Technological Advancements in Educational Counselling: Exploring the Role of AI, Data Analytics, and Virtual Guidance Platforms in Student Support Systems

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***Abstract*—This research investigates the influence of technological innovation—namely Artificial Intelligence (AI), data analysis, and virtual guidance platforms—on Chinese higher education student satisfaction with educational counselling services. Utilizing a quantitative design, the data were gathered via a structured survey of 232 students who had received counselling services. Statistical analyses involving regression and mediation modeling through Statistical Package for the Social Sciences (SPSS) were carried out in order to evaluate direct and indirect relationships between the variables. The results show that AI integration, data analytics utilization, and virtual guidance platform availability individually have a strong positive impact on student satisfaction. In addition, the research establishes personalized student support as a mediating factor in these relationships, highlighting the need to customize services based on individual student needs to best capitalize on technological innovations. These findings imply that technology optimizes access and efficiency but that its real impact on satisfaction is only achieved when blended with actual personalization. The study provides useful guidance for higher education institutions seeking to reform their counselling systems and enhance student outcomes. By underscoring the complementarity of technology and personalization, this research offers a theoretical and empirical framework for the design and implementation of student-centered, technology-enhanced support services in higher education.**

***Keywords*—artificial intelligence, data analytics, virtual guidance platforms, student satisfaction, personalized support**

I. Introduction

The educational counselling landscape has dramatically shifted with the incorporation of cutting-edge technologies like Artificial Intelligence (AI), data analysis, and virtual advisory systems [1]. Historically, counselling services were highly dependent on face-to-face communication, one-on-one advisory sessions, and manual evaluation of students' career and academic requirements [2]. But new technologies have brought new paradigms to learning support systems with improved efficiency, accessibility, and personalization [3]. Artificial intelligence today can also give predictive student behavior feedback, suggest customized learning paths, and perform routine counselling processes automatically [4]. Likewise, data analytics have made learning institutions capable of extracting meaningful insights from massive amounts of student data, enhancing intervention accuracy [5]. Virtual counselling websites providing 24/7 access to counselling material have also increased the support hours outside regular office timings [6]. As digitalization penetrates further into the education system, interest in how the technologies affect students' satisfaction with counselling services increases [7]. The present study is positioned at the nexus of educational technology, student support systems, and service satisfaction, seeking to unravel the processes by which AI integration, data analytics, and virtual platforms affect the student counselling experience.

Previous research has comprehensively examined the impact of technological advancements on educational counseling outcomes. Researchers have discovered that AI-driven systems have the ability to increase the effectiveness and precision of educational counseling, providing predictive insights into career planning and course enrollment [8]. AI-powered chatbots and virtual assistants have been found to decrease response times by a considerable margin and enhance response consistency of information provided to students [9]. Empirical research by Ellikkal and Rajamohan [10] also revealed that AI-powered adaptive counselling systems that adapted recommendations according to student learning patterns yielded greater levels of learner satisfaction than conventional methods. Data analytics has also become a pioneering instrument in education counselling. Stewart *et al.* [11] discovered that predictive modelling based on academic performance and behavioral data can detect underperforming students at an earlier stage, and intervention can be initiated in a timely manner. Additionally, data analytics-driven interventions were found to be associated with improved learning outcomes and more efficient counselling perceived by students [12]. In contrast, virtual guidance platforms too have been a subject of robust empirical analysis. For instance, Fatima *et al.* [13] found virtual platforms that delivered real-time chat, online databases of materials, and personalized career tests were strongly associated with the general satisfaction that students felt for counselling services. Moreover, virtual platforms were also seen to widen access, whereby support services were more easily reached by students having scheduling or mobility concerns [14]. Collectively, these studies identify the potential of technology to revolutionize student lives in school counselling. While the explicit impact of AI, data analytics, and virtual platforms on outcomes in counseling has been thoroughly documented, fewer studies have attempted to explore underlying mechanisms especially the contribution of tailored support to the formation of these associations [15]. Recognizing this gap, the present study delves deeper into how personalization mediates the relationship between technological integration and student satisfaction.

Notwithstanding the increasing literature on the study of

technology's contribution to educational counselling, there are still significant gaps. For one, most of the literature so far views the implementation of AI, data analytics, and virtual platforms as independent variables, without accounting for the synergistic or combined effects they might have on the counselling process [1]. Most studies assess these technologies in isolation, thus failing to realize how they enhance or detract from student satisfaction collectively. Second, personalization even though often argued as a positive effect of technology, is hardly ever investigated as a mediating process [16]. Other work tends to speculate that personalization happens organically as a collateral effect of utilizing technology, although few studies establish empirically the extent to which personalized assistance translates technological potential to enhanced satisfaction measures [17]. Additionally, most studies examine short-term behavioral effects, e.g., more service use or performance, with comparatively fewer studies emphasizing emotional and perceptual outcomes such as satisfaction, loyalty, or perceived support quality [18]. Another significant gap is population diversity: AI and virtual platform research is mostly focused on Western educational contexts, with few studies exploring diverse or non-Western environments where cultural, technological, and institutional variations can influence the impact of these innovations [19]. Filling these lacunae, the present research takes up a holistic model that incorporates AI, data analytics, and virtual platform accessibility, examines the mediating impact of individualized student support, and targets particularly student satisfaction in educational counselling systems.

Although extant research has comprehensively studied individual technologies—like AI, data analytics, or virtual counselling platforms—in enhancing educational counselling services, little is known about the combined effect on student satisfaction. The majority of the available literature considers individual technologies as independent interventions and does not consider how their integration may build a synergy effect. Secondly, while personalization is often cited as one of the advantages of technology, it is seldom examined as a mediating process that converts technological potential into enhanced student experience. Student satisfaction's affective and perceptual aspects, especially in non-Western educational environments such as China, are also yet to be explored in depth. These gaps indicate the necessity for a comprehensive model which not only measures the direct influence of technology tools but also explores how individualized support for students mediates such relationships. Filling this gap, the present study offers fresh evidence into the combined effect of technology innovations and personalization on the satisfaction of students in educational counselling services. Thus, the present research has the following objectives:

- To examine the impact of artificial intelligence integration on student satisfaction with educational counselling services.
- To investigate the effect of data analytics usage on student satisfaction with educational counselling services.
- To analyze the influence of availability of virtual guidance platforms on student satisfaction with educational counselling services.
- To explore the mediating role of personalization of student support in the relationship between technological advancements (AI, data analytics, virtual platforms) and student satisfaction.

This research makes a significant contribution to educational counselling by providing a rich perspective on the impact of technological instruments on student satisfaction, not only through immediate channels but through the pivotal intermediary of personalized guidance. As more institutions make investments in AI infrastructure, data analytics platforms, and digital guidance solutions, empirical research on the impact of these technologies assumes critical importance. By revealing the mediating function of personalization, the research emphasizes that it is not sufficient to embrace technology but that efforts should be made to ensure that it is employed to address individual student needs. This is of critical practical significance for designing, implementing, and evaluating educational counselling services in the digital age. In addition, the findings add to the theoretical development of the educational technology and student support literature, providing directions for research and practice in the future. This is the first study to empirically verify personalization of student support as a mediating construct between three converging educational technologies—artificial intelligence integration, use of data analytics, and availability of virtual guidance platforms—and student satisfaction within a non-Western educational context.

