job market. With the help of data analysis and a logical approach, AI tools can give input that students may not get easily otherwise in case their instructors or mentors are not available or are overburdened (Tshidi, 2022).

Using AI tools to assist the students, every student gets to get their portfolio assessed and reviewed at any time, and thus, the work can be made to progress without necessarily waiting for a directed timed assessment. That kind of feedback can be given constantly, which allows for a steady progression of improvement to make a portfolio more professional and refined for the growth of students. AI tools also have the added advantage of checking all the portfolios from all the students simultaneously with very close attention and making inputs to check that all the portfolios are being updated as expected in the current market. Portfolio assessment has a strength in that AI tools can look at the portfolio from a neutral perspective and determine the student's areas of proficiency and areas that require improvement (Buckley et al., 2009). Such real-time contextual feedback assists design students in building confidence in their work while at the same time giving them the necessary pointers to enhance their portfolios in real time. AI can be frequently changed to suit new designs, allowing students to gain knowledge according to the current design paradigm.

The **ePortfolio process** is often framed as a cyclical process to ensure continuous improvement and reflection. **Figure 1** illustrates the "Plan-Do-Review" cycle, which allows design students to assess and refine their portfolios over time, improving both their presentation and alignment with industry expectations.
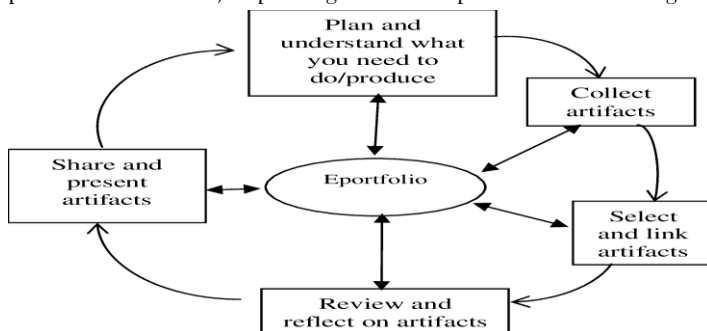

Figure 1: The eportfolio process as a 'Plan-Do-Review' cycle

2.2 Skills Assessment and Career Advancement Suggestions

Self-directed career development tools that AI powers cannot only assess portfolios but also give valuable feedback to the student to be trained on areas needing enhancement (O'Sullivan et al., 2012). Skills gap analysis is particularly helpful if a design student is in a design field and has not determined which skills are most useful for particular careers. AI can measure a student's level of competency in some of the main design applications, such as

Adobe XD, Figma, or AutoCAD, and suggest how they might improve (Le Cornu, 2022).Other than checking one's expertise in certain areas, AI tools can always present young talents with new trends in the designing industry that they might not be aware of, like generative designing or AI interface designing. In this way, AI instruments assist the learners with gaining the necessary knowledge of up-to-date technology and requirements for performing their tasks at the workplace and, thereby, retain the competitive advantage. The opportunity to determine where one stands in certain skills creates an ability to concentrate on developing those skills that would prove most useful in the student's field of work, thus always staying one step ahead of the competition.

Using AI, one can suggest potential professions based on the student's preferences and demands in the labor market. These tools refer to real employment opportunities in the marketplace, and by using the information extracted from job descriptions and postings, reports, and expert profiles, the resource identifies which occupations match the student's needs and strengths best. This feature assists students in coming up with better decisions on which sectors in the career path to venture into and information on what they need to learn to meet the market demand (Katz, 2013).

AI tools can evaluate one's technical capabilities and career interests, making them capable of providing a holistic approach to career mentoring. This way, students can get specific recommendations on where and how to develop the required competencies to fit particular jobs or design disciplines like UI/UX design or Industrial design, among others. Through these recommendations, using AI tools helps students better understand the available pathways and sets them on the right career path. AI tools can monitor industry trends, new positions available on the market, the latest technologies used, and new methods in design processes. This implies that students are always right on the information front and can alter skills and career goals in unity with the field. The benefits of this approach include the possibility of delivering the most timely and appropriate information to the students to help them in their occupations.

Figure 2 illustrates the **conceptual framework of metacognitive design thinking**, which integrates cognitive processes with self-awareness and reflection to improve problem-solving and creativity in design tasks.
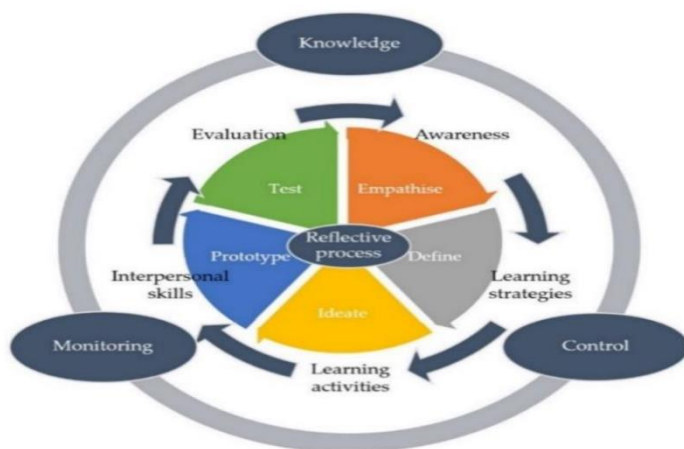

Figure 2: Conceptual framework of metacognitive design thinking.

