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Research Article

Development of Certification System for Engineering Faculties in India

Anilkumar E. N.[†*], Vishnu C. R.[‡] and B. Anil[§]

[†]LBS Institute of Technology for Women, Trivandrum, Kerala, India
[‡]Department of Mechanical Engineering, National Institute of Technology Calicut, Kerala, India
[§]Government Engineering College, Barton Hill, Trivandrum, Kerala, India

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Abstract

With the increase in number of engineering colleges in India there is huge public uproar that the quality of engineering education has gone down in the past decade. The affiliated University system, outdated curricula, inadequate academic infrastructure, shortage of qualified teachers, poor teaching/learning process, lack of innovative and creative activities, obsolete evaluation system, absence of proper academic ambiance and non-participative and bureaucratic governance mechanism have all contributed in different degrees to the lowering standard of the educational offerings of a large proportions of the engineering colleges of the country. Among these different factors one main problem is the lack of enough number of trained qualified teachers in these colleges. For improving quality of engineering educational offerings, a large scale training and certification of the existing engineering teachers need to be taken up urgently. This paper makes a comparative study of different accreditation and certification systems and develops an accreditation of the personnel certification bodies along with national level personnel certification system for engineering college teachers in Indian scenario. This is done by conducting a delphi survey among educational and scientific experts across the nation.

Keywords: *Engineering education, Teacher certification, Delphi method.*

1. Introduction

Certification means a certificate that attests to the fact that an individual is qualified and thus authorized to do their work in the respective areas (Penny, 2003). Certification is a simple concept: it is a written testimony that a person has the necessary qualifications to perform the functions that he or she was certified to do. However, the process of determining and obtaining the required qualifications can be complex. A person can be certified in one process or several, and there are many levels and processes where certification can be obtained. Certification can be broadly applied or limited to certain tasks. Employers and individuals can obtain certification based on the qualification services, which can be obtained through a recognized certification agency (European Accreditation of Certification).

While there are a large number of quality assurance and quality management systems available in commerce and industry, accreditation of educational program offerings by independent agencies is recommended as the most valuable tool for quality monitoring and certification in the educational system. In India the University Grants Commission (UGC), All India Council for Technical Education (AICTE) and Association Indian Universities performed the major co-ordination role for ensuring equivalence of similar University degrees awarded by different universities in India and abroad. Two autonomous bodies NAAC (National Accreditation and Assessment Council) and NBA (National Board of Accreditation) were established to accredit programs in general higher education and engineering education respectively. The main difference between NAAC and NBA accreditation is that NAAC is institution based certifying all programs for institutions/Universities while NBA accredits individual program offerings of an institution.

More than ever before in our nation's history, education is the way, not only to economic success but to basic survival. Hence the Indian classroom requires teachers with high levels of knowledge and a broad range of skills. Teacher expertise—what teachers know and can do—affects all the core tasks of teaching. Their skill in assessing their students progress also depends on how deeply they understand learning, and how well they can interpret students discussions and written work. No other intervention can make the difference that a knowledgeable, skillful teacher can make in the learning process (Biswas *et al*, 2010).

*Corresponding author **Anilkumar E. N.** is working as Assistant Professor , **Vishnu C. R.** is a Research Scholar and **B. Anil** is working as Principal

Teacher expertise is one of the most important factors in determining student achievement. That is, teachers who know a lot about teaching and learning and who work in environments that allow them to know students well are the critical elements of successful learning. Teacher knowledge of subject matter, student learning and development, and teaching methods are all important elements of teacher effectiveness in a class room (Chia-Chien and Sanford 2007). Hence the concept of certification of teachers will provide an opportunity to ensure quality of the service provided in the education sector (Berk *et al*, 2004)

Even though there is accreditation and certification systems available for institutions and programs there is no such system available for engineering college teachers to ensure the quality of teaching offered by these institutions. Hence this paper develops and proposes an accreditation and certification system for teachers in engineering colleges across India.

2. Accreditation & Accreditation bodies in India

Accreditation is both a status and a process. As a status, accreditation provides public notification that an institution or program meets standards of quality set forth by an accrediting agency. As a process, accreditation reflects the fact that in achieving recognition by the accrediting agency, the institution or program is committed to self-study and external review by one's peers in seeking not only to meet standards but to continuously seek ways in which to enhance the quality of education and training provided.