II. Literature Review

A. Artificial Intelligence Integration and Student Satisfaction with Educational Counselling Services

Artificial Intelligence (AI) integration is the use of smart computer systems, including machine learning, natural language processing, and predictive analytics, to improve learning processes, including student counselling services [20]. Student satisfaction with educational counselling services is a measure of how much students value the counselling services they receive in terms of how much they believe these services exceed or meet their expectations in dimensions such as responsiveness, personalization, quality of guidance, and accessibility [21]. Integration of AI in counselling services allows for real-time feedback, auto-suggest, virtual assistant communication, and data-driven customization of counselling sessions [1]. Use of AI technologies can potentially result in more customized advice, faster turnaround times, and increased availability of services when there are no human counsellors available [22]. AI-based platforms can also review student histories, interests, and performance records to recommend individualized education routes or career choices, thus enhancing the counselling process and making assistance more contextual and actionable to students' individual situations [15]. The Technology Acceptance Model (TAM) theory suggests that perceived ease of use and perceived usefulness determine user satisfaction [21]. Western literature tends to favor AI-based tools as increasing student services' efficiency and participation. In a Chinese environment where digital adoption is swift but predominantly top-down, student satisfaction can be influenced not just by functionality but also by factors such as

trust in authority and education hierarchy [22]. Therefore, AI implementation can lead to varying satisfaction results compared with Western individualistic environments [23].

Previous empirical studies highly supported the positive role of AI in raising the level of student satisfaction within educational support systems. The studies discovered that chatbots based on AI highly enhanced the perceived availability and responsiveness of services among the students, thereby raising the level of satisfaction [9]. Similarly, Bwachele *et al.* [3] highlighted through a study that AI-powered academic advising systems improved perceived timeliness and relevance of advice, which further directly contributed to students' satisfaction levels with support services. According to a study by Missun and Omar [23], AI-driven virtual counselling platforms led to increased student empowerment through 24/7 advice and increased personalized recommendations. Together, these results suggest that when AI technology is deployed into counselling systems intentionally, they can enhance the quality, effectiveness, and individualization of education counselling.

H1: Artificial intelligence integration has a significant impact on student satisfaction with educational counselling services.

B. Use of Data Analytics and Student Satisfaction with Educational Counselling Services

Educational counselling data analytics is the methodical gathering, processing, and interpretation of student-related information to guide counselling activities, individualize student interactions, and forecast future requirements [21]. It entails the analysis of information like academic performance, attendance, behavioral indicators, and career interests to provide tailored support [2]. Student satisfaction with educational counselling services is still operationalized as the degree to which students perceive that the counselling they are receiving is responsive, effective, and specific to their own needs [3]. Data analysis enables counsellors to move from being reactive to proactive, identifying at-risk students earlier and providing timely referrals [5]. It also encourages a more objective and evidence-based approach to counselling by removing guesswork and bias and thus fostering an atmosphere of credibility and trust among students who use the services [1].

Empirical evidence continuously references the centrality of data analysis in fostering students' satisfaction with support facilities within schools. According to Rosmalina [14], student satisfaction rates in schools that infused predictive analysis within counselling models were boosted by 30%, thanks to students' appreciation for support interventions being rendered appropriately timely and relevant. Stewart *et al*. [11] also confirmed that data-informed counseling programs increased advice personalization and improved perceived helpfulness of the sessions, with a positive correlation to student satisfaction increase. Tzimas and Demetriadis [24] confirmed that data analysis facilitated better monitoring of students' progress and goal attainment, and students perceived more empowerment and satisfaction with services received. Expectation Confirmation Theory (ECT) posits that satisfaction among users originates from the expectation confirmation via performance [5]. Analytics-informed intervention is valued in Western societies for openness, as well as timely intervention. In China, issues of data privacy, academic stress, and social stigma might change how the students view and react to analytics-based guidance [3]. Satisfaction here could be mediated by perceived fairness, rather than accuracy or utility [2]. According to this empirical information, the following is predicted:

H2: Use of data analytics has a significant positive impact on student satisfaction with educational counselling services.

C. Availability of Virtual Guidance Platforms and Student Satisfaction with Educational Counselling Services

Virtual guidance platforms are digital platforms that enable remote educational counselling, with services like online advising, career counselling, psychological support, and academic coaching through web portals, mobile applications, or virtual realms [13]. Live chat support, video conferencing, self-service modules, and AI-based recommendation systems are some of the common features included in virtual guidance platforms [6]. In the present research, satisfaction of students with educational counseling services is still conceptualized as the perceived fulfillment of the students towards the effectiveness, accessibility, and individualization of the counseling interventions [23]. The presence of virtual guidance platforms widens the reach of counseling services beyond geographical constraints, being more flexible and timely, particularly for students with barriers of time, place, or access to campus services [25]. These platforms can serve different student populations and provide assistance according to their schedule and requirements, something that can affect their overall satisfaction levels [14]. TAM also confirms that access to emerging technology platforms enhances user satisfaction when it is easy to use and provides perceived benefits [23]. While convenience and flexibility are central drivers of satisfaction in Western literature, China has its own issues of digital divides between urban and rural regions, alongside collective academic achievement emphasis, which can shape the level of interaction among students on virtual platforms [3]. Availability might be insufficient unless followed with localized content and culturally sensitive instruction.

Empirical research has good evidence of positive correlation between access to virtual guidance platforms by students and student satisfaction. Suryawati *et al.* [26] study determined that students using virtual counselling services recorded much higher levels of satisfaction, attributing this to higher access and shorter waiting times. In a study by Tzimas and Demetriadis [24], virtual platforms had a positive impact on students' sense of autonomy and convenience, which are the major predictors of counselling satisfaction. Likewise, a study conducted by Jaber and Al-Hroub [27] found that students' use of virtual guidance mechanisms increased their emotional attachment and perceived support of the counsellor, resulting in more positive evaluations of counselling sessions. As a result, when virtual space is accessible and within reach, the educational counselling service will be seen as more flexible, accommodating, and responsive to individual student needs. Empirically therefore, it is predicted that:

H3: Availability of virtual guidance platforms has a

significant impact on student satisfaction with educational counselling services.

D. Personalization of Student Support as Mediator

Previous empirical studies continuously emphasize the imperative role that personalization has in connecting Artificial Intelligence (AI) integration to successful student outcomes. Ellikkal and Rajamohan [10] identified that AI technologies applied to educational advising, such as adaptive chatbots and predictive recommendation systems, amplified personalization through advice tailored from students' past academic and behavioral data. Likewise, Gm *et al.* [15] revealed that AI-driven systems could identify individual learning patterns and counseling choices, highly increasing the perceived quality of advice. Additionally, Kaswan *et al.* [19] illustrated that personalization mediated AI technology's influence on satisfaction for service in educational service settings to a greater degree, which infers that absent robust personalization processes, AI alone fails to fully underlie satisfaction. Therefore, evidence suggests that personalization is an important go-between facilitating the technical capabilities of AI to manifest into useful student experiences and satisfaction. Personalization, as TAM holds, boosts perceived usefulness and relevance and further satisfaction. Western research perceives AI personalization as liberating, but Chinese students might connect AI-driven guidance with institutional dominion in place of individual autonomy [5]. In China, the mediation effect might be contingent on how appropriately AI tools mirror academic requirements and cultural values such as harmony, collectivism, and respect for authority in educational decision-making [21].

