Enhancing the Students Learning Efficiency of in University Libraries

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Abstract

This study aimed to determine the extent of university students' access to entity space service, online teaching services, digital resource services, and information literacy services and investigate the factors that influence university students' learning effectiveness, with a particular focus on Weifang Nursing Vocational College. Given the increasing prevalence of online and hybrid learning, the role played by university libraries in shaping students' education has gained significant importance. The research comprehensively examined elements such as the physical layout of the library, the availability of online teaching resources, the accessibility of digital materials, and the provision of information literacy education. By analyzing data collected from 505 students across four academic years and utilizing statistical tools like percentages, means, standard deviations, and multiple regression analysis.

The results highlighted the substantial impact of library services on learning efficiency, with personal factors contributing only minimally. Consequently, there is a critical need for university libraries to enhance their educational support services.

Introduction

Technology is advancing rapidly, making traditional teaching methods less effective. New multimedia teaching approaches are continuously improving (Chen & Niu, 2022). The Internet's origins dated back to the 1950s, but it didn't gain widespread popularity until the 1990s (Raccoon, 1997). It transformed various aspects of our lives, including financial

transactions, entertainment, and education. Libraries, which serve as reservoirs of knowledge, now harness the Internet to provide new books and assistance (Lal et al., 2023). Libraries remain crucial, evolving alongside technological changes to meet students' needs and leverage modern tools. The increasing emphasis on digital resources is reshaping the roles of both librarians and students. They must acquire new skills for teaching, research, and student support in this digital age. In the post-pandemic digital era, university libraries have gained paramount importance in shaping future intellectual leaders. This research delves deeply into the impact of university library support services on students' learning efficiency. This exploration aims to help libraries offer more targeted support and assist students in acquiring knowledge and skills more efficiently. The study examines how library spaces, online teaching, digital resources, and information literacy programs influence the learning outcomes of diverse students. This research is pivotal in enhancing online learning experiences for students.

Research Objectives

1. Determine the extent of university students' access to entity space service, online teaching services, digital resource services, and information literacy services.

2. Investigate the factors that influence university students' learning effectiveness.

Literature Review

Education is the process of acquiring knowledge and learning, and it has traditionally been delivered through formal classes or self-study. However, in the digital learning era, education is increasingly being delivered online and through digital resources. This literature review will explore valuable strategies for colleges and universities to adapt to the increasingly digital learning landscape, enhance online teaching and digital resource services, and thereby elevate the quality of education. The factors contributing to the advancement of digital learning environments, online teaching services, and digital resource offerings that enhance educational quality will be discussed. Basically, university libraries offer various types of self-study resource services:

Entity Space Service

entity space has not just become a key concern such that commentators try and predict its future role and place. Indeed, a book entitled The Library of the Future was written nearly 75 years ago that attempted to predict what libraries would look like (Headicar 1936). With this in mind, the authors determined to look back to see what predictions about university

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libraries and space have been made. When commentators have been predicting the future of university libraries they have varied substantially in the amount of attention devoted to the concept of space. The issues about physical space that writers and researchers discuss have changed a great deal over time. For many university librarians in the UK and the USA in the early twentieth century, entity space service was an issue of paramount importance. A common complaint in the literature is the idea of 'running out of space' (Rider 1944: 3). There are discussions of how to balance the ever-growing collections and the need for open access and space for scholars and students (Headicar 1936: 59); the idea of 'deselection' and weeding does not seem to be on the agenda. One of their major concerns for the future was how they would manage not only all their collections but the huge amount of space taken up by catalogue cards (Rider 1944). Authors from this period make the same kinds of prediction that occur right up to the present day, such as increased cooperation between different libraries (Rider 1944).

Online Teaching Services

In our rapidly globalizing world, academic institutions like universities and colleges are increasingly turning to distance education as an alternative to traditional teaching methods (Birch et al., 2019; Altun, 2017). This shift has been accelerated by the internet's rapid growth. When it comes to online education, it's crucial to consider students' perspectives and perceptions, as they vary widely and significantly impact satisfaction levels. Online education isn't just about cultural backgrounds; it also hinges on students' personal qualities.