2.1 The National Assessment and Accreditation Council (NAAC)

NAAC's process of assessment is towards holistic, systematic, objective, database, transparent and shared experience for institutional improvement (Michael Brody, John W. Fisher, Jr. 2010). NAAC has formulated a three-stage process for assessment and accreditation as given below:

i)The First-Step: 'Institutional Eligibility for Quality Assessment (IEQA): In the first step of Assessment and Accreditation, Institutional Eligibility for Quality Assessment (IEQA) is required to be obtained by an applicant institution at the beginning, while it is still in the planning stage for assessment. The benefits of this step for an applicant institution are:

- To get recognized as eligible to apply for the second step comprehensive Assessment and Accreditation process;
- To get feedback from NAAC if it does not qualify in the first step, about specific improvements to be made for reaching the required quality level.
- To receive assistance and suitable mentoring from NAAC in the latter case, for enabling it to qualify for IEQA in due course of time.

ii)Preparation of the Self-Study Report by the institution, its submission to NAAC and in-house analysis of the report by NAAC.

iii)Peer Team Visit to the institution for validation of the Self-Study Report followed by presentation of a comprehensive assessment report to the institution. Grading, Certification and Accreditation based on the evaluation report by the peer team.

2.2 National Board of Accreditation (NBA)

In India, technical education is imparted at various levels such as: craftsmanship, diploma, degree, post-graduate and research in specialized fields, catering to various aspects of technological development and economic progress. The beginning of formal Technical Education in India can be dated back to the mid 19 th Century. NBA accreditation is a process of quality assurance, giving credit where it is due for some clearly visible and demonstrable strategies of academic activities and objectives of the institutions, known to be honestly pursued and efficiently achieved by the resources currently available with a potential for continuous improvement in quality for effective growth. The goal of the NBA is to develop a Quality Conscious system of Technical Education where excellence, relevance to market needs and participation by all stake holders are prime the major determinants. NBA provides the Quality benchmarks targeted at Global and National Stockpile of human capital in all fields of technical education.

Accreditation process of NBA

- The Institutions who wish to accredit their programmes should submit the information and data in the Performa provided.
- The NBA will identify the Chairperson and the Members of the Visiting Team with regard to the Accreditation of a Programme.
- Team will visit the Institute and conduct discussions with the management, principal, faculty, supporting staff, students and other stakeholders to assess the performance.
- Within two weeks of its visit, the Visiting Team submits a Report giving the facts, observations, assessment, conclusions draw and recommendations to the concerned Sectorial Committee.
- The Report covers all observations and conclusion relating to the Institution's commitment to its goals, objectives and contents of the curricula, faculty and students, administration, financial position and other relevant factor affecting Accreditation.
- After considering the report of the visiting team and the Sectorial committee observations, NBA will announce whether the programme has been accredited or not (Zimmerman and Zumbo, 1993)
- Maximum period of accreditation will be 5 years
- Accreditation based on 1000 point scale
- Program scoring 750 or more (and meets qualifying criteria) accredited for 5 years.
- Programs given 'Provisionally Accredited' status for two years in case of scoring less than 750 and higher than 600 and with weaknesses that could be overcome.

- Program scoring less than 600 not accredited.

3. Development of a Teacher Certification System

To improve the quality of teaching one method that can be implemented is the teacher certification. The teacher certification should be performance-based i.e., they describe what teachers should know and be able to do rather than listing courses that teachers should take in order to be awarded a license. This performance-based standard-setting is intended to be developed in the teacher certification programme (Bill 2003).

This approach should clarify what are the criteria for assessment and licensing, placing more emphasis on the abilities teachers develop than the hours they spend taking classes. Ultimately, performance based licensing standards will enable the states to permit greater innovation and diversity in teacher certification programs (Ahmet, 2008). The standards were developed in response to the following major propositions like: (1)Teacher's commitment to students and their learning, (2)Teacher's ability to know the subjects they teach and how to teach those subjects to diverse learners, (3)Teacher's ability to use innovative teaching methodologies and (4)Teacher's responsibility for managing and monitoring student learning.