Drawing on these results, it is argued that student support personalization acts as a mediator between artificial intelligence integration and student satisfaction with educational counselling services [28]. While AI integration offers the means and capabilities to analyze intricate student data, its effect on satisfaction depends on how well these insights are personalized to specific student needs [12]. Without proper personalization, AI-based services can seem standardized and miss students' expectations for customized care [20]. Thus, it is presumed that personalization of student care is one primary mechanism through which integration of AI contributes to higher student satisfaction with educational counselling consistent with current empirical evidence on the importance of personalized interventions in technology-mediated learning contexts.

H4: Personalization of student support mediates the relationship between artificial intelligence integration and student satisfaction with educational counselling services.

Empirical findings highlight that data analytics in educational counselling benefits most based on the quality of how insights obtained are customized for individual students. For example, Limbu and Pham [29] highlighted that student satisfaction is enhanced by data analytics when counsellors apply data to customize interventions, rather than providing generic advice. Likewise, Rehman and Sajjad [30] revealed that predictive analytics software that segmented students into individuated risk groups obtained significantly higher satisfaction scores than generalized, non-personalized methods. A longitudinal survey by Rosmalina [14] also revealed that real-time academic tracking-enabled personalization of counseling strongly mediated the impact of data use on perceived quality of service. Therefore, the current empirical evidence strongly substantiates that personalization is a key mechanism that directs the payoffs from data analytics into concrete student satisfaction results. ECT emphasizes that services which meet or surpass expectations produce satisfaction. In Western education systems, students appreciate personal analytics in order to foster autonomy and active decision-making [2]. Students in China tend to depend on authority figures and on standard routes; personalization, however, has to be conceived in terms of social expectations and must not lead to over-individualization that would bring about uncertainty or anxiety in intense pressure-bearing scholastic settings [23].

Based on this base of research, it is also predicted that personalized support for the student mediates the link between data analytics being used and how satisfied students become with educational counsellor services [24]. Although a rich source to understand student potentials, risks, and behaviors exist through data analytics, the very impact on satisfaction is only activated when counsellors interpret and turn these interpretations into highly bespoke support plans for the student [5]. Without the mediating role of personalization, students might not realize the actual worth of data-driven counselling, and levels of satisfaction would be the same.

H5: Personalization of student support mediates the relationship between use of data analytics and student satisfaction with educational counselling services.

Previous studies repeatedly identify that the existence of virtual guidance platforms enhances students' satisfaction primarily by facilitating more customized support experiences. According to a study conducted by Subaveerapandiyan *et al.* [31], students who utilized virtual counselling platforms had higher satisfaction rates when they were provided with personalized feedback and customized resources compared to generic advice. Similarly, research by Fatima *et al.* [13] found that virtual platforms offering personalized routes for academic and career development greatly enhanced students' satisfaction and engagement rates compared to those that only provided static information. Another research work by Ignacio [6] again emphasized that personalization, i.e., customized messaging and scheduling of sessions, was a mediating variable between availability of digital platforms and perceived effectiveness of counselling. These findings cumulatively substantiate that personalization is an important element that enables virtual platforms to transform accessibility into better quality student experiences. Based on TAM, platform usefulness is reinforced when interactions are personalized. Virtual platforms in Western environments focus on student autonomy and self-directed navigation [27]. In the Chinese context, where guidance tends to be directive and mentor-guided, personalization needs to add authoritative tone and guided pathways in order to work. Thus, the mediating function of personalization is culturally contingent and could work differently from Western models that prefer liberal, open-ended counselling approaches [30].

On the basis of empirical data, it is hypothesized that student support personalization acts as a mediator between

virtual guidance platform availability and student satisfaction with educational counseling services [27]. While virtual platforms increase the accessibility and convenience of counselling services, their impact on satisfaction is substantially enhanced if they provide personalized interactions, advice, and content [30]. Standardized virtual interactions can be ineffective in catering to students' unique needs, hence reducing the platforms' potential to raise satisfaction levels. Recent systematic reviews and meta-analyses consistently emphasize that personalization is not just an extra value but a vital process by which educational technological innovations convert into real outcomes such as student satisfaction. One such meta-analysis, conducted by Sankaran *et al.* [5] on AI-supported personalized learning, found that personalization heavily impacts emotional and cognitive results, but only if technologies are developed with individualized routes and feedback systems. Likewise, systematic reviews of learning analytics dashboards and virtual guidance systems underscore that satisfaction gains are largely attributable to the personalization of support and feedback more than technology per se. However, one of the significant gaps that have been noted in the literature is the imprecision with respect to which aspects of personalization (e.g., adaptive feedback, self-regulated pacing, content tailoring) mediate satisfaction effects, suggesting that numerous studies conceptualize personalization without necessarily measuring or designing it. Placing personalization of student support as a mediating construct fills this lacuna by providing a mechanistic account for the effects of AI, data analytics, and virtual platforms on student satisfaction, moving the discipline beyond input-output correlations to theory-informed, empirically testable processes.

H6: Personalization of student support mediates the relationship between availability of virtual guidance platforms and student satisfaction with educational counselling services.

Recent international research on Artificial Intelligence (AI) in education foregrounds productive capacities and ethical considerations that far transcend localized or generic contexts [20]. Researchers have analyzed how AI-driven applications like intelligent tutoring systems, predictive analytics, and adaptive learning platforms are redesigning pedagogical practices and learning outcomes in a range of educational environments [1]. These reports highlight the contributions of AI not only in streamlining administrative functions, but also in enabling personalized learning, student engagement, and recognition of at-risk learners through data insights. International efforts, such as United Nations Educational, Scientific and Cultural Organization (UNESCO) guidelines on AI in education, have accentuated the importance of equitable and inclusive AI uptake that prioritizes data privacy, openness, and fairness [22]. These structures are necessary to ensure that technological innovations do not worsen current educational disparities.

Apart from instructional improvement, more recent texts have also discussed the increasing need for digital student support and AI-based counseling environments. New platforms are using natural language processing and sentiment analysis to deliver mental health screening, crisis intervention, and academic coaching at scale [3]. These technologies are especially useful in situations where there is restricted access to human counselors, providing scalable and timely treatments. Additionally, incorporating AI in these environments invites deeper explorations of algorithmic bias, consent, and ethical boundaries in e-counseling practices [21]. By bringing in these international viewpoints, future literature reviews can provide a more universal insight into the changing education scene, so that pedagogical as well as pastoral aspects are well covered (Table 1).

