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Quality assurance awareness in higher education in China: big data challenges

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Abstract

The quality assurance of higher education in China is an issue of vital international interest. To improve the international reputation of the nation's universities, steps must be taken to ensure a sustained focus on the quality assurance within its ranks. This paper is primarily focused on the quality assurance models operational in Chinese universities, the Big data challenges and the legal framework backing them. The paper also discusses the implementation of the models, the extent to which they meet international standards, and how they adhere to prevailing laws. The degree of success in attaining and maintaining quality and evaluation of quality improvement opportunities are also discussed. Some of the solutions recommended in this study are the participation of more teachers and students in quality management, more emphasis of Higher Education Institution (HEI) quality assurance on self-regulation and a learning-oriented approach and conducting sessions to collect anonymous feedback from students to reward staff with best practices. Some of the Quality Assurance practices/models adopted in Chinese Universities are the Ministry of Education (MOE) reviews; the Academic Degree Committee oversight; Higher Education Evaluation Center (HEEC) overview, University self-evaluation according to HEEC Indicators, and the Webometric Ranking Model.

Keywords: Quality assurance, Higher education, Quality management, Big data, Analytics, HEEC

Introduction

It is no secret that the preparation afforded by a high school education is increasingly inadequate to meet the ever-burgeoning requirement to compete globally in the twenty-first Century. To meet up with the standards of education in advanced countries, the need for higher education has grown exponentially. According to World Bank/UNICEF [1], the level of educational attainment, especially college education can be directly responsible for the formulation and growth of the knowledgebase of the national economies. They also gave some reasons for the dwindling of higher education in this current age. Some of these reasons include bad governance, financial constraints, and lack of efficiency and quality. Knowledge is an essential factor, especially considering the recent advances in technology and telecommunications, and the globalization of labour markets and trade. Gender Budgeting Initiative [2] described quality education as a basic need which provides access to other opportunities such as political awareness, health, and employment.

Access to quality education regardless of gender and background is a nurturing ground for the promotion of democracy and peace. Thus, education, especially higher education is of prime importance to man. It was estimated in [3] that in the next few years, the global demand for higher education could be as high as 263 million students— a step up from a little under 100 million students in 2000. There is an exponentially growing need for Quality Assurance (QA) for international universities and Higher Education Institutions (HEIs) in global networks [4]. Quality assurance is a vital way of ensuring excellence

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in higher education. It is important to ensure that the quality of educational programs and curriculum meets local and international standards. Thus, there is a need for QA agencies, as well as the adoption of their review decisions [5].

Big data is an invaluable asset to educational institutions. It allows these institutions to use Information Technology (IT) resources to enhance the quality of the education, improve general student performance and outcome, and ultimately shape a dynamic and modern education system. Murumba and Micheni [6] studied the factors that affect the adoption of big data analytics in institutions of higher learning, and how to overcome those challenges. Daniel [7] discussed the opportunities associated with the implementation of big data in higher education and proposed future directives for the development of a big data institutional project. Baig et al. [8] conducted a comprehensive and systematic review of big data in education to classify the research themes, and study possible ways to integrate big data into the curriculum for the improvement of the educational system.

In the world today, there is a general but somewhat misguided belief that possession of a university degree is assurance of a good/promising future. The demand for university education is at an all-time high and the capacity has to more than double to meet this growing need.

The major contributions of this paper include:

- The study of the quality assurance models that are operational in Chinese universities and the legal framework backing them.
- The extent to which the existing models have met international standards and law.
- Highlights of the implementation of existing Quality Assurance models with some comparison with applications in United Kingdom universities.
- Highlights of profitable research findings such as the Quality Assurance practices/models adopted in Chinese universities: the *Ministry of Education (MOE) reviews; the Academic Degree Committee oversight; Higher Education Evaluation Center (HEEC) overview, University self-evaluation according to the HEEC* Table 1 *Indicators, and the Webometric Ranking Model.*

The rest of the paper is organized as follows: Literature review section describes related work and elaborates on Quality Assurance practices in educational institutions. Methodology section explains the methodology and concept of Quality Assurance models. Results section provides the results of the study. Comparison with United Kingdom Professional Standards Framework (UKPSF) quality system section compares the Chinese models with United Kingdom models. Discussion & recommendation section provides some recommendations. Conclusion section concludes the work.