The quantitative and qualitative analysis of these factors shall assist in framing the logical, relevant policies and strategic planning of the technical institutions. According to the study conducted by Sabu et al. (2008) some of the important areas to be considered for the certification programme are (1)Teaching Effectiveness, (2)Interaction with students, (3) Interaction with industry and society, (4)Extra Curricular Activities, (5)Research and Development and (6)Administrative ability etc.

To improve the teacher quality a certification programme will do more impact as it periodically verifies the quality improvement in a specified period of time. Since the teacher certification is a new concept, it is important that the important factors to be considered for certification should be selected by collecting ideas from eminent persons related to the technical education sector. Survey, Interview, polls etc. are the different methods to collect opinions regarding various topics. One method which is used frequently is the Delphi survey where a series of questionnaires are used to collect data from a panel of experts.

This work tries to analyze different factors that have to be considered for teacher certification system and hence develop a certification procedure and certification body. In order to evolve consensus about the basic factors to be considered for certification, a Delphi study was conducted among the experts from different fields of educational and industrial sectors within and outside Kerala.

3.1 Research Methodology

The Delphi research methodology is a systematic approach to the collection of expert opinion on a specific topic. It is based on the premise that pooled intelligence enhances professional judgment and captures the collective knowledge of experts. The Delphi research methodology is appropriate for eliciting informed judgment and expert consensus on a specific issue. The popularity of the Delphi research approach is based on the fact that the process allows the anonymous inclusion of a large number of individuals across diverse locations and expertise and defuses a situation where any expert might dominate the consensus process (Brody and Fisher, 2010)

The application of Delphi to the identification and assessment of the teacher qualities posed a severe challenge. Before launching into a discussion of this Delphi application it is worth to consider the advantages offered by this technique for this application. Since the study was conducted with questionnaires transmitted through mails, it permitted many widely separated people to participate without the difficulty of having them travel to be co-located at any specific time and at any specific place. It permitted the group to focus on what they regarded as most important and to very quickly discuss only those prospects in detail. Furthermore, because anonymity was employed, each participant was forced to judge the potential of each possibility on the basis of his/her knowledge.

3.2 Sample Selection

This study used individuals who have knowledge of the topic and problems being addressed. This type of sample is purposeful and is sometimes referred to as a 'panel of informed individuals' or 'experts' (BRC004). These Delphi survey respondents were not chosen randomly but were carefully selected from all sectors including government, industry, universities and different engineering colleges within India. Around 150 names were chosen for the initial Delphi round. The questionnaires were send to these experts via mails.

3.3 Survey Response Rate

A total of 150 experts were involved with the first round of Delphi survey and round two had 107 participants. Overall response rate was good. Fig.1 shows state wise percentage of participation of the respondents.

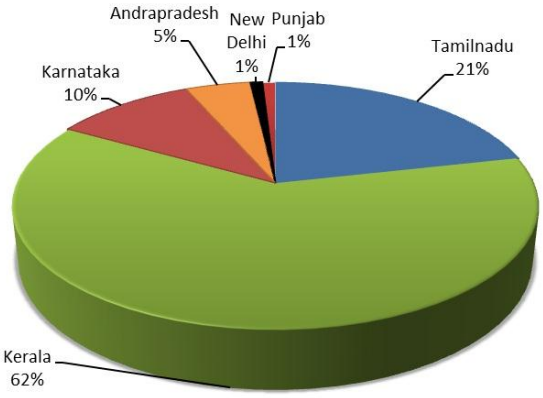

Fig.1 State wise percentage of participants

3.4 Survey Results

Through two iterated survey rounds, participants were asked a series of questions in order to determine areas of agreement, identify group disagreement, facilitate reconciliation, and finally reach consensus.

3.4.1 Round One

Round one was divided into two sections. The first section was about personal details of the respondent and the second section was the actual questionnaire (see Appendix B). Round One questions asked the participants their opinions regarding the necessity of personnel certification in technical education sector . Many participants provided useful suggestions for developing a certification system in India.