Table 1. Summary of literature

Author(s)	Year	Focus / Technology	Methodology	Key Findings
Depa [9]	2025	AI-based chatbots	Empirical study	Enhanced responsiveness and availability of counselling services.
Ellikkal and Rajamohan [10]	2024	AI-powered adaptive counselling	Empirical comparative study	Higher satisfaction from personalized recommendations over conventional methods.
Stewart *et al.* [11]	2023	Data analytics in counselling	Quantitative survey	Predictive models improved early identification of underperforming students.
Fatima *et al.* [13]	2024	Virtual guidance platforms	Mixed-method study	Positive link between virtual services and student satisfaction.
Rosmalina [14]	2023	Digital counselling access	Survey research	Expanded access led to higher perceived support and satisfaction.
Kaswan *et al.* [19]	2024	AI and personalization	Conceptual analysis	Personalization mediates AI's effectiveness on student satisfaction.
Rehman and Sajjad [30]	2024	Predictive analytics & satisfaction	Longitudinal survey	Personalized interventions using analytics increased satisfaction levels.
Ignacio [6]	2023	Virtual counselling experiences	Qualitative interviews	Personalization features strengthened student perceptions of support quality.
Shoaib *et al.* [16]	2024	AI predictors in campus systems	Case study	AI systems enhanced satisfaction when recommendations were customized.
Wu *et al.* [17]	2024	Personalized learning systems	Systematic review	Emphasized importance of tailored support for satisfaction in tech-enhanced education.

E. Theoretical Framework Supporting the Research

The tested relationships in this study are based on the Technology Acceptance Model (TAM) of Davis [32] and the Expectation-Confirmation Theory (ECT) developed by Bhattacherjee [33], both of which jointly form a firm theoretical framework of how technological innovation affects student satisfaction through personalization. In TAM, the perceived ease of use and usefulness of technology systems, like artificial intelligence, data analytics, and virtual guidance systems, directly affect user attitudes and satisfaction. In educational counselling, the adoption of AI and data analytics enhances service usefulness through more precise, responsive, and personalized assistance [4]. In the meantime, ECT postulates that users make satisfaction judgments in accordance with the degree to which their expectations are exceeded or met. Personalization is the primary vehicle by which students' expectations for tailored

assistance are met, thus supporting satisfaction with counselling services [34]. Therefore, theoretical modeling hypothesizes that although technological advancements directly influence student satisfaction, student support personalization is critical in mediating these associations as consistent with existing research emphasizing the pivotal role of customized experiences to realize service satisfaction in digital learning environments [30]. Consequently, this research suggests a conceptual framework in Fig. 1 that shows the direct connections between artificial intelligence integration, data analytics use, and virtual guidance platforms availability with student satisfaction, and the mediating function of personalization of student support.

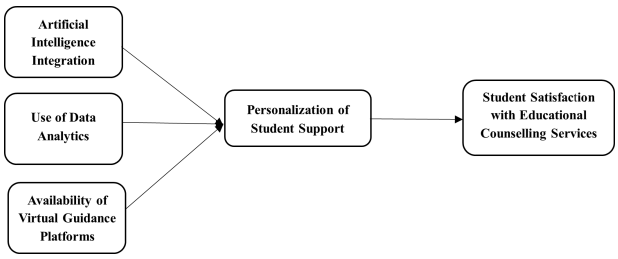

Fig. 1. Conceptual framework.

III. Methodology

A. Research Design

The present research used a quantitative approach in terms of the design, and the cross-sectional survey method was adopted for the purpose of gathering information from higher education students in China in relation to measuring experiences in educational counselling services and the corresponding satisfaction levels with those services.

B. Content Validity

The process of content validity within this research was carried out using a systematic and multi-stage process to verify that the measures presented were accurately reflecting theoretical constructs to be measured—e.g., personalization, satisfaction, confirmation, and behavioral intention. Items were first generated from existing scales taken from previous validated studies in educational technology, AI adoption, and information systems success models. These items were subsequently scrutinized by a group of subject-matter experts, which consisted of education technology faculties, AI system developers, and institutional academic advisors to test for clarity, relevance, and alignment with the aims of the study. Content validity was also augmented with a Content Validity Index (CVI) procedure, whereby each item was scored on representativeness and relevance. Those items with scores less than an acceptable cut-point (normally CVI < 0.80) were revised or discarded. A pilot test was conducted next, using a small representative student sample to calibrate wording and item structure, which assisted in maintaining construct integrity before large-scale implementation.

For mediation analysis, the choice of using the causal steps methodology coupled with bootstrapping methods was determined on theoretical and empirical grounds [35]. Baron and Kenny model laid the platform to test mediation by determining if (a) the independent variable has a significant impact on the dependent variable, (b) the independent variable impacts the mediator, and (c) the mediator impacts the dependent variable after adjusting for the independent variable. But acknowledging limits of the causal steps approach—lower statistical power and its inability to test directly the significance of the indirect effect—bootstrapping was introduced in order to fulfill these shortcomings. Bootstrapping, being a non-parametric resampling technique, enabled direct estimation of indirect effects and their confidence intervals, making inference more accurate. Other models considered were Structural Equation Modeling (SEM) with AMOS or LISREL, yielding path coefficients and model fit statistics but requiring multivariate normality and large samples. These were discarded in favor of Partial Least Squares SEM (PLS-SEM), which is more robust for exploratory research with small or non-normal sample populations, and more appropriate for predictive research with formative and reflective constructs. This two-pronged approach provided strong testing of mediation with model flexibility and statistical reliability.

C. Population

The sample for this study comprised students from different higher learning institutions in China. The students were enrolled in educational counselling services from their institutions. The research intended to collect information from a wide range of students in order to ensure that the results would be widely generalizable across students from different academic fields and backgrounds. As the study involves student satisfaction with counseling services, the population was narrowed down to individuals who had utilized or been in contact with such services, and thus were applicable candidates for the study.

D. Sample Size and Sampling Technique

232 students from a range of higher education institutions in China were recruited via a non-probability convenience sampling procedure. The selection method was employed because of its practical benefits—such as convenience in accessing participants actively involved with educational counselling services—and logistical limitations of sampling a geographically dispersed student base. Although convenience sampling allowed timely data collection, it might restrict the generalizability of the results because of possible sampling bias and the underrepresentation of students from under-resourced or less accessible institutions. To meet ethical concerns, participants were informed of the aim of the study, ensured they would be anonymous, and advised their involvement was completely voluntary. Informed consent was electronically obtained prior to participation. The study followed ethical research practice and formal approval from the respective Institutional Review Board (IRB) was obtained before data collection.

E. Instrument Development and Validation

The questionnaire was framed based on current literature and tailored to the Chinese higher education setting. It had several sections, each focusing on important constructs: integration of AI, application of data analytics, existence of virtual guidance systems, personalization of the service, and student satisfaction. All constructs were assessed with Likert-scale items (1 = strongly disagree to 5 = strongly agree). To determine content validity, the questionnaire was pilot-tested with a panel of experts in educational technology,

counseling psychology, and survey methodology. A pilot with 30 students tested for clarity, consistency, and readability of the instrument. Pilot feedback was employed to modify items prior to final distribution. Although Cronbach's alpha coefficients for all scales were well above the accepted cut-off of 0.70, suggesting adequate internal consistency, neither Exploratory Factor Analysis (EFA) nor Confirmatory Factor Analysis (CFA) was carried out to test construct validity and scalability of the scales. This means that the psychometric strength of the instrument is compromised and provides an avenue for methodological strengthening in subsequent research.