The COVID-19 pandemic in 2020 forced academic institutions worldwide to close their doors, prompting a swift transition to online education (Celik et al., 2020). UNESCO reported that over a hundred countries were affected by the virus, leading to widespread closures. Researchers around the globe leveraged technology to implement online education, using internet and cloud-based tools to facilitate remote learning (Chen et al, 2020).

As the online education landscape continues to evolve with a growing number of platforms and applications, challenges persist in enhancing students' learning experiences and optimizing teaching processes. One notable development is the Online Learning System proposed by TMT Nguyen (2021), which employs virtual assistants to support lecturers in delivering lectures and assessing students using synthesized speech and facial expressions based on text. (Dao, 2021)

Online courses have the potential to benefit rural and inner-city schools, which often struggle to find highly qualified teachers for all subjects. Online teaching is particularly

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accommodating for educators with limited flexibility and tight schedules. Furthermore, research by Archambault and Crippen (2009) suggests that online teaching has retained educators who might have otherwise left the profession, providing options for both full-time and part-time faculty that traditional schools may not offer, thereby increasing available teaching resources.

Digital Resource Services

Digital resources encompass a broad spectrum, including commercial databases, databases established by institutions or individuals, and various freely available online resources. In comparison to printed materials, digital resources offer a more extensive array of options. They encompass diverse formats such as databases, electronic journals, electronic books, web content, multimedia materials, and more.

In terms of storage media classification, Cuthbertson and Furseth (2022) distinguishes two main types: magnetic media and optical media. Magnetic media includes items like floppy disks, hard disks, disk arrays, removable hard drives, USB flash drives, and tapes. Optical media encompasses formats such as CDs, DVDs, and LDs. Commonly used storage media for digital resources include hard drives, disk arrays, tapes, CDs, DVDs, and LDs.

Digital resources can be categorized based on the scope of data dissemination. According to Schroeder and Kotlarsky (2015), these categories include standalone resources, resources accessible within a local area network (LAN), and those available through wide area networks (WAN). Standalone utilization refers to resources stored on a computer or a CD. LAN utilization allows users to access resources within the organization's network but not beyond it. WAN utilization enables users to access resources from any location with internet connectivity, typically requiring identity authentication.

Looking at resource providers, Opazo-Basáez, Vendrell-Herrero, & Bustinza (2022) divides them into two main groups: commercial digital resources and non-commercial digital resources. Commercial digital resources consist of various electronic materials offered by database vendors, publishers, and institutions for a fee. Libraries may need to pay for access, or individual readers may purchase database access through methods like library cards. These resources are often content-rich and data-intensive, playing a significant role in expanding library collections. Non-commercial digital resources include institutional collections, open-access resources, and unique online materials. These resources are either developed by the library itself or acquired freely from the internet. It's worth noting that libraries may sometimes choose to operate their characteristic resource libraries in a commercial manner, at which

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point they can be considered commercial digital resources (Amit & Han, 2017) for other libraries, it can also be called commercial digital resources (Amit & Han, 2017)

Information Literacy Services

Since first entering the professional discourse in the 1970s, the concept of information literacy has created a massive amount of discussion regarding its definition and implications for learners and librarians in an ever-changing information environment. Librarians across the world have quickly adopted various information literacy policies and guidelines, eager to provide students with the training necessary to access and evaluate information. The major transformation that information literacy has brought to the profession has not gone unexamined. The literature of critical information literacy questions many widely held assumptions about IL and the very nature of education in library settings, broaching such topics as the impossibility of pedagogical neutrality and the incompatibility of skills-based instruction with student engagement in the learning process. Critical information literacy considers in what ways librarians may encourage students to engage with and act upon the power structures underpinning information's production and dissemination. It is this critical appraisal of information literacy's conventions and norms—from a lack of involvement with the sociopolitical dynamics that shape student learning and scholarly information to the notion that IL is an educational obstacle that can be conquered—that in part distinguishes critical information literacy from traditional conceptions of IL and makes it an important perspective to consider.

