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RESEARCH ARTICLE

MEASURING THE IMPORTANCE OF SMART E-LEARNING EDUCATION SYSTEM

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ABSTRACT

E-learning is both a crisis and a turning point for education, because when the COVID-19 epidemic swept the world, governments around the world implemented the policy of suspending classes without delaying students' learning. Since last year, the global experiment began, and schools have carried out distance teaching, e-learning, etc.The word "smart" refers to intelligence, wisdom, efficiency, and effectiveness. Therefore, smart education refers to a learning medium that enables learners to think intelligently, act effectively, and solve problems effectively.The term "e-learning" has different interpretations and nouns with the development of different technological tools, such as: Internet based training, web-based training, or online learning, online learning, distance learning, etc., but basically all are the application of computers and network technology media in learning situations, including synchronous and asynchronous network learning.The aim of this paper is to develop a hierarchy framework in assessing the key success factors of the importance of smart E-learning education systems. Compare the relative weight values with AHP; it clearly understands the impact of the criteria on the importance of E-learning. Through this dual assessment model, it can more thoroughly assess the impact of the guidelines, and further provide a gradual increase in the use of E-learning system. Also, it is an important reference and substantive recommendations to the smart E-learning education providers.

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INTRODUCTION

E-learning is both a crisis and a turning point for education, because when the COVID-19 epidemic swept the world, governments around the world implemented the policy of suspending classes without delaying students' learning. Since last year, the global experiment began, and schools have carried out distance teaching, e-learning, etc. -Learning education, unfortunately, after many years of implementation, how to evaluate its policy priorities and teaching effectiveness, and whether it achieves the expected goals, is still a mystery, and it is worth exploring in depth. In recent years, with the development of Internet technology, smart E-learning education system is growing quickly. The education policy promoted by Taiwan's Executive Yuan in 2018, with the slogan of "AI in education", brings Taiwan's education to a new era of artificial intelligence education and digital advanced personalization and adaptive learning, and hopes to make good use of it The power of information technology improves the quality of education and promotes equal opportunities for education, and then implements the educational philosophy of teaching students in accordance with their aptitude and lifelong learning.

Recently, there has been a lot of research on smart classrooms, covering multiple fields, including information and communication technology, machine learning, sensor networks, cloud computing, and hardware. Smart classroom research has been rapidly implemented to enhance education systems to increase engagement and empowerment of students, educators, and administrators. It is a pity that there are many multi-attribute studies on elearning education in the past, which still lack quantitative data to verify the priority of E-education planning. Therefore, this paper firstly collects the relevant "information technology of smart education" literature about the smart education system, thereby constructing a multi-criteria decision-making framework for Education. Conceptually, this Analytic Hierarchy Process (AHP) analysis framework follows the four-level basis of "goal layer – main criterion – sub-criterion - alternative layer" and aims to evaluate the weight of each criterion in the smart teaching system.

LITERATURE REVIEW

The word "smart" refers to intelligence, wisdom, efficiency, and effectiveness. Therefore, smart education refers to a learning medium that enables learners to think intelligently, act effectively, and solve problems effectively.

Therefore, smart schools aim to provide an intelligent learning environment based on student-centered, personalized, and adaptable learning services, providing interactive and collaborative tools that are accessible and accessible. We define smart education as "the effective and coherent use of information and communication technologies to achieve learning outcomes through appropriate teaching methods". An earlier definition given by Zhu and He is that "the essence of smart education is to use intelligent technology to create an intelligent environment, provide personalized learning services, promote intelligent teaching, and empower learners to develop intelligent talents. It has orientation, better value. Higher quality of thinking, greater capacity for action".