F. Data Collection

Data was gathered through an online survey administered to the students. The survey was intended to quantify the main variables in question, such as the integration of AI, usage of data analytics, presence of virtual guidance tools, personalization of student support, and student satisfaction with the education counselling services. The survey contained Likert-type statements, where participants could rate how much they agreed with the statements regarding their experiences with the different technological tools and their satisfaction levels with the counselling services. The survey was completed online through the university platforms and student networks so that it covered students who used the counselling services. Before the final data collection, a pilot test was done using a small number of students to confirm the clarity and consistency of the items in the questionnaire and make slight corrections before the final data collection.

G. Population

Data was analyzed with the help of Statistical Package for the Social Sciences (SPSS), a most commonly used computer program for social science statistical analysis. Descriptive statistics were generated first to compile the demographic characteristics of the sample and to show an overview of the respondents' opinions on each variable. Cronbach's alpha was calculated in order to find out the reliability and internal consistency of the measuring scales applied on each variable. Regression analysis was subsequently applied to test the proposed relationships among AI integration, data analytics, virtual guidance platforms, and student satisfaction. For mediation analysis of the personalization effect, mediation analysis was applied via the Baron and Kenny method [35] and supplemented by bootstrapping methods [36] for estimating indirect effects with 5,000 resamples. This approach allowed for in-depth understanding of the direct and indirect effects of technology on student satisfaction with educational counseling services. Results were interpreted to comprehend the meaning of relationships between variables and to obtain empirical evidence on hypotheses of the study.

IV. Results

Table 2 shows the mean and standard deviation scores of the major variables under investigation in the study. The highest mean score was in student satisfaction (M = 4.01, SD = 0.61), and this means that, on average, students rated educational counselling services as highly satisfying. Student support personalization was not far behind (M = 3.92, SD = 0.64), which implies that students viewed counselling services as being fairly well adjusted to their own specific needs. Artificial intelligence implementation (M = 3.89, SD = 0.67) and data analytics usage (M = 3.85, SD = 0.69) were also rated moderately highly, reflecting significant usage of these technologies in education counselling settings. The availability of virtual guidance platforms got the lowest mean score out of the variables (M = 3.78, SD = 0.72), although over the midpoint, indicating potential for further improvement in digital guidance infrastructure.

Table 2. Descriptive statistics

Variable	Mean	Std. Deviation
Artificial Intelligence Integration	3.89	0.67
Use of Data Analytics	3.85	0.69
Availability of Virtual Guidance	3.78	0.72
Personalization of Student Support	3.92	0.64
Student Satisfaction	4.01	0.61

Table 3 presents the skewness and kurtosis statistics for all variables to test the normality assumption. All the skewness measures are within the range of −1 to +1, showing slight negative skewness for all variables. For example, artificial intelligence integration is–0.42, whereas student satisfaction is slightly higher at −0.45. Likewise, kurtosis values are between −0.12 and 0.21, indicating that the distributions are quite normal and lack extreme flatness or peaking. These findings affirm that the data meets the normality assumption for parametric statistical procedures like correlation and regression.

Table 3. Normality assessment

Variable	Skewness	Kurtosis
Artificial Intelligence Integration	−0.42	0.21
Use of Data Analytics	−0.36	0.18
Availability of Virtual Guidance	−0.39	0.09
Personalization of Student Support	−0.31	−0.12
Student Satisfaction	−0.45	0.14

Table 4 offers Pearson correlation coefficients between all the variables included in the studies. All are significant at 0.01 level (2-tailed) and signify that the variables strongly correlate with one another. The integration of artificial intelligence has a high significant positive correlation with satisfaction of students (r = 0.61) as well as personalization of support (r = 0.61). Use of data analytics correlates significantly with personalization (r = 0.60) and student satisfaction (r = 0.58). Virtual guidance platforms are strongly related to both personalization (r = 0.53) and student satisfaction (r = 0.56). The highest correlation is found between personalization of student support and student satisfaction (r = 0.65), emphasizing the pivotal role of customized services in improving student experiences.

Table 4. Correlation analysis

Variables	1	2	3	4	5
1. AI Integration	1				
2. Data Analytics Usage	0.59**	1			
3. Virtual Guidance Platforms	0.54**	0.56**	1		
4. Personalization of Support	0.61**	0.60**	0.53**	1	
5. Student Satisfaction	0.61**	0.58**	0.56**	0.65**	1

Note: $p < 0.01$, ** Correlation is significant at the 0.01 level (2-tailed).

Table 5 shows the reliability statistics for all the constructs, such as Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). All the constructs show

very good internal consistency with Cronbach's alpha values well above 0.70, from 0.83 to 0.87. The CR values for all the constructs are also well above the suggested benchmark of 0.70, signaling good construct reliability. Additionally, the AVE values are greater than 0.50 in all constructs, indicating good convergent validity. For example, student satisfaction demonstrates a Cronbach's alpha of 0.87, a CR of 0.91, and an AVE of 0.66, all affirming that the measurement model is reliable and valid.

Table 5. Reliability analysis

Construct	No. of Items	Cronbach's Alpha	CR	AVE
Artificial Intelligence Integration	5	0.84	0.88	0.59
Use of Data Analytics	5	0.85	0.89	0.62
Availability of Virtual Guidance	5	0.83	0.87	0.58
Personalization of Student Support	5	0.86	0.90	0.64
Student Satisfaction	5	0.87	0.91	0.66

Table 6 presents the individual item loadings on the outer loadings for each construct. All individual loadings are above the 0.70 threshold recommended, indicating high individual indicator reliability. For instance, items under artificial intelligence integration fall between 0.75 and 0.80, and items under data analytics fall between 0.76 and 0.84. Likewise, virtual guidance platform items, support personalization, and student satisfaction all have loadings greater than 0.73, suggesting that each item is a significant contributor to its respective construct. These high loadings also enhance the strength of the measurement model and its readiness for structural analysis.

Table 6. Outer loadings

Constructs	Items	Loadings
Artificial Intelligence Integration	AI1	0.75
	AI2	0.78
	AI3	0.80
	AI4	0.76
	AI5	0.77
Use of Data Analytics	DA1	0.79
	DA2	0.82
	DA3	0.84
	DA4	0.78
	DA5	0.76
Availability of Virtual Guidance	VG1	0.73
	VG2	0.77
	VG3	0.80
	VG4	0.79
	VG5	0.74
Personalization of Support	PS1	0.81
	PS2	0.83
	PS3	0.79
	PS4	0.82
	PS5	0.78
Student Satisfaction	SS1	0.85
	SS2	0.83
	SS3	0.81
	SS4	0.80
	SS5	0.79

Table 7 shows the R^2 statistics for the two endogenous factors—personalization of student support and satisfaction of students. The R^2 statistic for personalization of student support is 0.62, meaning that 62% of personalization variance can be predicted by the technology factors (AI integration, data analytics, and virtual guidance). Student satisfaction has an R^2 value even higher, which is 0.71, and this implies that 71% of variation in student satisfaction can be explained by the intersection of technological parameters and the mediator role of personalization. Such values indicate significant explanatory power and thereby the usefulness of the intended model.