Analysis of the first round results

1. 74 % of the respondents believe that personnel certification is needed in Indian technical education sector.
2. 73% of the respondent's agree that the personnel certification will result in the improvement in the quality of education sector.
3. 58% respondents believe that certification enhances professionalism of educators.
4. 58% respondents believe that personnel certification should be made mandatory in India.

As the standard deviation was minimum for the round one, the consensus was reached regarding the necessity of personnel certification and hence the round two questionnaires were prepared.

3.4.2 Round Two

Based on responses from Round One, Round Two consisted of 14 sets of statements. The statement rankings and comments were then reviewed. Round two questions asked the participants their opinions on how to implement the teacher certification system effectively, the factors to be considered for certification and the structure of the certification body.

Analysis of the Second round results

1. 84%of the respondents believe that the certification body should function like the AICTE.
2. 94% of the respondents believe that the personnel certification body should be under the control of the government..
3. 24 % of the respondents believe that the certificate renewal of a teacher who got certification for two consecutive periods can be made after 5 years.
4. 86 % believe that a probationary certificate can be issued to a teacher who is under probation period.
5. 81% believe that the teacher certification should be based on their educational qualification.
6. 78 % respondents believe that there should be a written test and interview to evaluate teachers to certify them.
7. 79% believe that grading system is necessary.
8. 2% of the respondents believe that personnel certification of the teachers should consider the Current performance indicators (Co-curricular and Professional activities etc).
9. 40% of the respondents believe that personnel certification of the teachers should consider the publications and conferences attended by the applicant.
10. 76% believes that publications and conferences should be given weightage.

Hence to ensure the quality of the services provided in the engineering education sector and to standardize it a certification cum accreditation system will be helpful. If an authorized agency is set up to help all participating teachers to assess their performance vis-a-vis set parameters then that rating agency for teacher excellence across India, will be country's first such effort.

3.5 Reliability Checking

Reliability can be expressed in terms of stability, equivalence, and consistency. Consistency check is commonly expressed in the form of Cronbach Coefficient Alpha (Cronbach, 1951), is a popular method. Unlike test retest for stability and alternate form for equivalence, only a single test is needed for estimating internal consistency. One could compute Cronbach Coefficient Alpha, Kuder Richardson (KR) Formula, or Spilt-half Reliability Coefficient to examine internal consistency within a single test (Sabu *et al*, 2008) Cronbach Alpha is recommended over the other two for the following reasons:

1. Cronbach Alpha can be used for both binary-type and large-scale data. On the other hand, KR can be applied to dichotomously scored data only.
2. Spilt-half can be viewed as a one-test equivalent to alternate form and test-retest, which use two tests. In spilt half, you treat one single test as two tests by dividing the items into two subsets. Reliability is estimated by computing the correlation between the two subsets. The drawback is that the outcome is affected by how you group the items. Therefore, the reliability coefficient may vary from group to group. On the other hand, Cronbach Alpha is the mean of all possible spilt-half coefficients that are computed by the Rulon method (Streiner, 2003)

Alpha is an important concept in the evaluation of assessments and questionnaires. It is mandatory that assessors and researchers should estimate this quantity to add validity and accuracy to the interpretation of their data. Nevertheless alpha has frequently been reported in an uncritical way and without adequate understanding and interpretation. In this work IBM SPSS (Statistical Package for the Social Sciences) software is used for calculating Cronbach alpha. By evaluating the alpha it is found that the alpha

value for the questionnaire is between the limit 0.75-0.85. Hence the reliability of the test is proved (Blalock, 1970).

3.6 Conclusions

The Delphi surveys have successfully combined expert information and reached consensus regarding the need for implementing the personnel certification system in technical education sector. The survey has proven useful for reconciling disparate viewpoints and coalescing perspectives from geographically dispersed respondents. Results of this comprehensive survey inform the development of a certification programme to assist professionals throughout the nation. The survey has allowed engaged scientists, educators and other professionals in a broad and thoughtful dialog about how resources may be shared, reconcile differing institutional agendas, and develop networks from a common platform of commitment for the certification programme.

4. Certification System

Based upon the information earned through Delphi survey and analysis of different available teacher certifications a national level certification system is developed. The factors that have to be considered for the teacher certification, which has been arrived through Delphi survey, are classified as two criterions: Mandatory Criterion and Non Mandatory Criterion.