The literature on critical information literacy includes the main tenets of critical pedagogy and critical approaches to information literacy. A substantial amount has been written on topics concerning critical information literacy in the past decade, and this body of work is likely to hold particular significance for librarians seeking to reflect upon or reconsider their approaches to instruction and librarianship in general. Critical information literacy is an approach to IL that acknowledges and emboldens the learner's agency in the educational process. It is a teaching perspective that does not focus on student acquisition of skills, as information literacy definitions and standards consistently do, and instead encourages a critical and discursive approach to information (Simmons, 2005). It is critical information literacy's intent that students will ultimately "take control of their lives and their own learning to become active agents, asking and answering questions that matter to them and to the world around them" (Elmborg, 2006, p. 193). In these ways critical IL has a great deal to offer librarians interested in developing a deeper engagement with their work and its implications,

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as well as the potential to shift the focus of information literacy instruction to an authentically student-centered mode.

With the four support services, university students consequently achieve learning efficiency. The concept of learning efficiency is explained as follows:

Learning Efficiency

Learning efficiency is a key metric in education, as it measures how much learners have improved in a given time. Students can achieve learning efficiency by employing a variety of strategies, including:

- Relational learning: Connecting new information to prior knowledge facilitates understanding and retention.

- Multisensory learning: Engaging multiple senses (e.g., auditory, visual, kinesthetic) during learning can improve retention and efficiency.

- Elaboration: Explaining or teaching learned material to others is an effective way to solidify one's own understanding.

- Active learning: Engaging in active learning activities, such as taking quizzes and tests, can improve recall and long-term retention.

- Distributed practice: Breaking down learning into shorter, more focused sessions spaced over time can improve efficiency and retention.

By implementing these evidence-based strategies, students can optimize their learning efficiency and achieve their academic goals. (Docebo, 2023)

Conceptual Framwork
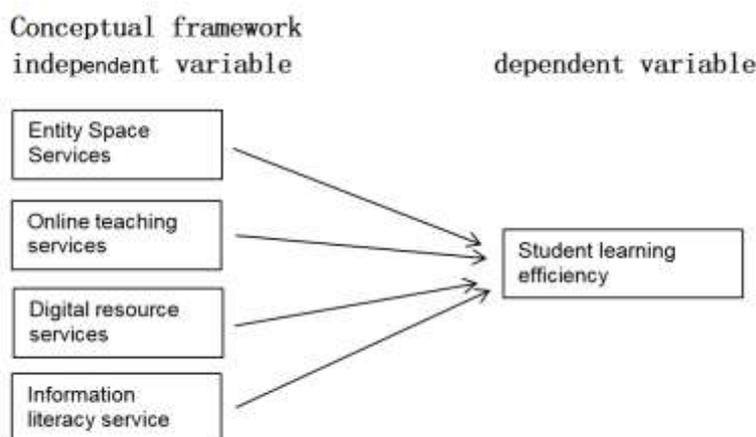
Methodology

Research Design

In this study, internet-based surveys were employed as the primary method for data collection to investigate the opinions of respondents regarding various variables, including library services, entity space services, online teaching services, digital resource services, information literacy service, and learning efficiency. The online questionnaire utilized a combination of close-ended questions presented in Likert scales and nominal scales, and it was structured into several sections, including demographic data questions and questions pertaining to library services, entity space services, online teaching services, digital resource services, information Literacy Service, and learning efficiency. The self-administered online questionnaire was designed and implemented using Google Forms.

Questionnaire Structure

The questionnaire was divided into three sections. The first section was dedicated to gathering demographic information, with the aim of gaining insights into the profile of the survey respondents. The second section encompassed multiple items that explored variables related to entity space services, online teaching services, digital resource services, information literacy services, and learning efficiency. These variables were associated with four independent variables and one dependent variable.

Sampling Method and Sample Size

Weifang Nursing Vocational College has more than 14,000 full-time students, The samples consisted of 397 students calculated by Yamane's formula (Yamane, 1973: 1089) with reliability level of 95% (α = .05). That is the sample size is 397, but for better reliability, the researcher added up extra 108 samples making a total of 505 samples for the study. Snowball sampling is a non-probability sampling technique where researchers deliberately choose the sample, rather than selecting it randomly. This means that not all members of the population have an equal chance of inclusion in the study (Simkus, 2023). To gather the sample for this survey, the researchers used a combination of convenient and snowball sampling techniques. In August 2023, they distributed the questionnaires online in Google Forms to participants within the specified geographic area.