Table 1 The Deans' mean response ratings on awareness of the need for quality assurance in the university setting

Deans	N	Mean ($\overline{X}$)	Standard deviation	Decision
Total	280	2.73	0.51	High

Literature review

Quality speaks to how excellent or meritorious a product, service, person, or institution is. It can be measured using adjectives such as poor, average, good, top, excellent etc. [9] as depicted in Fig. 1. All sorts of societies and communities present awards and medals for work done meritoriously. Presently, there have been implementations of Total Quality Management (TQM) systems used mostly within the manufacturing industry [10]. Some other systems adopted are the Continuous Improvement process (CI) and Quality Assurance (QA). However, it is important to note that QA is only accepted as a system for checking if a product or service meets the expectations set for it so that its deficiencies and flaws can be addressed and corrected [11]. There is also statistical quality control which includes the development and application of software and other types of QA present in the private sector but not yet trendy in the public sector. The products from QA software are used for deploying, managing audits and compliance, Corrective and Preventive Action (CAPA), tracking of defects, managing documents etc. [12].

Higher education, also known as post-secondary or tertiary education is the last stage in formal education where there is usually an award of a degree, grade or any other kind of certification [13]. The knowledgebase of the world is largely formed by the products, inventions, and graduates of higher education. Universities are institutions where higher education and research is taught. They are capable of awarding degrees and are accessible to both undergraduates and postgraduates. They should have academic freedom, staff tenure and should be somewhat distinct from the society they are present in [14].

Assessing quality in academia is a study that evolves over time as the standards are dynamic and progress according to the changing times. Presently, there is an issue of accountability with students who are now seen as consumers with rights, including one of litigation. This issue is resulting in grade inflation and the dropping of standards. Now, there is no significant difference between the average salary of a graduate and a non-graduate. 'Return on investment (ROI)' is suddenly a subject of

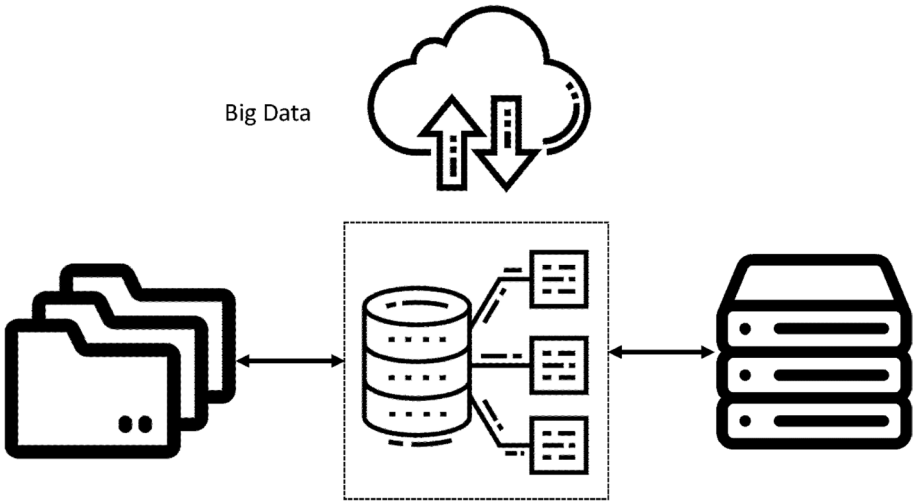

Fig. 1 Illustration of Big Data and Quality Assurance

concern and consideration in education. It was reviewed in [15] and it was determined that it varies from country to country. Willetts [16] estimated that there is between 10,000 to 30,000 generally accepted and self-acclaimed universities in the world. It has been observed that cities with one or more universities have a better economy, a higher standard of living and are sophisticated in their cultural ways. This leads to a cluster of start-up companies as well as established ones gathering around with the aim of exploiting their access to so many graduates and research programs. The Economist [17] illustrated that between 1995 and 2014, government investment in higher education in the Organisation for Economic Co-operation and Development (OECD) grew from 0.9% to 1.1%, and private spending grew to 1.5% from 1.2%.