Definition of e-Learning: The term "e-learning" has different interpretations and nouns with the development of different technological tools, such as: Internet based training, web-based training, or online learning, online learning, distance learning, etc., but basically all are the application of computers and network technology media in learning situations, including synchronous and asynchronous network learning. Computer-based learning is to store learning content on CD-ROM or disk and learn through independent personal computer. Internet based learning generally refers to all learning activities using Internet technology, not just learning behaviours through web pages, such as learning by e-mail, file transfer, newsgroups, exclusive systems, etc. On-line learning generally refers to all teaching activities transmitted through web pages or network technology. E-learning, also known as digital learning, is a learning and teaching activity that uses a variety of tools. The new communication mechanism and abundant learning resources, realizing a new learning method will change the role of teachers in traditional teaching and the relationship between teachers and students, thereby changing the teaching structure and the nature of education. It can include various learning activities such as web-based learning, computer-assisted learning, virtual classrooms, and digital cooperative learning. Therefore, digital learning (e-Learning) refers to the activities of learning and teaching through the Internet or other digital content. It makes full use of the learning environment provided by modern information technology with a new communication mechanism and rich resources to achieve a new type of learning way. In the field of e-commerce information system success model, known as the IS model. It consists of six variables with relevant variables. The success factor of the proposed e-learning site is through many levels of the concept. From the literature to explore the main criteria can be divided into smart classroom function, Technology-based learning system (IoT, Metaverse), Teaching monitoring system and Conceptual elements of smart learning. Smart classroom function can be divided into teaching is differentiated from person to person, mobile technology, educational resources optimization" and "students cooperation learning". Technology-based learning system (IoT, Metaverse) can be divided into education through gamification, virtual community, and reliable wireless connection. Teaching monitoring system is divided into cybersecurity protection, system data backup, course completion rate and learning attention detection. Conceptual elements of smart learning can be divided into smart learners, smart pedagogies and ergonomics and learning analytics.

STUDY DESIGN AND IMPLEMENTATION

This study mainly uses the Analytic Hierarchy Process (AHP) to explore the index connotation and relative importance of the key success factors of the E-learning education system. AHP was developed by T. L. Saaty in 1971. The purpose of its development is to systematize complex problems and decompose them into different levels. Through quantitative methods, we can grasp the background and make comprehensive evaluations, to provide decision makers with appropriate choices. A certain level of elements, with its level of the elements as an assessment benchmark, perform a pairwise comparison between the hierarchy elements, and the comparison between the various elements. The basic assessment scale used for hierarchical analysis is defined by verbal judgments ranking, including equally important, slightly important, quite important, extremely important and absolutely important. Corresponding to the resulting numerical scale (numerical judgments) for and the trade-off values. The meaning and description of each scale are shown in Table 1.

Table 1. Hierarchical analysis method to assess the scale of the semantic table

Evaluation scale	Definition	Description
1 or (1: 1)	equally important	the two elements are of the same importance
3 or (3: 1)	slightly important	Experience to judge a little tendency to like a certain factor
5 or (5: 1)	quite important	Experience judgment tends to prefer a factor
7 or (7: 1)	Very important	the actual display is very strongly inclined to like a certain factor
9 or (9: 1)	absolutely important	sufficient evidence certainly definitely likes an element
2, 4, 6, 8	Adjacent scale	Need to compromise

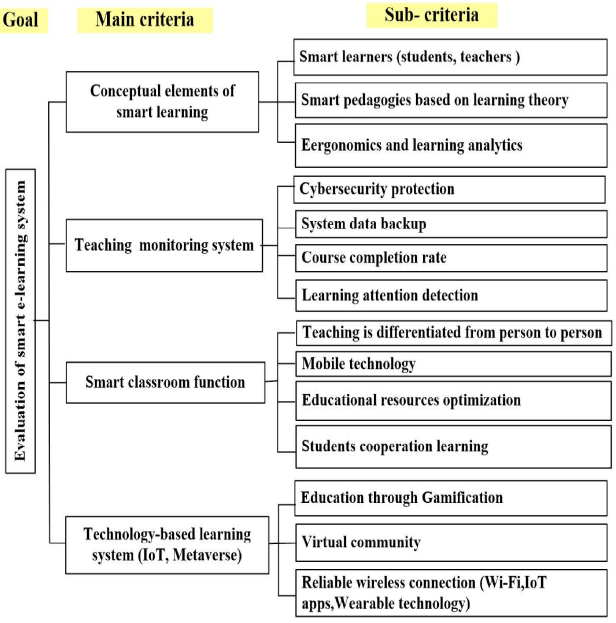

Figure 1. Research architecture

The AHP model in this paper includes a total of 4 main criteria and 14 sub-criteria. The overall weight of the sub-criteria is obtained through the Expert Choice software, which is used as the priority of E-Education strategic planning. This ranking of AHP weighted values sorting to identify the key success factors driving digital learning. Fundamentally, the main and sub-criteria definition are as shown in Tab. 2 and Tab. 3.