2.3 Automated Mock Interviews and Feedback

Technical and behavioral interviews are the standard in hiring practices for designers, and portfolios or portfolios and technical assessments are also standard components of the hiring process. In this context, it may become quite stressful for design students, and testing,g personal and group performance, and projection are seriously urgent. Mock interview programs powered by AI present a great way to address these realistic situational samples since students can rehearse the answers in a relatively risk-free environment. These platforms enable students to know their performance status in content and delivery and build confidence before real interviewers.

Available NLP and machine learning-based mock interview tools simulate the interview process by evaluating the students' responses to interview questions. These key points are not limited to the content of the answers; they also include soft skills like comprehensible communication, confidence level, and capacity to explain the design processes and the ways of solving the problems appropriately. For instance, the AI system can determine whether the student effectively demonstrates how they tackled a design-related problem. This analysis

assists students in developing or refining the answers that they provide to clients, making them more potent and relevant. Apart from evaluating the content, these tools also have the added benefit of assessing the flow and manner in which the content is delivered (Abdallah & Jaleel, 2015). For example, if a student typed answers that were too short, the system would prompt them to explain the iteration process or elaborate on the aspect of the design for the user. If the student appears hesitant or non-confident, the AI can provide hints concerning how one may be more assertive or rephrase some of their answers to sound more formal, for instance. These are very important since they give the students immediate feedback on their presentation skills, which is important when applying for design job interviews.

Another advantage of mock interview platforms implemented with the help of AI is that the interviews are recorded in the form of videos and contain additional assessments. Such systems can interpret a student's gestures, eye contact, and even attitude, providing feedback on how such aspects would influence the perception of professionalism and confidence. For example, if the student tends to look down or not make eye contact in the feed, the AI can recommend generally enhancing these features to appear more confident. These signs are very important in interviewing candidates for design jobs and are usually centered on proficiency in oral communication and physical appearance (Nyati, 2018b).

Mock interview aids, driven by artificial intelligence, provide students with an extensive virtual interface to practice and appraise. Even though these tools do not mimic real-life and personal communication, they are helpful as preparation materials. As the form of the interview varies depending on the student's performance, it allows for providing feedback on the interview's technicalities and the student's behavior, which is ideal for reaching the end goal. Integrating AI tools into preparation means that design students will be much more confident during interviews and have a better idea of how they can market themselves.

Figure 3 presents a **design framework for developing school students' self-regulated learning (SRL) skills**, outlining key strategies and components essential for fostering SRL in students.
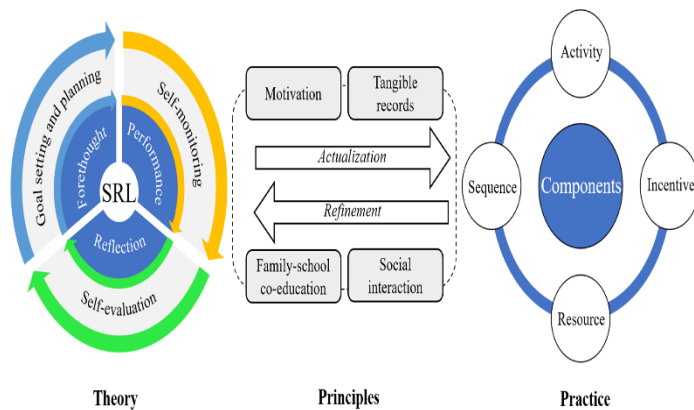

Figure 3: Design framework for developing school students' self-regulated learning (SRL) skills.

2.4 Forecasting Techniques and Using Industry Data

Sources that employ AI algorithms also offer trend analysis and industry insights that will be helpful to design students, given the emergence of new opportunities in the competitive job markets (Nyati, 2018a). This is especially true for professions like UI/UX design, Industrial design, and Product Design, where 'trends' dictate what is required of designers in the market. Employing big data methodologies, the AI tools pull data, such as job descriptions, reports, and design trends on various sites like Dribble and Behance, to discover the skills and competencies employers are demanding in the candidates. For instance, in UI/UX design, AI can identify trends where new courses such as voice user interfaces or augmented reality are starting to appear from those that would be valuable for students to know are rising and probable to become requirements.

AI tools assist students in offsetting these trends in the design industry to ensure that the education and portfolio they undergo fit the current market. For example, suppose the AI recognizes that the trend is moving towards sustainable design or smart products in industrial design. In that case, the students should add these areas to their portfolio or get practical experience designing these developments. When one knows what an employer's

expectation is or what technological advancement is expected to happen shortly, the student can work towards developing competencies that will enhance employment chances. Using natural intelligence, insights ensure that students are not acting as followers of trends but as leaders anticipating future needs.