4.1 Mandatory Criterion (600 Mark)

- Basic Qualification -200 Marks
- Higher level qualifications -100 Marks
- General Engineering knowledge -100 Marks
- Teaching skill -100 Marks
- Journal and conference publications -100 Marks

The evaluation guidelines for the above mentioned mandatory criterion is given in table 1.

4.2 Non Mandatory Criterion (400 Marks)

- Teaching experience -100 Marks
- Research & Consultancy -100 Marks
- Academic Activities -75 marks
- Co-curricular activities -25 Marks
- Professional activities -25 Marks
- Industrial experience -25 Marks
- Continuing education -25 Marks
- Other higher qualifications -25 Marks

The evaluation guidelines for the above mentioned non mandatory criterion is given in the table 2.

5. Certification Procedure

- Receipt of application
- Scrutiny of application (Preliminary stage)

Scrutiny of the applications is done based on the mandatory criterion. The candidate should have a minimum of 150 marks for basic qualification to be eligible for the written test and interview. Candidates who do not satisfy the above criteria are eliminated.

- Written test and interview (Intermediate stage)

The candidates who have a minimum of 150 marks during preliminary screening will be called for the written test. The written test is an objective type online test and is designed to evaluate the general awareness and engineering knowledge of the applicant. The test will consist of 100 questions each question will carry 1 marks and duration of the test is 90minutes. The candidate should secure a minimum of 40 marks to qualify for the interview. Every certification body has to have a question bank which consists of a minimum 10000 questions from which randomly questions are selected to conduct the test. The interview session is the most important phase of this certification system. In this stage the overall teaching skill, communication skill etc. are evaluated. The following important factors are considered for awarding marks subjected to a maximum of 100 and a minimum of 60: Presentation skill, Communication skill, ability to clear doubts, and knowledge of innovative teaching methods. Every interview session is vide recorded and is kept as a record for verification in case if any disputes that may arise in future. The candidate should secure a minimum of 100 marks in this test cum interview session if they have a minimum of 50 marks for publications. If the applicant is not having any publications, he/she have to get a minimum of 150 marks in this test cum interview session.

- Certification (Final Stage)

The candidate should secure a minimum of 300 marks out of 1000 marks to be eligible for the certification. Based upon the marks secured the following grades are awarded: A, B, C& D. Certificates shall be issued within 30 calendar days after the audit date. The certificate must be in English. The letter grade for the certification is shown in table 3.

- Surveillance

Surveillance is the periodic monitoring, between the periods of certification, of a certified person's performance to ensure continued compliance with the certification scheme. Once certification has been granted, any additional significant achievement, which are required to be included in the scope of certification, must be communicated to the Certification Body who shall conduct a verification to examine the aspects of the required extension to scope. The current certificate will be superseded by any new certificate. Surveillance is done once in a year.

Table 1 Evaluation guidelines for Mandatory Criterion

S.No.	Item Description	Points	Evaluation Guidelines
1	Basic qualifications	200	• First Class Master's Degree in the appropriate branch of engineering with 60- < 75% OR 6- <7.5 CGPA – 150 Marks.
			• First Class Masters Degree in the appropriate branch of Engineering with ≥75 % OR ≥7.5 CGPA – 200 Marks.
2	Higher qualifications	100	• PhD in appropriate branch of engineering /technology – 75 marks.
			• Post-doctoral - 25 marks
3	General Knowledge & Engineering awareness test (written test)	100	• An objective test for general knowledge and general engineering/ technology awareness.
			•The objective test will consist of 100 questions out of which 25 on general knowledge and 75 on general engineering awareness.
			• Each question will carry 1 mark and duration of the test is 90 minutes.
			• A cut-off mark of 40 is fixed.
4	Teaching skill (interview)	100	Mark division Presentation skill (25), Communication skill (25), Ability to clear doubts (25), Innovative teaching methods (25). a minimum of 60 is required
5	Publications	100	• Conferences: i) International :05 marks per conference
			ii) National : 03 marks per conference
			• Journals: i) International : 10 marks per publication
			ii) National : 05 Marks per publication
			• Text Book Chapters: 10 Marks.
			* For the last 3 years is considered.