RESEARCH STRUCTURE

AHP is a set of decision-making methods developed by Saaty. In the case of the US Department of Defence contingency plan, it is mainly used in the case of uncertainty and decision-making problems with multiple evaluation sub-criteria, to simplify the complexity of the problem one by one. The AHP theory is simple and practical. Therefore, from the beginning, it has been used for prioritizing order decisions, planning resources, allocation, forecasting, and investment portfolios.

AHP is widely adopted by academia and practitioners due to its clearness, ease of operation, and the ability to accommodate many experts and decision-making opinions, and its application range is quite extensive. This study evaluates the research framework of the sub-criteria of the smart E-learning education system, based on the successful model of the information system proposed by Smart classroom function , Technology- based learning system, Teaching monitoring system and Conceptual elements of smart learning, and develops the main criteria for evaluating the smart Elearning education system through the relevant literature. Its overall distinction is divided into three levels, such as Figure 1 shows.

DATA ANALYSIS

Based on the hierarchical structure analysis and questionnaire data, the evaluation structure of the smart E-learning education and smart classroom function is constructed. The weight of the main and sub-criteria is developed. Then the key success factors of smart e-learning are discussed. The analysis steps are listed below:

CONCLUSION AND SUGGESTION

Conclusion

The aim of this paper is to develop a hierarchy framework in assessing the key success factors of the importance of smart E-learning education systems. Compare the relative weight values with AHP, it is clearly understanding the impact of the criteria on the importance of E-learning. Through this dual assessment model, it can more thoroughly assess the impact of the guidelines, and further provide a gradual increase in the use of E-learning system. Also, it is an important reference and substantive recommendations to the smart E-learning education providers. In the 4 main criteria and 14 sub-criteria, the analysis results of AHP found that in the planning of smart teaching system, the important order of the main criteria, from largest to smallest, is: Smart classroom function, Technology-based learning system (IoT, Metaverse), Teaching monitoring system, Conceptual elements of smart learning. The sub-criteria weights show the key success factors of ELearning Education Planning, in order: Educational resources optimization, teaching is differentiated from person to person, Students cooperation learning, Course completion rate, Reliable wireless connection (Wi-Fi, IoT apps, Wearable technology). Smart E-learning System. Advances in information technology provide opportunities for new or improved educational and training practices with new teaching methods and tools. Furthermore, these technologies are changing the educational paradigm. Based on a survey of various information technologies that support smart education, we develop a smart education framework. The AHP framework builds information technology in a layered architecture. We also develop a smart educational planning method based on this AHP.

Additionally, we show how AHP frameworks and design methods can be used to develop a specific course or lecture design. To validate the smart e-learning AHP framework, we examine smart e-learning systems reported in the literature. To identify smart e-learning systems, we conducted a systematic literature search. The literature search results show that the smart e-learning framework can describe the importance of smart education system. This study contributes to the current literature through the smart e-learning framework. The smart education framework will guide the design of future intelligent e-learning systems. Educational resources optimization. Education and educational equity aim at distributional equity and optimization. Educational equity, as the name implies, is the process of standardizing and rationally distributing limited educational resources among different educational levels, regions, and schools in accordance with established principles. The fair allocation of educational resources is the essence and core of the allocation of educational resources. Education equity is to adhere to the principle of equal educational opportunities, and to rationally allocate educational resources through established educational policies and regulations. Provide reasonable and balanced educational resources for the education systems of schools at all levels in various regions, so that educational subjects can fully enjoy educational resources when educational resources reach a relatively balanced state and realize the optimal supply and demand relationship of educational benefits. Education fairness is closely related to social fairness, and fairness in the allocation of educational resources is the premise and foundation of achieving educational fairness. Therefore, only a reasonable and balanced implementation of the optimal allocation of educational resources can achieve educational equity and social equity. Teaching is differentiated from person to person. This study summarizes the executive constructivist pedagogies that have adopted e-learning in the past.

Five constructivist pedagogies were found to be: (1) differentiated learning, in which teachers tailor specific instructional learning needs to students' uniqueness, and (2) peer learning, which provides Opportunities for shared learning, (3) student-centered learning, where students are encouraged to make their own choices in their learning paths, (4) individualized learning, which focuses on meeting unique learning needs, and (5) active learning, which emphasizes students' own exploration by engaging them in different learning activities.