As a result of the recent proliferation of degrees, some employers now demand for higher qualifications, even for jobs that shouldn't require certain qualifications. This is gradually degenerating into a phenomenon referred to as "degree devaluation" which is likely going to result in 'over-education' [18]. Universities need to rise up to meet the challenge of producing graduates and postgraduates with the appropriate skills for companies to employ. A lot of these universities are not suitable for lifelong learning. The quality of the distance or online programs of some of these institutions are dismal. They need to come to terms with the fact that their residential campus isn't as important as it used to be. Considering the rampant educational reforms and sharp increase in cost, some universities have not yet been able to embrace the merits of Information Technology that is required for QA and other relevant assessments [19, 20]. In [21], some indicators to evaluate Quality Assurance in students were identified. They include progression rate, drop-out rate, and graduation rate. Though these indicators can be manipulated either through inflation of grades, promotion of those not ready or worthy to be promoted etc., they are still some of the best indicators there is. Due to the rigorous requirements for the evaluation of quality assurance in China, schools need to ensure that they pay attention to some of these metrics or indices.

Cao et al. [22] proposed a QA framework for Chinese Private Higher Education (PHE) composed of three main players: market, government, and institution, and their joint association. Its success would depend on how well it is implemented, and the role of each player is enforced independently. In [23], the author presented a comprehensive overview of QA in Chinese higher education through the analysis of the development and context of QA initiatives, and the current management and structure of QA in higher education in China. This paper attempted to shed light on the implications of the future path of higher education institutes in quality assurance. The author in [24] discussed measures to improve higher education quality in China such as special policies for QA, professional certification system for evaluation, national quality standards and innovation, etc.

Organizations use various data analysis solutions to achieve their strategic and operational goals. Big data analytics turns unstructured data into useful information and patterns. The numerous processes in higher education require an efficient content management system. Big data could be useful to students, educators, administrators, and course developers in managing and tracking degrees, grades, courses, institutions, and certifications [25]. The authors in [26] compared the data practices of

two higher education institutions in terms of quality in teaching and learning. They believed that each higher education institution could benefit from exploring their ongoing discourses and practices relating to data and create a contextualized understanding of data usage. They also identified some challenges affecting the adoption of big data in higher education for quality assurance such as: bad connectivity across networks, availability of technological gadgets, attachment to local and international approaches to quality assurance, and the data processing performance. Quality Assurance is the bedrock of most successful universities. Its aim is to ensure that universities produce high quality and competent graduates who can compete globally in their respective disciplines.

Methodology

Quality assurance models

This section explains the methodology of the quality assurance practices obtainable within the Chinese university system and the legal framework that supports them, per Chinese law. The QA models are applicable to all academic institutions in the country.

1. The Ministry of Education (MOE) of the People's Republic of China: The MOE was established in 1949 as the Ministry of Education of the Central People's Government, and subsequently became the State Education Commission of the People's Republic of China from 1985 to 1998. During the restructuring of the State Council in 1998, it was assigned its current title. The validity of the MOE is derived from the Education law of the People's Republic of China which was adopted at the third session of the 8th National People's Congress on March 18, 1995. It was promulgated by Order No. 45 of the President of the People's Republic of China on March 18, 1995 and became effective from September 1, 1995. Some of the responsibilities of The MOE include:
    - Drawing up policies and strategies for educational development and reform and supervising their implementation.
    - Overall planning and coordination of all forms of education at various levels, and analysis and statistics of basic educational information.
    - Promoting development of compulsory and equitable education.
    - Providing guidance for the reform and development of employment-oriented vocational education.
    - Directing the reform and development of all forms of higher education, and the formulation of curriculum catalogues for the guidance of teaching.
2. The Academic Degree Committee of the State Council: The ADCSC organizes the examination and evaluation of postgraduate programs offered by the universities in conjunction with higher authorities. They oversee formulating policies, principles and tasks of evaluation and ratification of evaluation results.
3. The Higher Education Evaluation Center (HEEC): A subsidiary of the Ministry of Education, the HEEC is charged with the responsibility for providing higher education quality assurance through multi-level, diversified and professional forms of services on higher education quality monitoring in China. The HEEC has the job of ensuring that programs offered by the universities meet the minimum standards of the body.
4. Webometric Ranking Model and Thomas Reuter University Ranking Model: Webometric ranking model rates world universities based on composite indicators of visibility and activity measures. Webometric ranking model and Thomas Reuter ranking model ranks universities based on quality and research results reflected through website presence and domain, repositories, and informal scholarly communication [27]. It is important to note however, that the Chinese government doesn't officially recognize or endorse the ranking of their universities according to this model.