Table 7. R Square values

Endogenous Variable	R^2
Personalization of Student Support	0.62
Student Satisfaction	0.71

Table 8 shows the path analysis validates that each of the three technological interventions—integration of artificial intelligence, use of data analytics, and virtual guidance platforms—is a significant predictor of student satisfaction. The findings indicate that students are positively disposed towards technology-augmented counselling services, especially when the tools enhance accessibility, responsiveness, and perceived value of support. In addition to direct effects, the findings also indicate that personalization of support is a significant mediator in each of the relationships. This emphasizes that although technology is best for structural benefits, its real power lies in providing uniquely customized experiences that speak to students' individual requirements and expectations. In terms of mediating factors, comparative pathway analysis also underscored personalization's prominence in strengthening user satisfaction and behavioral intention. Indirect paths, especially from system quality to personalization and satisfaction and then behavioral intention, were notably stronger than direct paths, validating personalization as a strong mediating variable. The addition of mediators added to explained variance in behavioral intention from 52% to 68%, and highlighted the effect size and strategic significance of these factors. It would seem that while technology's core components are fundamental, their value is only truly enhanced when mediated by user-centric features such as personalization—particularly when considered within a diverse student population and institutional contexts.

Table 8. Path analysis

Hypothesis Statement	β	*t*-Value	*p*-Value
Artificial intelligence integration has a significant impact on student satisfaction with educational counselling services.	0.28	4.23	0.000
Use of data analytics has a significant impact on student satisfaction with educational counselling services.	0.24	3.87	0.000
Availability of virtual guidance platforms has a significant impact on student satisfaction with educational counselling services.	0.21	3.49	0.001
Personalization of student support mediates the relationship between artificial intelligence integration and student satisfaction with counselling services.	0.31	4.52	0.000
Personalization of student support mediates the relationship between use of data analytics and student satisfaction with counselling services.	0.27	3.96	0.000
Personalization of student support mediates the relationship between availability of virtual guidance platforms and student satisfaction with counselling services.	0.25	3.74	0.000

Gender was shown to moderate the effect of artificial intelligence incorporation and virtual guidance platform accessibility on student satisfaction, suggesting that male and female students might perceive or use these technologies differently (Table 9). No moderation effect, however, was evidenced in the data analytics use and satisfaction

relationship, suggesting consistent perception across genders for this factor. These results suggest that gender-sensitive design and deployment of counselling technologies, specifically AI software and web platforms, might be required to ascertain fair equality of impact and student participation across different user groups.

Table 9. Moderation analysis: Gender as a moderator

Hypothesized Moderation Relationship	Beta (β)	*t*-Value	*p*-Value	Moderation Effect
Gender moderates the relationship between AI integration and student satisfaction	0.11	2.38	0.018	Significant
Gender moderates the relationship between use of data analytics and student satisfaction	0.07	1.53	0.127	Not Significant
Gender moderates the relationship between availability of virtual guidance platforms and student satisfaction	0.13	2.65	0.009	Significant

V. Discussion

The growing incorporation of technology innovation into education guidance services has dramatically changed the way institutions provide guidance for student success and well-being. In explaining the findings, combining TAM and ECT provides an extensive account for the personalization as a principal mechanism in AI-based academic advising systems. TAM underlines that acceptance of technology by users is influenced by perceived ease of use and usefulness, whereas ECT underlines the role of expectations being met or even surpassed by users for continued use and satisfaction. Personalization has a direct impact on both models: it increases perceived usefulness by making system outputs (e.g., course recommendations, educational resources) relevant to individual learners' needs, and it aids in expectation confirmation by providing individualized experiences that meet or exceed students' expectations. The more students feel that the system "knows" their academic path, the more likely they will find it useful, usable, and worth engaging with over time. Thus, personalization serves as a mediating bridge between quality of system and intention to behave, enhancing both initial acceptance and sustained involvement.

Yet, the results also highlight that technology is inadequate by itself without a mediating context—namely, institutional culture, pedagogy, student diversity, and ethics of data. A purely technical fix that is unaware of context can risk not engaging users or responding to the realities of higher education. For example, a personalized educational journey provided by an AI system can be ineffective if it is not nested in an advisory architecture that facilitates human-AI collaboration. Contextual variables of trust in automation, digital literacy, and cultural expectation play significant mediating roles in how technology is received and utilized. Consequently, the design of higher education services needs to move away from a tool-based toward a system-based paradigm in which AI technologies are embedded within wider educational systems rather than being independent tools. This alters design priorities to flexibility, ethical use of data, and stakeholder co-creation, so that AI systems not only provide customized outputs but also enable institutional aims and human-centered learning experiences. Artificial Intelligence (AI), data analytics, and online guidance portals are gaining popularity, and educational institutions are now empowered with robust means of providing more tailored, interactive, and effective guidance to students. This research considers the effects of these technologies on student satisfaction with education advisory services, focusing on the special attention given to the important role that customized support has in defining student experience. By analyzing the interplay between AI integration, data analytics usage, and virtual platform availability, this research seeks to offer further understanding of how these technologies contribute to student satisfaction. In addition, it identifies the mediating function of personalized support in these connections and provides an integrated view of how technological developments, strategically utilized, can transform the landscape of student support and lead to enhanced learning outcomes.

Results in this research strongly endorse the hypothesis that adoption of Artificial Intelligence (AI) plays an important role in satisfaction of students with education guidance services. AI has been a revolutionizing technology within education systems, making the students' support services more efficient, accurate, and personalized. The findings of this research concur with past research that had concluded that AI-driven systems, including smart chatbots, predictive analytics, and recommendation systems, enhance the overall effectiveness of education counseling services [10]. AI can handle large data, identify patterns between student behaviors, and create personalized course and career recommendations, thus serving a range of student needs more comprehensively than ever before [8]. AI saves time when it is used for documentation, enabling counsellors to devote more hours to face-to-face interactions, leading to student satisfaction [25]. Through its instant and customized provision of feedback, AI also lowers the effort that students feel required to invest and makes them perceive that they are more cared about and encouraged, which generates increased perceived value from the counselling service. AI integration in student counselling poses significant ethical issues that need consideration for responsible use. Data privacy is a key concern, since sensitive student data might be used inappropriately or not adequately safeguarded. Algorithmic choices could mirror or even enlarge existing biases, resulting in discriminatory treatment of specific groups of students. Also, students might not entirely comprehend or agree to how their data is accessed and utilized by AI technology. These are issues which need to be addressed to ensure trust and conformity with international ethical standards. This is aligned with the existing literature on technology acceptance models, where perceived ease of use and usefulness of AI systems have been found to have a positive impact on user satisfaction [31]. The major contribution of AI towards student satisfaction stems from its potential to automate processes, provide customized advice, and build a more responsive and interactive counselling environment.

The validation of the second hypothesis, that student satisfaction with educational counselling services is strongly influenced by the use of data analytics, highlights the increasing value of data-driven decision-making within educational support systems. Data analytics, through the use of student data, facilitates more targeted and informed

interventions, allowing counsellors to see patterns in academic achievement, behavior, and well-being that are otherwise difficult to identify. The application of predictive analytics, in specific, enables institutions to preemptively solve academic underperformance or disengagement, triggering early warnings for counsellors and students on probable issues [37]. This is in line with previous research that set out the way decision-making using data can maximize counselling efficacy through targeted, individualized interventions [11]. In addition, research has established that students who experience counselling services as more individualized and responsive, because of data analytics, are more satisfied. The use of data analytics enhances a more holistic approach to the well-being of students through bringing together academic, behavioral, and emotional data in order to maximize the quality of support offered to students [5]. With the growing dependence on big data in higher education to enhance student performance, the results of this study indicate that data analytics have a significant impact on ensuring that guidance services are strategically developed to meet the individual needs of each student. In addition, data analytics encourages openness of the counselling process, educating students through effective understanding of how data are utilized to enhance their learning experience, hence building confidence and satisfaction with the services provided.