One can obtain trend forecasts depending on one's preferences and aspirations with the help of AI tools (Kotsiantis, 2012). The former is particularly useful if a student is interested in a specific area of design to work in, for instance, designing user interfaces for mobile applications or 3-D modeling for creating product designs; the AI will be able to provide more tips regarding movements in the specific field the student wants to work in. This customization lets students get relevant advice for their fields and needs. This way, AI tools help students identify precise steps by consistently evaluating trends in the education industry and relating them to their abilities.

The second important application of trend analysis employed by AI is its capacity to forecast changes in the job market and the demands of the design industry. For instance, technical tools may use historical analysis to decipher which design sectors will likely expand in the subsequent years. This may assist student's academic mapping to have a guide on aspects that will be relevant in the future even though they are not sought in the current world. Such predictive capability enables students to decide which technologies to begin with, which fields to focus on, and which career paths to follow. Trend analysis based on AI results gives students a constantly updated picture of the design industry's further evolution. That's where AI steps in; by enhancing trends identification and forecasting, the user receives suggestions on what courses to take and what portfolios to create to match the demands of employers in the coming years. They help students make purposeful choices in their careers and thus will secure them in the ever-ambiguous design market.

Figure 4 illustrates **A Guide to AI in Trend Analysis**, outlining how AI tools can analyze data trends to predict future patterns in design and other relevant industries. The diagram highlights key steps involved in trend analysis, demonstrating how AI systems gather and process large datasets, identify emerging patterns, and provide actionable insights to inform decision-making.
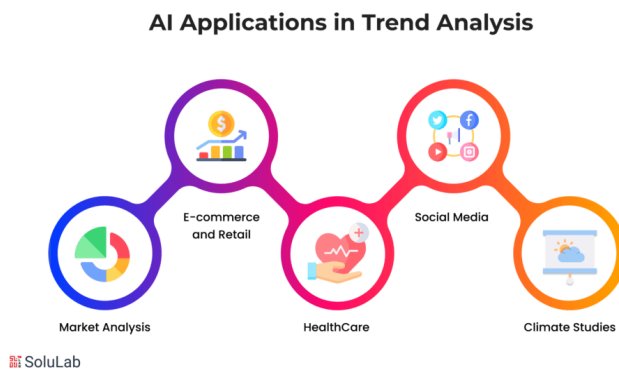

Figure 4: **A Guide to AI in Trend Analysis**

3. Evaluating the Effectiveness of AI-Powered Feedback Tools

Feedback tools enabled by artificial intelligence give design students the enhanced feature of immediate, cumulative, and evidence-based feedback on whatever they produce (Lawton et al., 2012). However, for these tools to offer apparent benefits, their data output must be viewed with keen self-analysis. The tools' capacity to be beneficial and accomplish the above tasks must be critically assessed to determine their applicability in presenting meaningful and valuable contributions. Among the considerations that should be considered are the tools' capacity to deliver individual evaluations, the integration of humans and AI, and the non-selectivity and open availability of the tools. Understanding these concerns in detail will help AI feedback tools augment learning experiences and positively impact students' professional growth.

Figure 5 illustrates the **Principles for Acceptable and Responsible Use of AI in Higher Education**, highlighting the ethical, transparent, and accountable application of AI tools in educational settings. This framework emphasizes the importance of fairness, privacy, and continuous evaluation to ensure that AI systems are used to support, not replace, the educational process while safeguarding students' rights.

Figure 5: Principles for acceptable and responsible use of AI in higher education

3.1 Personalization and Contextual Understanding

Career coaching tools supported by artificial intelligence pose one of the biggest difficulties in registering personalized experiences (Kantarjian& Yu, 2015). Since students are sought in the infield and are exposed to all the imaginative and liberal artistic professions, design education is by far more subjective. AI tools work on certain preset formulas drawn from different design process guidelines, features that an individual student might not incorporate, and the industry the candidate is to be designed for. For example, a portfolio may be evaluated against criteria related to a given style, but that takes no account of whether the student is obtaining industrial design or interactive media design, skills and trends of which are different.

To overcome this challenge, AI tools should be trained with data that cuts across all specializations within the design and possible future careers. These datasets would be most beneficial if they included portfolios of various fields and design disciplines and insights from experts in those fields. As AI sources can appeal to more extensive data, they can start to reevaluate the circumstances that define a given design and provide more helpful feedback. Such personalization guarantees students the support they need regarding their career paths and design interests, which is essential in developing professional individuals.

Adding flexibility in the basic form of a machine learning model with close adaptation to the students' inputs and ever-growing learning abilities is another approach to improving integral AI-based feedback assistance. Therefore, the more a tool is aware of a student's preferences and performance goals, the more it can provide specific tips. For instance, while a student is working on some projects and building up the portfolio, the AI tool may gradually understand that particular learner's work strategy and provide more relevant and useful suggestions as time goes on. This flexibility of learning makes it easy to make AI feedback more inclined toward the specific student development plan. As these points are individualized, the AI tool may be overly specialized and not look for creative ways around a problem not accounted for in the model (Bennett & Hauser, 2013). However, it is important to ensure that AI feedback does not restrict the inherent contingency that design can contain. If this problem is solved and the contextual understanding of AI models is refined thoroughly, AI tools' application in delivering personalized feedback will be much enhanced.