Research questions

The research design adopted for the study was the descriptive survey. It is a design that allows the researcher collect relevant data from a sample of a desired population, and the findings on the sample generalized to the entire population. The following research questions were formulated to guide the study:

1. Are public university deans aware of the need for quality assurance in the higher education setting in China based on their mean response ratings in selected schools?
2. Are public university deans cognizant (awareness and practice) of the need for quality assurance in school discipline based on their mean response ratings in selected schools?
3. Are public university deans cognizant (awareness and practice) of non-violent discipline control strategies that sustain quality assurance based on their mean response ratings in selected schools?

Null hypotheses

The following null hypotheses were tested at 95% confidence interval to guide the study:

1. There is no significant difference in experienced and less experienced public university deans' awareness of the need for quality assurance in the school setting based on their mean response ratings in selected schools.
2. There is no significant difference in experienced and less experienced public university deans' cognizance (awareness and practice) of the need for quality assurance in school discipline based on their mean response ratings in selected schools.
3. There is no significant difference in experienced and less experienced public university deans' cognizance (awareness and practice) of non-violent discipline control strategies that sustain quality assurance based on their mean response ratings in selected schools.

The population of the study comprises 300 Chinese public university Deans in China where the study was carried out. The sampling for the study was done using simple random sampling to select 300 Deans of differing levels of experience for the study. Three research questions and three null hypotheses tested at 95% confidence interval guided the study. The instrument for data collection was a questionnaire titled 'Quality Assurance Cognizance in School Discipline Questionnaire' (QACSDQ), rated on a 4-point scale, and containing 10 items. It was expert validated and posted a Cronbach Alpha reliability coefficient of 0.78, meaning that it was reliable since it was closer to the whole number 1. The instrument passed through factor analysis using Varimax rotation and only items that loaded sufficiently constituted the final copy of the instrument for distribution. Data were also screened for inconsistencies in item response; hence, 280 copies of the instrument were used in analysis. The research questions were answered using descriptive statistics (mean and standard deviation), while the null hypotheses were tested using t-test. Data were analysed on the platform of the Statistical Package for the Social Sciences (SPSS) version 23. The decision criterion was that mean responses of 2.50 and above were taken as positive responses and vice-versa. For the hypothesis testing, where the calculated value of 't' was higher than its critical value, it led to a rejection of the null hypothesis.

Results

The findings from the analysis in Table 1 indicate that the deans sampled are aware of the need for quality assurance in the school setting.

The findings from the analysis in Table 2 indicate that the deans sampled are not cognizant of the need for quality assurance in school discipline.

Table 2 The Deans' mean ratings on their cognizance (awareness and practice) of the need for quality assurance in school discipline

Deans	N	Mean ($\bar{X}$)	Standard deviation	Decision
Total	280	2.35	0.46	Low

Table 3 The Deans' mean ratings on their cognizance (awareness and practice) of non-violent discipline control strategies that sustain quality assurance

Deans	N	Mean ($\bar{X}$)	Standard deviation	Decision
Total	280	2.13	0.41	Low

The findings from the analysis in Table 3 indicate that the deans sampled are not cognizant of non-violent discipline control strategies that sustain quality assurance.

Table 4 indicates that there is significant difference in experienced and less experienced deans' perspectives on the need for quality assurance in schools. Accordingly, the null hypothesis was rejected as shown in Fig. 2.

Table 5 indicates that there is significant difference in experienced and less experienced deans' cognizance of the need for quality assurance in school discipline. Accordingly, the null hypothesis was rejected as shown in Fig. 3.

Table 6 indicates that there is significant difference in experienced and less experienced deans' cognizance of non-violent discipline control strategies that sustain quality assurance in schools. Accordingly, the null hypotheses were rejected as shown in Fig. 4.

Comparison with United Kingdom Professional Standards Framework (UKPSF) quality system

The UKPSF is currently managed by Advance Higher Education (HE). Advance HE is listed in the UK Companies House. It was initially registered with the title 'Higher Education Academy' (HEA) in 2003 as a private company limited by guarantee with the mission of delivering educational support services. Following the recommendation of Bell Review in 2013, the HEA merged with the Leadership Foundation for Higher Education and the Equality Challenge Unit to form the Advance HE [28]. The Advance HE listed its mandate to include the following:

- Providing insight for foresight.
- Enhancing organisational performance to deliver sustainable change.