- Suspension and withdrawal

The Certificate can be suspended to the following reasons:

- Result of surveillance audit.
- Non-elimination of serious nonconformities within agreed term (max 60 days) discovered during surveillance audit.
- Non-allowance of surveillance audit performance within the term according to Certification Agreement.
- Misuse of Certificate or certification mark
- Non-performance of any obligation against CB – not even within 30 days after the fulfilling term.

A certified person has no right to use the Certificate and certification mark or to refer to certification during Certificate suspending. Maximum term for Certificate suspending is 60 days. If the reason for Certificate suspending continues also after the expiry of mentioned term, Certification Body is obligatory to withdraw the Certificate indefinitely.

Recertification

- Recertification

Re-certification is a process of confirming conformity with current certification requirements. A separate application form along with necessary documents may be submitted for recertification (See Appendix F). The recertification period for various grades is given below:

A grade- After 5 Years
B grade- After 3 Years
C grade- After 2 Years

Recertification for further periods may be effected 6 months prior to & not later than 6 months after the date of expiry of the previous certification. Assessment examination is not applicable to the applicants seeking renewal of certification. Such applicants shall be assessed for:

(a) Self-Appraisal giving details of professional activities during the period of the last certification in around 300 words.
(b) Time spent in activities related to Continuing Professional Development (CPD) in the profession. The applicants shall be assessed in the interview by the concerned certification body on the basis of the criteria at the time of renewal of certification.

For the recertification of a certified faculty he/she has to submit an application with a self-appraisal report. Recertification for further periods may be effected 6

months prior to & not later than 6 months after the date of expiry of the previous certification. If an applicant is not submitted the application for the recertification within the above mentioned period, he /she have to apply for the new certification process.

The various factors considered for the recertification process is as given below.

- Higher level qualifications -100 Marks
- Teaching skill -100 Marks
- Conferences & Publications -100 Marks
- Teaching experience -100 Marks
- Research & Consultancy -100 Marks
- Academic Activities -100 marks
- Co-curricular activities -25 Marks
- Professional activities -25 Marks
- Continuing education -25 Marks
- Other higher qualifications -25 Marks.

6. Certification body

Based on the consensus reached from the Delphi survey a national accreditation body similar to AICTE for teacher certification has been developed. Certification bodies that are part of government, or are government departments, will be deemed to be legal entities on the basis of their governmental status. Since preference is given to government engineering colleges the legal status is thus obtained. Such body's status and structure shall be formally documented and the bodies shall comply with all the requirements of the accreditation body. Certification body should not allow commercial or other considerations to influence the confidentiality, objectivity or impartiality of the certification process.

The certification body may be a top premier engineering college coming under the state government which also functions as the nodal centre. The preliminary and the final stages of certification are

Table 2 Evaluation guidelines for Non Mandatory Criterion

S.No	Item Description	Points	Evaluation Guidelines
1	Teaching experience	100	• A minimum of 1 year teaching experience is required for awarding marks for teaching experience. • For the experience in teaching at PG level, 15marks per year • For the experience in teaching at degree level, 10marks per year • For diploma/lower level technical course - and 5mark per year (Mark can be awarded subjected to a maximum of 100 marks.)
2	R & D projects and consultancy work	100	A faculty member gets at marks depending upon the amount of externally funded R & D project and/or consultancy work subjected to a maximum of 100. For multiple faculty members involved in a single project, every faculty member will earn the points, depending on the funding agency as given below: • 25 points for >10 lakhs, • 10 points for ≥5 lakhs and < 10 lakhs • 3 points for ≥1 lakhs and < 5 lakhs • 1 points for <1 lakhs.
3	Academic Activities	75	• Project/ Thesis guidance, Seminar Guidance, Conduct of Courses, Services rendered to other departments - 5marks per batch/course or course in a semester. • Publication of text books - 10 marks per publication. • Awards won for academic excellence - For each award 10 marks can be awarded • Social service activities, Professional society activities etc - For each service 5 marks can be awarded.
4	Co-curricular activities	25	Assessment : 5 points for each item staff advisor, Coordinator of NSS/NCC, Nature club, Entrepreneurship Development Cell, Career Guidance and Placement Cell etc.
5	Professional activities	25	Assessment : 1 point for each item subjected to a maximum of 25 • Professional societies/ chapters and organizing engineering events, • Organization of paper contests, design contests etc. • Publication of technical magazines, newsletters etc., • Entrepreneurship initiatives, product designs, innovations. • Publications and awards in inter college events.
6	Industrial experience	25	For awarding mark for industrial experience a minimum period of 1year is required. After one year, 5 marks can be awarded per year subject to a maximum of 25.
7	Continuing education	25	Points are awarded in proportion to participation in continuing education programs to gain and/or disseminate their knowledge in their areas of expertise by contributing to course modules and conducting and attending short-term courses and workshops. 2 point for each program subjected to a maximum of 25 points.
8	Other higher qualifications	25	Depending upon the relevance of the other educational qualifications of the applicant 5 marks per other qualification can be awarded subjected to a maximum of 25