Figure 6 outlines the **Related Fields to Explainable AI in Education**, highlighting the interdisciplinary nature of explainable AI (XAI) and its integration with various educational domains. This figure emphasizes how XAI can draw insights from fields such as educational psychology, human-computer interaction (HCI), ethics, and data science, enhancing AI's transparency and user trust within educational settings.
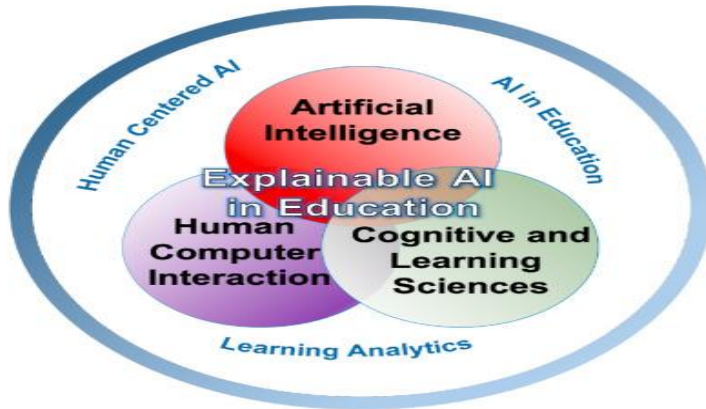
Figure 6: Related fields to explainable AI in Education.

3.2 Human-AI Collaboration

While it is drawing remarkable results to apply artificial intelligence in the feedback tools, human input is critically important in education, specifically in design disciplines (Nye et al., 2014). While AI can compute through various data sources, make patterns distinguishable, and provide generalized recommendations on yet another set of parameters – ranging from design theories to skill deficiencies – it cannot comprehend or give a human touch inherent to teachers. As for fields like design, creativity, and artistic perception, the aspects of the human perspective are more important in that area since the judgment of the creative work depends greatly on subjective viewpoints, and more so because the human way of evaluating tends to consider impressions and feelings and cultural connotations of the design better. For instance, an instructor could determine how effectively a design is informative to a specific culture, a field in which AI may still lag in providing adequate sophistication.

While using AI tools in design education can improve the quality of created projects and student experience, the best results are achieved when an AI system is embedded in a human–area system model. In this approach, AI can perform basic calculations, such as analyzing portfolios or determining skill deficiencies. At the same time, human educators are more suited for qualitative feedback that requires the usage of context. That way, the instructor can focus on aspects of students' creations, such as the innovative concept or emotion behind the piece, instead of being tied up by muscle-mem technicalities better addressed through AI tools. Substituting routine tasks with the help of AI allows educators to focus on the things that can bring the best results. AI can also help an instructor notice lacunae and student work trends that may not be seen immediately. For example, the AI tool may identify patterns across different portfolios, such as homogeneity of artifacts, the absence of coherent patterns, or lack of user-centric design. The instructors can use this insight as a base to give feedback during one-on-one sessions, which could be personalized to suit the student. Consequently, AI tools can supplement the feedback provisioning process to the educators instead of making them redundant.

It is essential to remember that AI tools should never replace human involvement in the design education process (Luckin& Holmes, 2016). While AI is good at analyzing data and can generate a pattern, which may be a way forward, it cannot offer the extra additional and emotional lessons that, for example, a student needs in particular. Seeking advice or feedback from human teachers or tutors, learners could struggle with difficulties connected with creative self-narrative, coping with adversities, and self-identification – domains that artificial intelligence is not ready to tackle adequately. Input control by AI and input from the tutor is a crucial component in enhancing the feedback process, especially within the purview of design education. As helpful as artificial intelligence can be in the design process, getting feedback as an ordinary non-artificial human Pro can be beneficial to help bring creativity, provide emotional encouragement, and handle the subjective part of the design.

Figure 7 provides a **Summary of Concepts for Responsible Design of AI**, which focuses on ensuring that AI technologies are designed and deployed ethically, inclusively, and transparently. This figure underscores the importance of considering various principles during the design and implementation of AI systems to ensure they are aligned with societal values and the well-being of users.

Figure 7: Summary of concepts for responsible design of AI

3.3 Accessibility and Inclusivity

The use of AI for receiving feedback has two major benefits – it can help make career coaching more accessible for those design students who might not otherwise be able to get in touch with a career coach or gain necessary contacts. First, minority students or those who attend the least resource-endowed institutions are opted by few mentors who can impart timely and meaningful information. The issue is that traditional feedback cannot offer all students the same kind of comprehensive and actionable feedback due to their inequality regarding connections to professional communities. The availability of such models is especially important in design, a domain in which apprenticeship and connections to employers are usually considered the linchpin to obtaining employment.