Table 4 Test for significant difference in experienced and less experienced university Deans' awareness of the need for quality assurance in the school setting

Deans	N	Mean $\bar{X}$	Standard deviation	Df	t-cal	t-crit	Decision
Experienced	112	2.3	0.58	198	2.34	1.96	Reject
Less experienced	168	2.8	1.2				

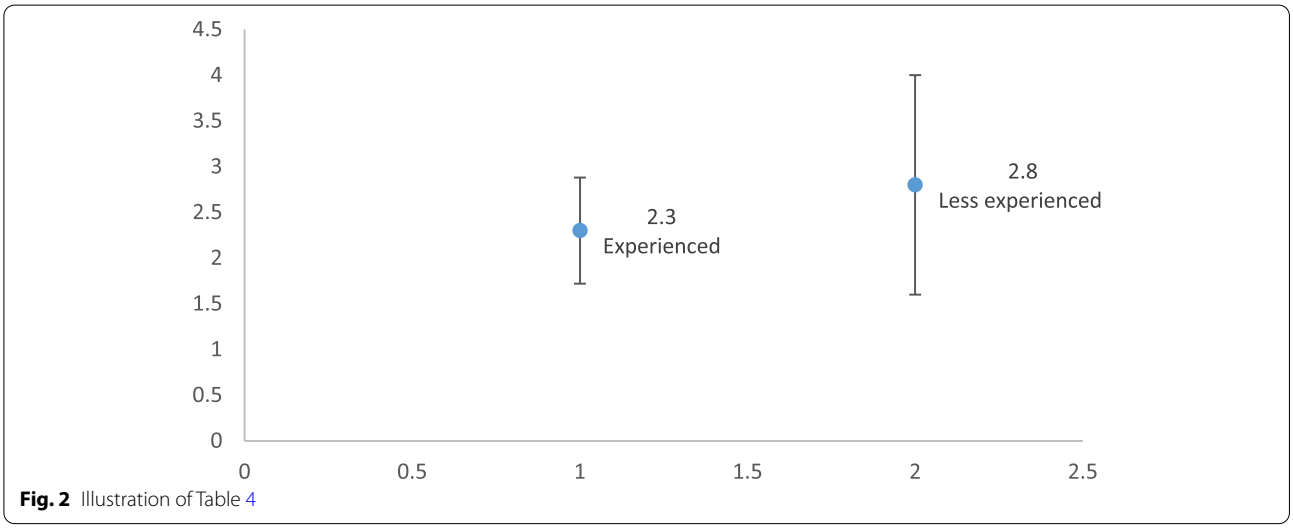

Fig. 2 Illustration of Table 4

Table 5 Test for significant difference in experienced and less experienced university Deans' cognizance of the need for quality assurance in school discipline

Deans	N	Mean $\bar{X}$	Standard deviation	Df	t-cal	t-crit	Decision
Experienced	112	2.46	0.49	198	2.69	1.96	Reject
Less experienced	168	2.24	0.47				

- Developing and connecting people, so they can deliver impact.
- Accrediting achievement for recognition.

The Advance HE developed a three-area framework with 16 dimensions for teaching and supporting learning in higher education.

Whereas the UKPSF is voluntary, the MOE, ADCSC, HEEC, and other professional quality assurance agencies in China are compulsory and backed by laws. However, the focus of the UKPSF and the Chinese agencies are different in some ways. While the UKPSF primarily sets standards, the Chinese agencies also organizes and implements higher education evaluation, conducts research in policies regarding higher education reform, and develops international cooperation with evaluation agencies in other countries. The equivalent body of the MOE and HEEC in the UK is the Office for Students (OfS) and United Kingdom Research and Innovation (UKRI) [29].

The OfS' main responsibility is to ensure that students get the best from higher institutions while the UKRI is charged with the responsibility of directing research and innovation funding. This is like the regulatory body in China which also has the responsibility of overall management of educational funds under the Ministry's jurisdiction and participating in formulating policies for the allocation and raising of educational funds.