Reliability and Content validity

The online questionnaire underwent a thorough validation process and received approval. To ensure its validity, the questionnaire was initially reviewed by three experts in the education industry. After incorporating recommendations from independent study

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advisors and industry experts, the researchers revised the questionnaire. Subsequently, a total of forty pilot tests were conducted, and the Cronbach's Alpha Coefficient was calculated for each factor using statistical software. The reliability scores for all factors fell within the range of 0.7 to 0.9, which aligns with the accepted range of 0.7 to 1.00 as suggested by Nunnally (1978).

Statistical Analysis and Data Methodology

In this research, a quantitative survey served as the primary research approach, and data analysis was facilitated through computerized software. The analytical techniques employed encompassed both descriptive statistics and multiple linear regression.

Descriptive Statistics: These statistical methods were applied to examine the demographic data of the survey respondents, which encompassed variables such as age, gender, education, income, and marital status. The purpose of using descriptive statistics was to analyze and succinctly summarize the data's characteristics and observations, with results presented in the form of percentages.

Data Collection

A total of 505 questionnaires were distributed, and 505 were returned, including 505 valid questionnaires, with a total effective recovery rate of 100%.

Results

1. Characteristics of the Respondent Group

Using statistic software to carry out statistical analysis on the basic information of the sample and get the results.

It can be seen from Table 3 that the sample selection is based on the ratio of male and female student in the surveyed university, and the ratio of the sample to the total number is close to 1:1, and the data is reasonable.

TABLE 3: GENDER ANALYSIS

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Male	256	50.69	50.69	50.69
	Female	249	49.31	49.31	49.31
	Total	505	100.0	100.0	100.0

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This table 4. summarizes grade data from a survey of 505 respondents. It shows that 256 respondents (50.69%) identified as male, and 249 (49.31%) as female. The "Cumulative Percent" column demonstrates that, cumulatively, male respondents account for 50.69% of the total, while female respondents represent 49.31%.

TABLE 4: GRADE

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Grade1	64	130	25.74	25.74
	Grade2	142	116	22.97	48.71
	Grade3	68	131	25.94	74.65
	Grade4	26	128	25.35	100.0
	Total	505	100.0	100.0	

It can be seen from Table 5 that there are three types of educational background of the surveyed subjects: History science and engineering others, among which the number of Others is the least. The survey respondents were not evenly distributed. On the one hand, the largest number of science and engineering.

TABLE 5 SUBJECT

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Validity Test	History	159	31.49	31.49	31.49
	Science and Engineering	218	43.17	43.17	74.66
	Others	128	25.34	25.34	100.0
	Total	505	100.0	100.0	

The level of entity space services (ES_T)、 Online teaching services （OT_T) Digital resource services (DR_T) and information literacy service (IL _T)

The researcher presents the results of analysis on average and standard deviation in Table 7

TABLE 7 MEAN AND STANDARD DEVIATION REPORT

Variables	$\overline{X}$	SD	Verbal Interpretation
Entity space services(ES_T)	3.6530	.88640	Agree
Online teaching services（OT_T)	3.6748	.89131	Agree
Digital Resource Services (DR_T)	3.5743	.88497	Agree
Information literacy service (IL _T)	3.6748	.88642	Agree
Student learning efficiency(LE_T)	3.6134	.85650	Agree

The table 7 presents data on four variables with corresponding means ($\overline{X}$) and standard deviations (SD).

Entity space services (ES_T): The mean rating for this service is approximately 3.6530, with a standard deviation of about 0.88640. This suggests moderate satisfaction with a relatively low level of variability among respondents.

Online Teaching Services (OT_T): This service has a mean rating of around 3.6748 and a standard deviation of approximately 0.89131. Similar to the first variable, it indicates moderate satisfaction with a slightly higher degree of variability.

Digital Resource Services (DR_T): The mean rating for this service is about 3.5743, with a standard deviation of roughly 0.88497. It shows slightly lower satisfaction compared to the previous two variables.

Information literacy services (IL_T): This service also has a mean rating of approximately 3.6748, similar to Online Teaching Services, and a standard deviation of about 0.88642, indicating moderate satisfaction with low variability.