It is important to check that these tools do not become prejudiced and cause some particular groups of students to get worse results (Stangor, 2015). The same applies to the cases when the datasets used for training the AI models are dominated by the samples of work typical for certain students, for instance, Representing the over-privileged white Western student); the feedback may be incomplete or less impactful for the other students. For example, if an AI tool is trained through a portfolio that "favors" a given cultural or aesthetic style, it cannot provide useful feedback to a student whose work differs from the given style. Therefore, it may be less useful for those learners whose designs are not quite traditional or traditional in color.

For AI-enhanced career guidance tools to be effective for all students and to capture the numerous nuances of the design learning process, the dataset from which the respective tools are learned should also be diverse and encompassing. This includes race and ethnicity, gender diversity, and specialization in design fields such as graphic design, industrial design, and architectural design. By including various datasets, AI-based tools can provide feedback statements more appropriate to the given students' experiences, backgrounds, and goals, thus making the feedback more useful. Another action that should be taken to address these issues is to audit AI systems and tools routinely (Raji et al., 2020). Since such AI models are reconsidered periodically, it is necessary to evaluate how they help provide equitable feedback for students of different demographic backgrounds by comparing them across various portfolios. Such audits could also reveal any biases that affect the recommendations given to one or many students, making the feedback as useful as possible for as many students as possible.

Feedback tools that are driven through artificial intelligence to enhance the delivery of career coaching have benefits in extending the reach of services delivered through capital-intensive processes, and, therefore, the issue of their inclusiveness has to be actively managed. If the AI tools are trained from different inputs and the bias check is conducted continuously, it becomes a great asset for every student, and they can assist all students in finding a better job without the limitations of background and money. Such inclusivity is needed to ensure AI becomes a liberating force in design education (Gill, 2018).

When implementing tools using AI to give feedback to the design students, some factors have to be pointed out to help in the evaluation of the effectiveness of the tools implemented for the task. As highlighted in Table 3, the main evaluation criteria, therefore, include personalization and contextual understanding of the user,

AI-human interaction and collaboration, and AI tool accessibility and inclusiveness for all. All of these factors are crucial to avoid the application of AI tools that provide a drought and generic-type feedback but instead create a positive and constructive learning environment.

Table 3: **Evaluating the Effectiveness of AI-Powered Feedback Tools in Design Education"**

Evaluation Aspect	Description	Key Benefit
Personalization and Contextual Understanding	AI tools need to offer tailored feedback by adapting to the student's specific design field, style, and goals. This includes understanding the student's preferences and performance history.	Provides more relevant, customized feedback that aligns with the student's unique development and career goals.
Human-AI Collaboration	AI should complement human educators rather than replace them. AI can analyze data, but human input is essential for subjective, emotional, and creative aspects of design feedback.	Combines AI's data analysis with human creativity, fostering a balanced approach to learning and professional growth.
Accessibility and Inclusivity	AI tools can increase access to career coaching and portfolio reviews, especially for students who lack mentorship or resources. However, the tools must be carefully designed to avoid bias.	Expands career coaching accessibility, ensuring all students receive equitable, valuable feedback regardless of background.

4. Integrating AI-Powered Career Coaching into Design Education

For AI to significantly improve design students' educational outcomes and marketability, conceptual tools to drive career coaching need to be appropriately implemented in design education. This integration must be a holistic one that involves the teachers, the developers of the AI, and the experts in numerous industries to ensure the implementation of the tools fits both the academic goals, strategies for implementation of the tools in the classroom, and the demands of the job market. Integrating AI tools should be smooth to ensure students get value as they learn and prepare to become good designers in the fruitful design industry. Using AI tools integrated with design programs will provide students with an enhanced learning experience that will prepare them for the market.

AI in teaching and learning design cannot be limited to commenting on student's work. During their implementation, these tools should be presented as additional tools that support conventional approaches to teaching. This means using AI in designing curriculum and course maps in a manner that meets students' needs and aspirations. For instance, in one design program teaching about user experience design, the AI tool may check portfolios to see how well students convey the user-centered design principle or how properly they meet prevailing UX design standards. In this context, AI feedback would greatly help as it would offer information that can be quickly implemented in the scholar's work and projects.

Integrating AI tools can enable instructors to work with big data and use this evidence to lead class activities, including portfolio assessments and skills training sessions (Cope &Kalantzis, 2016). AI can give an initial view of the students' performance and thus allow the instructors to engage in discussions concerning design principles and processes, as well as strengths and areas of improvement. What it does create, however, is a more well-rounded feedback system that provides students with both numerical and qualitative grades to show them how they stack up in not only the material they have learned but in comparison to a blueprint of what is considered acceptable within the parameters of their future careers. This way, through the combined use of artificial intelligence and trainers or professors, students receive knowledge and skills that will directly help them in their professions.