Higher education in the UK is registered as charities, so the focus of a UK government regulatory body like UKRI is to ensure that the universities utilize the funding disbursed to them. The OfS was established to ensure that students that pay tuition fees through student loans or are self-funded get value for their money and a fulfilling

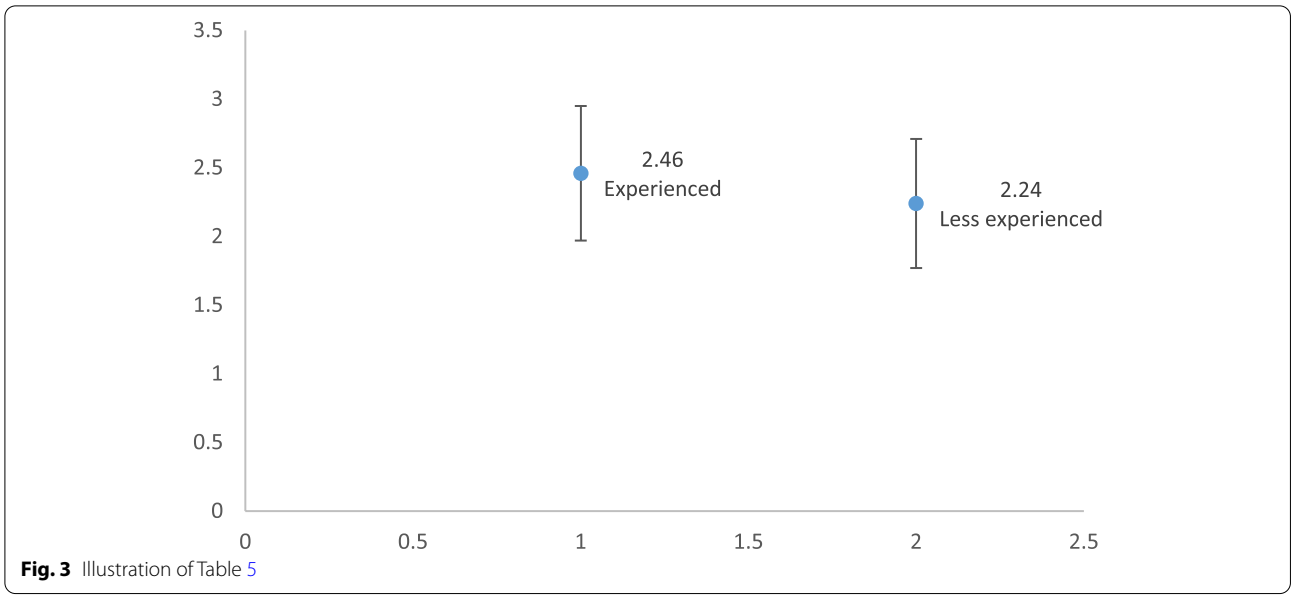

Fig. 3 Illustration of Table 5

Table 6 Test for significant difference in experienced and less experienced university Deans' cognizance of non-violent discipline control strategies that sustain quality assurance

Deans	N	Mean $\overline{X}$	Standard deviation	Df	t-cal	t-crit	Decision
Experienced	112	2.26	0.47	198	2.71	1.96	Reject
Less experienced	168	2.01	0.44				