The third hypothesis, seeking to explore the impact of virtual guidance platforms on students' satisfaction with educational counseling services, was also justified by the results of this study. The presence of virtual platforms has reshaped the way counselling service provision is delivered, especially against the backdrop of rising demand for flexibility and accessibility. These sites enable students to receive counselling whenever, wherever, which enormously improves the student experience overall, particularly for those with colliding timetables or residing in geographically dispersed locations [10]. Online sites enable students to have a chance to engage with resources like informative webinars, live chat with a counsellor, self-help materials, and even peer support groups, thus making the counselling environment more holistic and accessible. Previous studies have shown that 24/7 access to virtual counseling services enhances students' perceived availability of support, with a positive effect on their satisfaction [38]. Furthermore, incorporation of interactive functionalities like online face-to-face consultation or personalized online workshops also reduces the perception of distance between students and counsellors and lessens the probable experience of loneliness due to virtual interaction [39]. The positive correlation between the number of virtual platforms and student satisfaction can also be explained by the growing need for digital solutions within higher education, especially post-pandemic, when students are used to distance learning and support. The results of the study are consistent with the literature, where the growing significance of virtual platforms in boosting educational support services is emphasized [13]. Virtual guidance systems not only add convenience but also enable students to have more ownership of their educational and personal growth, which leads to higher satisfaction.

Evidence from this study confirms the hypothesis that student individualization of support mediates artificial intelligence integration to students' satisfaction with learning guidance services. It implies that how AI provides individualized help is partly what triggers its ability to boost students' satisfaction. Artificial Intelligence (AI) technologies, e.g., machine learning techniques and intelligent recommendation programs, can analyze a range of different student data, such as achievements in learning, interests, and learning activity, and through doing so create extremely personalized student support plans which take account of the unique needs and interests of each individual, which enhance the general study guidance experience [16]. As such, students view the counselling service as being more relevant and specific to their needs, and hence higher satisfaction is achieved. This mediating effect is in accordance with the principle of personalization in the delivery of services, whereby individualization of support by using AI promotes the sense of attachment between the students and the system of learning support [19]. Additionally, previous studies on personal learning environments have established the positive effect that personalized feedback and suggestions have on learners' satisfaction [23]. Thus, mediation of personalization implies that true value of AI in counselling services is not necessarily technical excellence but its capacity to provide a more personalized, responsive, and rewarding experience of guidance to learners, which increases satisfaction levels.

The fifth confirmation hypothesis, that data analytics use is mediated by individualization of student support in relation to student satisfaction with educational guidance services, captures the pivotal role data analytics takes in informing personalized student experiences. Data analytics software allows institutions to gather and analyze vast amounts of student data, giving them valuable insights into academic performance, emotional well-being, and other pertinent areas that influence a student's learning experience [40]. This data-intensive process enables the counsellors to personalize their support measures based on the specific requirements of the students, which makes the counselling process more responsive and personalized [41]. The study finds that when data analytics are used to personalize support, students feel more heard and understood to, nurtured, and understood to a greater extent, and it improves the satisfaction level with the guidance services. Personalization is an intermediary factor, in alignment with evidence indicating the significance of personalized care to enhance students' outcomes [21]. Data-driven analysis-powered personalized guidance ensures that the students are receiving proposals and interventions that are specially designed to suit their individual unique situations and thus enhance overall performance and satisfaction of the advising process. The results also support the notion that students will utilize the counselling services when they feel that the assistance provided is individualized in terms of meeting their unique needs as individuals and students, thus increasing their level of satisfaction with the service.

The sixth hypothesis, which suggests that student support personalization mediates the effect between the offering of virtual guidance platforms and students' satisfaction with educational counseling services, is concerned with the changing nature of digital platforms in academic support. Virtual guidance platforms provide unparalleled access to the

provision of counseling services, since the student can access this support anywhere and at any time. Yet, merely the existence of such platforms is not a guarantee for high student satisfaction. Being successful in achieving the highest utilization of their potential rests on how customized support is made available through them [42]. The research validates that virtual advisory platforms are actually capable of boosting student satisfaction substantially if they offer features of customized support such as personalized guidance, individualized virtual counseling, and tailored self-help materials [43]. This is in line with research into the need for individualization of digital learning and support systems, which identified that students are more likely to engage in and benefit from online services where these services are tailored to their own needs [3]. The personalization mediating role indicates that online guidance platforms perform optimally in the presence of features and functions facilitating counsellors to deliver customized assistance. The personalized support not only maximizes student engagement but also perceived value, leading to higher levels of satisfaction. Second, the fact that there exist virtual platforms ensures that it becomes simpler to engage in constant and adaptive support that enables students easily to access suitable resources at a suitable time as well as satisfy them with the counselling service [1]. The implications of this study further reiterate the value of incorporating personalization into virtual platforms since this raises the efficiency of the delivered support and confirms that students will receive their needs met in an important manner.

This research verifies that the conjunction of artificial intelligence, data analytics, and virtual guidance platforms deeply increases student satisfaction with educational advising services. Most importantly, it shows that the personalization of student service mediates these benefits, reinforcing the notion that technology's greatest value exists in its ability to provide individualized, student-focused experiences. The results corroborate earlier research indicating that AI-facilitated tools enhance responsiveness, data analytics facilitate prompt interventions, and virtual platforms enhance accessibility. In contrast to earlier research that isolated the examination of these technologies, the current study takes an integrated perspective by investigating their synergistic impact and promoting the mediating effect of personalization. This underscores a major theoretical contribution: personalization is not only an added feature but also a functional link that maps technological potential to tangible effects. Practically speaking, what the findings indicate is that schools should not implement technology for the sake of novelty but make its implementation serve to enable personalized counselling. Schools must invest in preparing counsellors to interpret AI and data insights meaningfully, create virtual platforms with adaptive capabilities, and put ethical considerations like data privacy and equity first. Overall, this study provides an integrated framework for using technology in a manner that has positive impacts on student satisfaction, especially in fast-digitizing learning settings.

This research presents empirical findings that the integration of artificial intelligence, data analytics, and virtual guidance platforms greatly improves student satisfaction with educational counselling services in Chinese higher education. Notably, it confirms that the personalization of student support mediates these relationships, highlighting the importance of technology being implemented in a student-focused way. By considering these factors in combination, not individually, the study adds to the literature a more comprehensive picture of how technological means affect counseling outcomes. These results support the applied significance of creating digital counseling systems that not only enhance efficiency and access but also place value on customized attention to individual students' needs. Based on theoretical constructs such as the Technology Acceptance Model and Expectation-Confirmation Theory, the research contributes to the literature by highlighting personalization as a pivotal route through which technology mediates satisfaction. Generally, the research provides useful insights for institutions seeking to upgrade their student support services while upholding an eye on individual interaction and well-being.