AI tools can be advantageous in creating a more personal learning environment because the instructors may provide feedback that fits each student. For instance, if a student is facing difficulty understanding a particular design technique or a tool needed for a specific task, then the AI tool will recognize the knowledge deficit and suggest it appropriately. These individual assessments assist students of all learning abilities to move to

the next level without the hope of leaving behind any learners, let alone those with poor performances. One way of integrating such tools into students' educational process, which is essential for their further learning and development, is by properly aligning curricula.

This figure below illustrates the different applications of AI in the system and the impact they have on the education sector and those benefiting from it. It also reveals the solutions that AI technologies could provide. It provides information concerning the plan that should be taken to encourage the use of technologies in learning institutions. AI, as represented by the above figure, is essential in teaching and learning experiences ranging from personal learning, technological administration, and scalability and accessibility, amongst others.
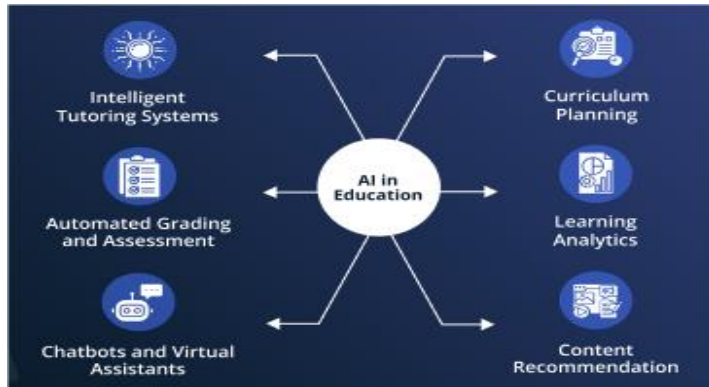

Figure 8: AI in education: Use cases, benefits, solution and implementation

4.1 Curriculum Alignment

For AI tools' goal in the discussed cases to be achieved at their best, these tools need to be incorporated into the framework of career education within the context of design disciplines (Pedro et al., 2019). Such alignment avoids situations where the information given by an AI tool to a student is useful for the near future yet irrelevant to their career progression. When these tools are linked to the program's learning outcomes, students are given information that will fit into their learning and studying processes in the shortest time possible. For example, if the program the students are in places importance on the design aspects of sustainability, then the AI tool should be able to infer by considering the students' portfolios and providing feedback that guides them toward sustainable design strategies. This way, the students are always engaged in learning skills that are relevant and of quality standards concerning the modern world market.

Curriculum alignment also entails the applicability of the whole concept when considering the learning course or module. In educational design establishments, courses are separated depending on the type of design they aim at, such as typographic design, brand design, or 3D design. AI tools must be in a position to review work produced by students, bearing in mind these particular competencies, given the teaching objectives of the course involved. For example, in a typography course, an AI tool will assess the effectiveness of the student's choice of typefaces, spacing, and alignment for communication. When implemented in the classroom, these AI-based assessments will enable the instructor to provide feedback to the students based on the core values education of the course.

Another aspect of the usage of AI is that instructors can monitor their students' performance at different stages, which enables them to have important data concerning the behavior of learners in the future. Suppose the student is good in some areas but weak in others; the AI tool will guide where to provide extra help. Thus, it can contribute to how instructors can better support individual students and make certain that such a student gets what they need to perform well. Such an ongoing feedback process can assist students not only in becoming better learners but also in becoming more proactive.

The correlation of AI-supported tools with study subjects in the curriculum can help students define more effective ways to achieve occupational goals. Thus, using data from industry standards and practices in the feedback implementation allows for the presentation of student portfolios and the overall set of skills in demand upon graduation. For instance, if AI tools notice trends in the design work, for example, an augmenting focus on UX research within web designs, students could be encouraged to bring these into their work and be better prepared for contemporary practices and experiences.

The figurebelow outlines fundamental aspects of cultivating innovation orientation among scholars, insisting on the values of creative thinking, analysis, and perseverance. It discusses deployment methods that include pilot encouragement, learning from failure, and knowledge promotion with regard to cross-functional perspectives. These principles are helpful in getting the readiness of students within a changing environment, especially within the context of design learning, where creativity is key to success.
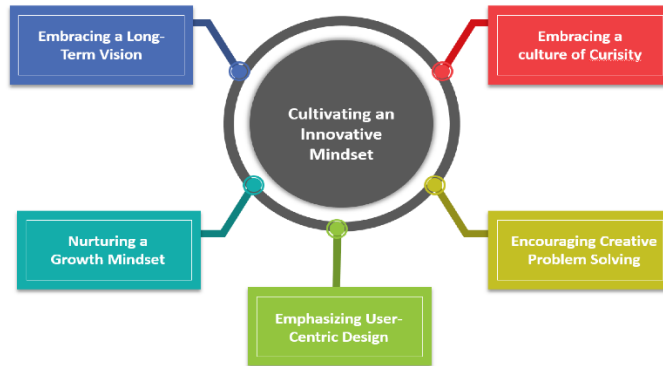

Figure 9: Principles of cultivating an innovative mindset.