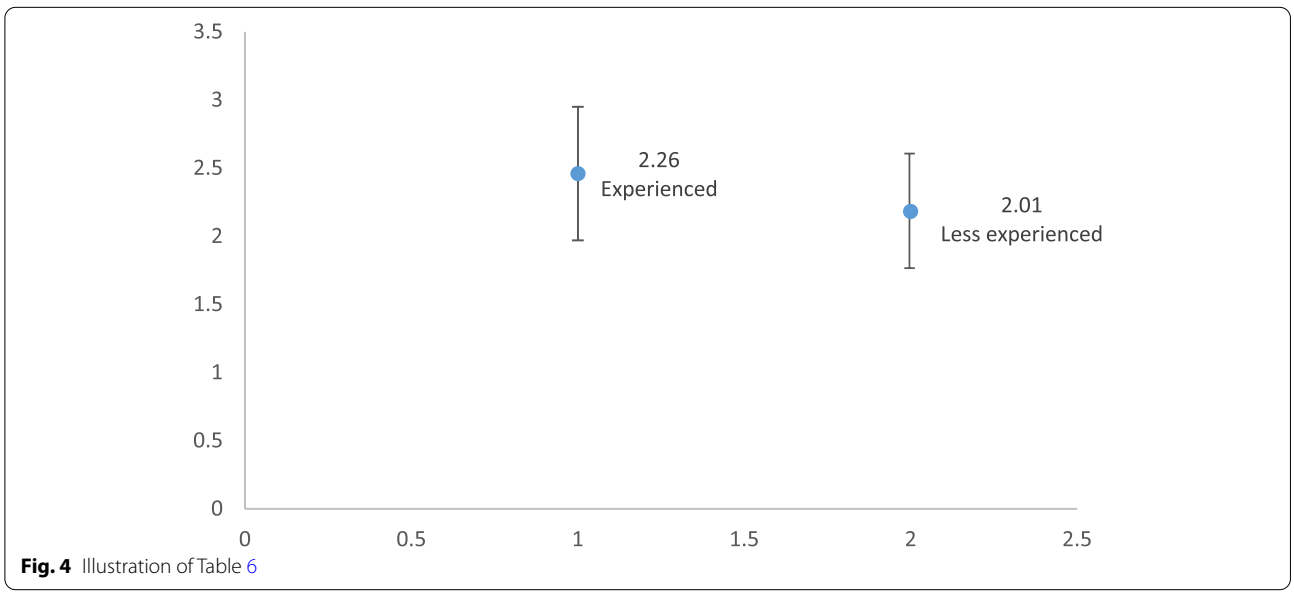

Fig. 4 Illustration of Table 6

experience that enriches their lives despite their background. Chinese universities, except those privately owned, are mainly public institutions owned and funded by the MOE. The tuition fees of students are also subsidized by the government making the responsibility of regulating the universities the sole responsibility of the

government. As a result of these two facts, higher education admission in the UK is highly competitive and students have the freedom to apply to any university of their choice provided they can afford the tuition fees and meet the standard.

The UK universities, on their part, are always striving to attract the best staff that will enable them to attract the right students. Chinese universities are a major destination in Asia for international students, because of their world-class standards teaching and learning practices.

The duties of UKPSF are mainly to set standards and framework with which the UKRI and OfS can access the impact of the universities on teaching and learning thereby making the universities to strive for quality. The MOE and HEEC take it a step further and take measures to ensure compliance with these standards by conducting regular evaluation exercises of the quality of the higher education.

Discussion & recommendation

In answer to the first research question, deans were found to be are aware of the need for quality assurance in the school setting. Although the mean score numerically crossed the cut-off mark for decision, it means there is a lot to do in terms of awareness of QA in schools so that service delivery will be seamless. The corresponding null hypothesis indicated a significant difference, meaning that experience influenced their levels of awareness in this regard. In answer to the second research question, university deans seemed not to be aware of the need for quality assurance in school discipline. A significant difference was also found in their cognizance in this regard. As such teachers and curriculum implementers in the school settings might keep meting out corporal punishment on learners without thinking if the psyche of the student is affected positively or not, and which might lead to a steeling effect on the students. The third research question led to the finding that deans are not cognizant of non-violent discipline control strategies that sustain quality assurance in schools, and the corresponding null hypothesis was rejected due to significant differences in this regard based on experience.

For effective quality assurance in Chinese public universities, the following are recommended:

- More pressure should be applied to Chinese HEIs to publish their activities in order to measure the achievement of their objectives.
- Internal quality assurance can be ensured by conducting sessions to collect anonymous students' feedback and surveys to discover staff with best practices and reward them. The benefits would encourage staff to be professional.
- Quality management of HEIs should take a learning-oriented approach.
- Universities would fare better and have better quality management if it had the capacity to manage its knowledge reservoir. In this way, the process of quality generation would be optimized.
- Teachers and students should be more involved in quality management and should participate more in the quality development of learning and teaching.
- The quality assurance of HEIs needs to emphasize more on self-evaluation and regulation.

Conclusion

Quality assurance is an integral and essential part of university systems and should be encouraged. The quality assurance of Chinese universities is a vital issue of international significance. A proper management of QA can result in improvements in the international reputation of the educational system. This paper referenced some of the difficulties encountered in the implementation of Quality Assurance. Some of the solutions recommended include participation of more teachers and students in quality management, more emphasis of HEI quality assurance on self-regulation and a learning-oriented approach and conducting sessions to collect anonymous feedback from students to reward staff with best practices. Some of the Quality Assurances practices/models adopted in Chinese Universities were discussed. It was also observed that a good number of the measures are backed by laws and decrees. The study concluded that the findings still need to be improved greatly and urged governments and other relevant bodies to heed the recommendations.

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Authors' contributions
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The supporting data can be provided on request.

Declarations

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The research has consent for Ethical Approval and Consent to participate.

Consent for publication
Consent has been granted by all authors and there is no conflict.

Competing interests
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