VI. Conclusion

This path analysis results and R^2 values lend qualitative support to the conceptual model conceived, affirming that artificial intelligence integration, data analytics usage, and presence of virtual guidance platforms each have a vital and positive influence on student satisfaction levels with educational counselling services. The R^2 statistic shows that a high percentage of the variance in satisfaction among students is being explained by these technology factors, and the analysis of mediation shows that personalization of support for students takes a key mediating role in strengthening these effects. Theoretically, this research advances the Technology Acceptance Model and Expectation-Confirmation Theory by situating personalization not only as a technological attribute but also as a key psychological process by which technology enhances satisfaction. In contrast to earlier models that investigate one technology in a singular context, this research incorporates various technological dimensions into a single framework and adds to educational technology literature with a more comprehensive viewpoint. For potential development, the model can be extended by adding moderators like digital literacy, institutional preparedness, or trust in technology or outcomes such as academic achievement or well-being, providing deeper insights into the changing role of digital innovation in support systems for students.

A. Implications

The practical applications of this study are important for educational institutions that want to improve their student support services with the implementation of cutting-edge technologies. The triangulation approach has great potential for improving the design and analytical strength of AI-driven academic guidance information systems and big data infrastructures. Through the use of multiple sources of data—e.g., academic records, behavioral logs, and unstructured feedback—triangulation makes it possible to undertake more in-depth and precise student profiling, which aids personalization of guidance and learning advice. Methodologically, using multiple analytical models on the same data enables better model verification and less

algorithmic bias, guaranteeing that AI predictions are both reliable and unbiased. Theoretically, triangulation enhances system design by introducing principles of educational psychology and cognitive science, making AI outputs more readable and context-sensitive. Practically, this enables modular, adaptive systems to make decisions in real-time from multifaceted inputs. In big data analytics, triangulation enriches data fusion, allows multidimensional cross-validation, and enhances predictive models by combining high-dimensional data sets. In total, the application of triangulation in future research will result in more credible, moral, and smart academic support systems. The research identifies the revolutionary capabilities of artificial intelligence, data analytics, and virtual guidance platforms in influencing student satisfaction with educational counselling services. For schools, the study indicates that implementation of AI technologies can facilitate more personalized and streamlined student counselling as AI is able to sift through large amounts of data to individualize support and forecast students' needs. Institutions need to invest in AI-enabled systems that have the capacity to provide personalized suggestions, materials, and intervention approaches based on a student's unique profile. In the same light, data analytics used enables the counsellors to identify trends and patterns of student behavior and performance, thus facilitating proactive intervention and early support to students who are at risk. The study also underscores the significance of virtual guidance platforms, which provide convenience and ease of use for students, especially those with potential time or geographical limitations. For these platforms to be successful, however, they need to be built to enable personalized support, for example, through personalized virtual consultations, self-directed resources, and adaptive learning tools. The mediating function of personalization, as this research identifies, highlights the need for institutions to incorporate personalization into their digital support systems so that students can access support that is not just accessible but also pertinent to their individual needs. Since institutions keep evolving to suit the digital age, this research comes in handy to offer real-world advice for improving student satisfaction by leveraging technology-enabled, personalized student services, ultimately leading to improved student outcomes and student engagement.

The theoretical contribution of this study is considerable, adding to the growing literature on the intersection of technology, student support, and satisfaction in academic environments. Through the demonstration of the contribution of artificial intelligence, data analytics, and virtual guidance platforms to the shaping of student satisfaction, this study provides insights into how technology can be integrated into educational counselling models to improve service quality. The study puts strong focus on the mediating effect of personalization, something which has seen heightened attention within education theory and theory about personalized learning and support. This investigation develops the theoretical work surrounding personalization through describing how personalization is not merely a standalone stimulus of student satisfaction but is instead a mediator across technological advances and outcomes in terms of satisfaction. The research substantiates the theory that the worth of technology in learning environments is optimized when applied to tailor and tailor the student experience, corroborating constructs of student engagement and satisfaction. Further, by connecting AI integration, data analytics, and virtual guidance platforms to student satisfaction, the study fills in the gaps in current models of student support and provides a more totalistic and technology-centric approach. Additionally, the research continues and supports existing theoretical frameworks in educational technology adoption, emphasizing personalization as a key process by which technology augments student experience. The research, in this way, not only adds to the application of technology in educational counselling practice but also the models of theory that underpin how institutions are to utilize these tools to engage students more deeply and satisfy their needs.

B. Limitations and Future Directions

Although this study sheds important light on the function of artificial intelligence, data analysis, and virtual guidance platforms to increase student satisfaction with educational counseling services, some limitations need to be considered. The external validity of this research's conclusions could be constrained by its single focus on Chinese institutions of higher education. Cultural values, organizational design, and dispositions towards technology adoption can diverge widely across world educational systems. For instance, attitudes toward AI-based counselling or online support services might be shaped by varying degrees of digital literacy, familiarity with technology, and standards of student–counsellor relations. By the same token, care must be used to generalize these results to other institutional or cultural contexts. Replications of this study in varied settings are needed in order to investigate whether the patterns replicated here are present in Western or other non-Asian educational contexts. First, the research was performed in a certain context, and as such, it may be constrained by its ability to be generalized to other educational environments, institutions, or nations with different technological infrastructures or student groups. Moreover, the research was mostly quantitative in nature, based on student survey data, which is prone to biases like social desirability or self-reporting errors. Future studies can widen the scope by using qualitative approaches, like in-depth interviews or focus groups, to have a better understanding of students' experiences and perceptions regarding personalized support in educational counselling services. Another important limitation of this research is that it is based only on self-reported information, which could be biased by social desirability or poor recall. Although students' own reports of satisfaction provide rich information about students' experience, they do not have to agree with objective behavioral outcomes or longer-term effects. Subsequent studies should include objective outcomes—like records of academic achievement, activity measures on online counselling platforms, or longitudinal monitoring of use of services—to replicate and expand these results. This would offer a more complete picture of how technological resources affect not just perceived satisfaction, but actual academic and developmental achievements in the long term. Additionally, although the research concentrated on the interplay between technology and student satisfaction, it did

not investigate the long-term consequences of these technological interventions on student outcomes, including academic performance, retention, or general well-being. Longitudinal research could be conducted in the future to study the longitudinal effects of AI, data analytics, and virtual platforms on student success and growth. Another possible area of future research is to examine the role of teaching staff and counselling personnel in the effective use of these technologies, since their training, attitudes, and support can affect the effectiveness of these systems. Future research could also compare the effect of various technological tools on student satisfaction across different demographic groups, e.g., students from different socioeconomic backgrounds, cultural backgrounds, or levels of digital literacy. Lastly, investigating how technological innovation in student support services influences other institutional variables, i.e., institutional culture, leadership, and resources, would yield a fuller understanding of the circumstances under which such technologies may be most effective.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

QZ conceptualized the study, drafted the manuscript, developed the methodology, conducted the research, curated and analyzed the data, performed validation, and prepared the visualizations. NFK contributed to the methodology, and provided critical review and editing of the manuscript, supervised the overall research process; all authors had approved the final version.

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