Smart pedagogies. Smart learning strongly emphasizes the pedagogy required when integrating technology. Student feedback highlights the lack of innovation in technology in current teaching methods and the need to define teaching in the 21st century. Approaches consistent with emerging technologies and learning systems. Teaching methods and learning strategies also need to change to provide learners with a learning environment that effectively takes advantage of technological advances. Things worth mentioning that intelligent learning raises new pedagogical issues in terms of technology integration, learning and assessment strategies, learning performance evaluation, and learning behaviour and pattern analysis. I recommend using thoughtful teaching strategies to develop critical thinking and study skills. The authors note that this advanced skill cannot be taught independently and must be taught in the context of the learner. I summarized four teaching strategies based on the number of participants in learning activities: class based differentiated teaching, group-based collaborative learning, individual-based personalized learning, and crowd-based generative learning. The Intelligent Learning Framework by in other words that intelligent learning environments include rethinking aspects of teaching, such as learning objectives, tasks, methods and strategies, media, resources, feedback, learning time and space, assessment, learning communities, and support structure.

Suggestion

The application of information technology to teaching and learning has become a global trend, and countries have listed the promotion of digital learning as an important national policy. In the face of increasingly fierce competition, how E-Learning can innovate and break through the framework to maintain market competitiveness is a major issue that must be faced by the future development of higher education. Advice to the government. With the rise of the Internet, it has changed the global competitive environment, social culture, educational development, lifestyle, self-awareness, and values, etc. Digital learning has connected all parts of the world with Internet technology to form a far-reaching global knowledge network. The traditional learning pattern has also brought unprecedented challenges and changes to the educational concept, management pattern, system reform, and curriculum update of higher education. At present, all countries in the world regard E-Learning as an important key to cultivate talents, enhance national competitiveness, and shape national competitive advantages.

While developing E-Learning, the government must also carryout environmental reforms to meet the advent of the digital learningera. There are three aspects to consider for reform:

- In terms of administrative regulations, because the current relevant administrative regulations, policies and systems lack an overall plan for digital learning, it is recommended that the government quickly establish complete regulations and systems related to digital learning, including online degree awarding methods and digital learning certification systems.
- In terms of teaching resources, strengthen the integration of resources, set up a digital learning promotion organization (e.g., Digital Science and Technology Department), which is responsible for the integration and distribution of educational resources, and establish strategic alliances to strengthen the coordination and cooperation of public and private resources, and promote the development of universities and industries. Division of labour and cooperation enhances the overall competitive

advantage; on-campus digital learning establishes its own characteristics through systematic planning and development, and effective integration of educational resources. In addition, if the intellectual property is not fully protected, it will not be able to attract many content owners to provide their content for the public to use. This result will not only lead to the dispersion and waste of teaching resources, but more importantly, the exchange of online learning materials cannot be achieved. Therefore, the government should establish clearer regulations on the commercial or academic use of digital property rights. In addition, establish an appraisal system for digital teaching materials to facilitate the transaction or exchange of digital teaching materials and achieve the purpose of sharing digital teaching materials.

- Determine the positioning of digital learning. According to international development or my country's national conditions, non-formal education (promotional education) should be more suitable to promote all digital learning.

Advice for schools. With the increase in the number of teaching resources, the allocation of teaching resources in colleges and universities has always been a topic of discussion. To improve teaching effectiveness and efficiency, university administrators must consider all options for optimizing and reorganizing many educational resources. Significant progress has been made in artificial neural networks and wireless networks due to advances in computer science. Besides, the foundation of a university training program is the curriculum. It contains subjects with appropriate parameters: a semester, multiple credits, hours of class work, type of course. To implement it, a lot of resources are used: a lot of teachers (departments), a lot of classrooms (for classes), a lot of training materials, a lot of equipment (various types), and a lot of e-learning courses. Many disciplines are combined with each set of resources. Each resource has its own parameters. To allocate resources, these parameters and many conditions should be considered. This is a multi-criteria optimization task. Resource parameters and limits may change during the run of the educational program. It requires new educational programs. This can be done using the concept of Continuous Acquisition and Lifecycle Support (CALS) widely used in industry rather than education.

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