Student learning efficiency (LE_T): This service also has a mean rating of approximately 3.6134, similar to digital resource Services, and a standard deviation of about 0.85650, indicating moderate satisfaction with low variability.

In summary, the table provides insight into the means and variability of ratings for different education services, with "Online teaching services" and "Information literacy services" having the highest mean satisfaction scores, while "Digital resource services" and "Student learning efficiency" scored slightly lower.

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Regression Analysis

The regression analysis is presented in table 8

TABLE 8   MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.928a	.861	.860	.32049

a. Predictors: (Constant), Sum Entity space services, Sum Online teaching services Sum Digital resource services, Sum Information literacy service.

In Table 8, a linear regression model is presented with various statistics. The independent variables include entity space services, online teaching services, digital resource services, and information literacy service, while the dependent variable is Student learning efficiency. The model's R-squared value, which is 0.861, indicates that the combination of these services explains 86.1% of the variability in Student Learning Efficiency. This means these services collectively have a substantial 86.1% influence on student learning efficiency. The high R-squared suggests a strong relationship between the independent variables and the dependent variable, making this model statistically significant for predicting student learning efficiency.

TABLE 9 ANOVA A

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	318.370	4	79.593	774.880	.000
	Residual	51.358	500	.103		
	Total	369.729	504			

a. Dependent Variable: Sum Student learning efficiency

b. Predictors: (Constant), Sum entity space services, Sum online teaching services, Sum Digital resource services, Sum Information literacy services

Table 9 displays an analysis of variance (ANOVA) for a statistical model. The model examines the relationship between the dependent variable, "Sum student learning efficiency," and several predictors, including "Sum entity space services," "Sum online teaching Services," "Sum digital resource services," and "Sum information literacy services.

The ANOVA results indicate that the model is statistically significant. The F-test, with an F-value of 774.880 and a p-value of 0.000 (which is less than the typical significance level of 0.05), confirms the model's significance. In practical terms, this suggests that the predictors collectively have a meaningful impact on "Sum Student Learning Efficiency."

TABLE 10 COEFFICIENTS A

	Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig
(Constant)	.143	.064		2.237	.026
Sum Entity space services (ES_T)	.326	.038	.338	8.651	.000
Sum Online teaching services (OT_T)	.240	.036	.250	6.719	.000
Sum Digital resource services (DR_T)	.206	.033	.213	6.170	.000
Sum Literacy education services (LE _T)	.179	.035	.186	5.073	.000

a. Dependent Variable: Sum Student learning efficiency

From Table 10 that entity space services online teaching services digital resource services and information literacy services are used as independent variables, and student learning efficiency is used as dependent variable for linear regression analysis. The formula for the regression model could be expressed as: student learning efficiency = 0.143 + 0.326 * (Sum entity space services) + 0.240 * (Sum online teaching services) + 0.206 * (Sum digital resource services) + 0.179 * (Sum information literacy services)Each coefficient's significance is reflected in its associated p-value (Sig), all of which appear to be statistically significant ($p < 0.05$), suggesting that these independent variables have an impact on the dependent variable X. the model The R square value is 0.860,

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which means that entity space services (ES_T) online teaching services (OT_T) digital resource services (DR_T) and information literacy services (IL _T)can explain 86.0% of the variation in Student learning efficiency. When the F test was performed on the model, it was found that the model passed the F test (F=774.880, p=0.000<0.05), which means that the independent variables collectively have a statistically significant effect on the dependent variable, at least one item in entity space services (ES_T) online teaching services (OT_T) digital resource services (DR_T), and information literacy services (IL _T) will have an impact on Student learning efficiency. In addition, the multicollinearity test of the model found that all VIF values in the model are less than 2, Therefore, it shows that there is no autocorrelation in the model, and there is no correlation between the sample data, and the model is better. The final specific analysis shows that the regression coefficient value of entity space services (ES_T) is 0.326 (t=8.651, p=0.000<0.01), regression coefficient value of online teaching services(OT_T) is 0.240(t=6.719, p=0.000<0.01),regression coefficient value of digital resource services (DR_T) is 0.206 (t=6.170, p=0.000<0.01), regression coefficient value of information literacy Service (IL _T) is 0.179(t=5.073, p=0.000<0.01)which means all four independent variables significantly affect student learning efficiency. The order of influence, based on the magnitude of the regression coefficients, is: entity space services, online teaching services, digital resource services, and then information literacy services.