4.2 Continuous Learning and Adaptation

This could mean the design industry is growing quickly, with new tools, trends, and technologies constantly emerging. To keep the students relevant in the respective fields of their choice, any AI career coaching tool must provide lifelong learning capabilities. These tools should be updated to meet new standards and trends in the industry concerning job market data, new technologies, and new design trends in feedback. That way, they can provide students with immediate feedback anchored on the current job market expectations.It also means that AI tools can be integrated with and updated with data from such sources as job announcements, online design forums, and studies. For example, AI tools should immediately adjust their analysis if a new graphic design tool or application emerges as popular for companies. Likewise, even if new design practices are introduced- for instance, ethical AI in design or an emerging trend of accessibility, the criteria they use to grade a design piece, the AI tools, can be programmed to reflect these practices to ensure students develop competencies in these areas. Such feedback is adaptive for a reason; it ensures that learners are memorizing design principles and the skills employers most frequently look for.

Using adaptive AI tools, it is real that it increases its level according to current data; students get acquainted with as many professions as possible and newcomers to new design directions. For example, AI can be used to monitor new job vacancies and even determine the particular skills that companies require from the vacancies. This information can be used to give relevant career advice to assist the students in seeking pertinent other careers that they can pursue by tapping into what they are initially skilled in. Overall, such an approach is successful because by being flexible, AI tools enable students to help them proactively align their knowledge and career choices in response to industry shifts (Ahmad, 2020).

The openness of the AI tools also compels students to be more active in learning. Students can utilize these instruments without waiting for instructors to tell them the current trends in the industry and define in what aspects they are not sufficient. AI can give constant suggestions regarding the new trends appearing in the market so the students are ready and able to learn new skills and become more valuable for the given job market. This kind of learning setup will also allow students always to have updated knowledge to address whatever future designs they may require in the industry. Learning and updating AI-based career coaching tools and applications should also be ongoing. Through knowledge of the industry and the changes that it undergoes in terms of practices in the designing world, AI brings students knowledge and suggestions towards prospective battleships in this employment market. Besides, it also means that students always have reliable information on industry practices and are free to organize their continued professional development.

Some of the features are highly technical and relate to the process of design education, while others are broad considerations of integrating AI into the design curriculum. As presented in Table 4 below, these aspects

encompass curriculum congruence, learning/teaching adaptiveness, learner-centeredness, feedback incorporating industry practice, and promoting student interest and self-mastery. If applied to these areas, AI tools will greatly help design students develop the needed competencies and prepare for challenges that constantly appear in the modern professional world.

Table 4: ***Integrating AI-Powered Career Coaching in Design Education***

Aspect of Integration	Description	Key Benefit
Curriculum Alignment	AI tools must align with the learning outcomes of design programs. This ensures that feedback is relevant to students' career paths and the skills demanded in the job market.	Ensures students are developing skills that are directly applicable to industry needs and future job opportunities.
Continuous Learning & Adaptation	AI tools should continuously update to reflect new industry trends, tools, and market expectations. This keeps the feedback relevant and ensures students remain competitive.	Provides students with up-to-date industry knowledge and prepares them for emerging trends and technologies.
Personalized Learning Experience	AI can offer tailored feedback based on individual performance, helping instructors provide more personalized support.	Enables instructors to focus on areas where students need the most support, enhancing individual learning experiences.
Industry-Relevant Feedback	AI tools should track job market trends, including emerging skills and practices, to provide students with advice and guidance aligned with current demands.	Prepares students for the specific skills and roles currently in demand in the design industry.
Student Engagement and Autonomy	AI can provide students with ongoing suggestions about new trends, design practices, and skills, allowing them to take charge of their learning.	Empowers students to proactively learn new skills and remain engaged in their professional development.

5. OECD Ethical Acceptance and Data Privacy

Like any other AI application, many ethical concerns apply when incorporating career coaching tools in design education. Students' portfolios, career interests, and learning data are garnered and processed to echo the students' individualized outcomes. It is important to guarantee that this data is protected to avoid doubts about these systems. In addition, there is a need to consider possible ways of embedding prejudice into the algorithms of an AI system and penalizing individuals of marginality or form discriminating possibilities in the design field.AI systems should also follow data protection rules and GDPR or an equivalent law to prevent the leakage of students' information. There is also the issue of how institutions and developers manage and process data and give students power over their data. The three approaches to practicing ethics in an organization involve ethical behavior and fairness policies, which should be checked frequently for accountability to avoid the biases of the Artificial Intelligence systems in the education system to serve students equitably and responsibly.

Similar to most AI applications, the issue of ethics for AI-based career coaching tools is vital, including in the realms of design education, where student data is collected and analyzed. To take the risk of applying these tools and maintain ethical standards, issues related to data privacy, bias, fairness, and accountability should be taken seriously. Table 5 also encapsulates the ethical and data privacy considerations that emerge with the use of AI systems in design education with corresponding consequences and measures. These issues are crucial to achieving proper usage of AI tools, avoiding biases or unfair discrimination, and respecting legal frameworks such as GDPR.