carried out by the nodal centre. The intermediate stage of certification is carried out at various regional centers, which may be the top government engineering college of the region. The certification body should be able to demonstrate to the accreditation body that it has evaluated applicable regulatory and statutory compliance and that action has been taken in cases of non-compliance with relevant regulations and statutory requirements. The certification body might have a specific procedure for the certification, recertification, and cancellation and for the withdrawal of the certificate.

The certification body should work under a Director for certification, who should be appointed by the government and there should be enough number of experts for different disciplines throughout the nation. The director is responsible for the management of National Accreditation body standards and for communication with the body. An organizational chart shall be available which identifies the key roles in relationship to the management of the National Accreditation body Standards. The CB should ensure that all the faculties in the engineering colleges are certified. The CB has the authority to take necessary actions if rules are violated.

6.1 Structure of certification body

The documented structure of the certification body has built into it provision for the participation of all the significantly concerned parties in the different sectors in which it operates, including the consideration of public interest. This should normally be through some kind of committee.

If the decision to issue, withhold or withdraw certification is taken by a committee comprising, among others, representatives with a vested interest in the person subject for decision, the operational procedures of the certification body should ensure that these representatives declare a conflict of interest and do not participate in the certification decision.

The certification body has to be responsible for all certification decisions. Any appeal procedure should therefore be within the control of the certification body, but any appeal panel or committee shall be independent in their recommendations except as required by international or national law.

The recommended structure for certification is as given below: Every certification body consists of three committees:

i) Certification Committee
ii) Evaluation Committee and
iii) Scrutiny Committee.

The certification committee consists of the Director and Asst. director of the certification body while the evaluation committee consists of a Chairman, Vice chairmen from different departments and the auditors of different streams.

Based upon the reports of the scrutiny and evaluation committee the certification committee will take a final decision about the certification of an applicant and this decision is communicated to the NABTC for the final approval. Once the approval is obtained the Director of the certification body can issue the certificate within the stipulated time directed by the NABTC. The director of the certification body can be an eminent academician in the cadre of Principal of the Government engineering college of the state while the asst. director post can be filled from academic dean cadre of the state government service.

The evaluation committee Chairman can be an efficient academician in Head of the Department cadre while the Vice Chairman post is filled from professor cadre of the different department. The auditor is selected from the Associate Professor post who has obtained A grade at least once. The scrutiny committee is selected from eminent academic administrative staff of the directorate of technical education.

Conclusions

Teaching is simply not a process that consists of application of codified techniques and principles that can be developed in the laboratory or learned in the university class. The critical skills are acquired through experience. In other words, the question is not whether there is a set of skills or knowledge that teachers need to have to be effective, but how teacher's best acquire them. There is much to learn and know about teaching well, but the acquisition of this knowledge through classroom experience cannot be preempted or circumvented. In fact, professional education coursework may have considerable value for enriching the professional development of practicing teachers. Personnel certification is a new concept to enhance the quality of teaching offered by the technical institutions in India. In this thesis work such a certification system have been developed. To develop this system various national and international certifications and various accreditation systems have been studied. By using the Delphi technique the viability of the personnel certification have been analysed and based on the survey results a certification cum accreditation system is developed.

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