Discussion

1. College students' access to solid entity space services, online teaching services, digital resource services and information literacy services

At Weifang Nursing Vocational College, students' needs for various library services show a complex pattern. Regarding physical space services, although digital resources are increasingly popular, students still attach great importance to the physical space of the library. This is not just because the library provides a quiet, focused learning environment, but also because it provides the opportunity for face-to-face communication with classmates and teachers, which remains essential in modern education. Online teaching services have become an important part of student learning. Through online platforms, students can access teaching resources anytime and anywhere, which greatly improves their learning flexibility. In addition, digital resource services, such as e-books and online journals, provide students with a wider and richer range of learning materials. Information literacy services are also increasingly important in today's educational environment. As information sources increase, students need

to develop the ability to think critically and evaluate information. This requires libraries to provide effective information literacy to help students establish correct information retrieval and usage habits.

These findings are also consistent with the research results in the case of the University of Pietermaritzburg Library in South Africa (Maponya, 2005). The research results show that factors such as entity space, online teaching, digital resources, and information literacy have a significant impact on student learning efficiency, while both emphasize the importance and functions of libraries in academic environments and explore how libraries adapt and respond to the rapid development of technology and knowledge. In addition, at Weifang Nursing Vocational College, students have different needs for various library services. Similar to the study of Guilin Medical College (Xu & Shen 2010), students showed complex patterns in their utilization of entity space, online teaching, digital resource and information literacy. In addition, we also noticed that students at Guilin Medical College tend to be divided into different usage groups when using library resources, such as study group, study place and computer use group, traditional use group and comprehensive use group. This classification may reflect students' different needs and habits when utilizing library resources.

2. Factors affecting the learning effectiveness of college students

In a sample of 505 students, we found that library services play a central role in influencing student learning outcomes. In contrast, personal factors, such as learning motivation and learning strategies, also have an impact, but are relatively small. More specifically, the library's educational support services, such as information literacy and online teaching assistance, directly affect the depth and breadth of students' learning. In addition, the library's digital resource services provide students with high-quality learning materials, which is also the key to improving learning results.

Both studies indicate that library resources and services have a significant impact on student learning outcomes. Similar to the findings of Guilin Medical College (Xu & Shen, 2010), our data also show that there is a positive correlation between library utilization and student learning outcomes. This is also consistent with the research results of (Haleem, 2022). This may be because the various services and resources provided by libraries are designed to support student learning and research, such as information literacy, online teaching assistance, and digital resource services.

In addition, a study by Guilin Medical College also mentioned that students' satisfaction with library content is an important factor affecting learning outcomes. This provides us with a new direction of thinking: in addition to providing rich and diverse resources and services, libraries should also pay attention to student satisfaction, because this is directly related to students' continued use of these resources and services. Whether it is Weifang Nursing Vocational College or Guilin Medical College, libraries play an irreplaceable role in students' learning and research. In order to further improve students' learning results, libraries should constantly adjust and improve their services to ensure that they meet students' needs.

Suggestion

1. **Entity space**:

Optimize the layout and add multimedia learning rooms, exhibition areas and innovation spaces. Use VR technology to set up an immersive learning room. Provides technical tools such as 3D printers and laser cutting machines. Integrate technology, such as providing high-speed Wi Fi, automatic book retrieval system and smart assistant. Ensure environmental comfort, such as introducing green plants.

2. **Online Teaching:**

Provides interdisciplinary online courses such as data science and AI applications. Academic experts are regularly invited to share online. Establish a real-time Q&A platform and use VR/AR technology to provide students with simulated experimental experience.

3.**Digital resources:**

In addition to updating e-books and databases, multimedia resources should also be added. Create a digital archive to collect the school's historical documents. Scholars are encouraged to share research data and collaborate with other libraries.

4. **Information literacy:**

Work closely with subject and career development centers to provide information literacy training to students. Advanced online assessment methods are used and students are guided through practical research projects.

5. **Student learning efficiency:**

Provide learning strategy guidance and psychological support. Provide resources and tools based on each student's learning style. Team learning and interdisciplinary collaboration are encouraged.

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