Table 5: **Key Ethical and Data Privacy Issues in AI Career Coaching**

Ethical Issue	Description	Potential Impact	Mitigation Strategies
Bias & Discrimination	AI systems may unintentionally perpetuate biases based on data inputs, leading to unfair recommendations.	Can disadvantage marginalized groups or favor particular design styles, impacting diversity in the field.	Regular audits, diverse datasets, and algorithm transparency to ensure equitable outcomes for all students.
Data Privacy & Security	Students' personal data, such as portfolios and career interests, is processed, raising privacy concerns.	Potential for data breaches or unauthorized use of sensitive student information.	Compliance with GDPR, encrypted storage, and secure data handling practices.
Fairness in Recommendations	AI feedback might prioritize certain design skills or approaches over others, limiting student growth.	May narrow career paths for students whose work doesn't align with AI's predetermined standards.	AI tools should be adaptive, considering different career paths and design specializations to offer balanced feedback.
Data Control & Student Consent	Students need control over their data and must consent to its use.	Without control or understanding, students may feel their data is being exploited or used unfairly.	Clear consent forms, transparent data usage policies, and the ability to opt out or manage data preferences.
Accountability in AI Systems	Ensuring that AI tools are used ethically and that institutions remain accountable for any harm caused by bias.	Lack of accountability may lead to unchallenged unethical AI practices, resulting in inequitable feedback.	Establish ethical guidelines, regular system audits, and hold developers accountable for their AI systems' impact.

6.Conclusion

Career advancement applications that use Artificial Intelligence technology are also changing the way design students train and get feedback on their work as they plan on entering the industry, a shift that is not found to be minor in the field of design education. These tools give specific analytics solutions based on topical areas like portfolio, shortage of skill analysis, and trending industries. In this context, through fast and individualized feedback, AI tools enable learners to become more proactive in their education and career choices to actively respond to the ongoing and enhanced demand in the workplace. Whether it is about sharpening a portfolio, defining skills that have to be learned, or changes that need to be incorporated into a profession, AI can help students navigate the confusion behind career progression.

For AI-based tools to be efficient enough, implementing such tools in the design of education programs should occur carefully and thoroughly. Therefore, these tools must align with the overall curriculum and teaching activities of design courses. Such a rapport makes it possible to incorporate AI feedback in addition to conventional teaching techniques. Although AI may provide insights into the Industry's practices and the current employment opportunities, it cannot supplant the heuristic, creative, and personable critiques that instructors and tutors offer. For instance, while using AI, it is easy to learn that technical gaps exist in the design portfolio. Still, it cannot facilitate the evaluation of the artistic content, cultural relevance, or even the personal touch that a mentor can facilitate. Hence, AI tools should complement existing feedback systems rather than replace them.

The other important factor is the flux nature of the design industry. Design technologies, techniques, and preferences of users in design evolution are fast, and as such, the AI tools' feedback requires frequent updates. Consequently, such artificial intelligence career coach platforms must integrate the related trends, tools, and methodologies into the alteration's feedback mechanisms. New postings, reports, and design innovations found in

the latest jobs posted on the internet will be frequently incorporated into AI algorithms to guarantee that the information being imparted to students is constantly updated. The continuous learning system enables students to develop better strategies to meet existing industry changes and be ready to face new challenges in their disciplines (Mohamed Hashim et al., 2022).

AI experts, educators, and other professionals must continue their partnership moving forward so that the tools created to drive AI work remain effective. Technical specialists provide academic experience in learning algorithms and data analysis, and pedagogical specialists can involve the knowledge of students' learning process. Using Industry professionals brings much-needed feedback on market demands into the equation, thus ensuring that the input provided by the AI tools is realistic. Such an approach will also make sure that the tools will not make prejudice on any particular demographic, ableism, racism, classism, and are created with an inclusive perspective that any student, regardless of their gender, color, ability, is capable of achieving whatever they want.

The future of design education is to combine AI tools with tutoring by human educators and skilled professionals. Integrating these strategies using AI's capabilities and having a mentor will provide students with better learning, one that is balanced and enriched. The pragmatic work that can be described in a broad brush-stroke by the portfolio analysis or the skills gap can be performed by AI; this can help instructors and mentors to devote more qualitative deliberations to other tasks. Students benefit from this collaboration because it supplements the course's learning goals and balances the rationale and fantasy of design training.

With the advancement in technology and the development of applications and software for machine learning and AI in career coaching, the use in detailing the students of design specialisms is profound. When properly integrated and used continuously, these tools can prepare the next generation of designers with the requisite skills, knowledge, and confidence to face the challenges inherent in the current competitive market. Here, the synergy of the artificial intelligence mentor and a human supervisor could help students cover all aspects of the design world and guide them on how to create the best portfolio, what trends to follow, and which technologies to learn. The integration of human skill and artificial intelligence programs in the engagement of design education and career coaching can be attributed to this strategic partnership to achieve better outcomes and improved, renewed, and rich learning strategies to benefit the design students.

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