

# Brainstorming and Fishbone diagram Tools for Enhancing the Student Placement in Technical Education System

Manjunath Patel G C<sup>1\*</sup>, Likewin Thomas<sup>2</sup>, Mujeebur Rehaman<sup>1</sup>, Praveena R<sup>1</sup>

<sup>1</sup>Department of Mechanical Engineering, PES Institute of Technology and Management, Shivamogga, Visvesvaraya Technological University, Belagavi, India

<sup>2</sup>Department of Artificial Intelligence and Machine Learning, PES Institute of Technology and Management, Shivamogga, Visvesvaraya Technological University, Belagavi, India

\*Corresponding Author

DOI: <https://dx.doi.org/10.47772/IJRISS.2024.803101S>

Received: 20 April 2024; Revised: 22 May 2024; Accepted: 27 May 2024; Published: 26 June 2024

## ABSTRACT

Increased engineering colleges and unemployment have raised critical issues of quality for sustaining invisible competition all around the globe. In the olden days, higher education success was truly measured based on the performance (ability to apply knowledge and skills in resolving problems) of graduates in industries, which in turn ranked the colleges. In recent years, campus placement for engineering students has been treated as an institution's responsibility, and the institute, upon successful job placement and average salary offered for the academic year. Since there are many engineering colleges, the reputed companies select to conduct placement drives for those institutes whose courses/programs have been accredited by quality assessment bodies. The accreditation to engineering institutions and their performance are tested for different attributes such as admission, teaching-learning process, infrastructure, curriculum and examination, placement, and career. Placement and carrier could directly or indirectly affect the other qualities and hence their improvement being the major concern to many engineering colleges. Brainstorming technique is first applied to know the possible methods for enhancing placement of students. The fishbone diagram is a standard way of representing in a more structured and precise manner that helps to identify the root causes that affect the graduate outcome, institution's quality, which in turn is the placement of students. The generic framework module is defined for enhancing the placement of students with the help of brainstorming and the fishbone diagram tool.

**Keywords:** Fishbone diagram, brainstorming, placement and carrier, quality assessment

## INTRODUCTION

Higher education is defined in terms of level based on the highest educational qualification gained by undergoing the teaching-learning process in academic institutions (i.e., colleges and universities) (Sharma et al. 2015). Higher education offers multifaceted benefits to individuals and society (Lumby et al. 2016). a) The need of higher education includes the following benefits: personality development (Chickering et al. 1973), such as enhance critical thinking and analytical skills (Mahdi et al. 2020, Bravo et al. 2016), personal growth (Chan et al. 2023), emotional maturity (Kilag et al. 2023), intellectual curiosity (Ramzan et al. 2023), and moral development (Pring 2021), b) improve specific skills and knowledge essential for professional success (Rios et al. 2020, Römgens et al. 2020), c) individual possessing higher education possess higher earning potential (Blundell et al. 2020) leading to greater innovation, productivity and

competitiveness (Indrawati et al. 2021, Barrichello et al. 2020). d) Prepare students to work together with experts across the globe that improve the globalized economy (Ahmad 2020, Olaniran et al. 2008). e) Higher education institutions pose well-equipped state-of-the-art centers for research and innovation facilities (Jolly 2024), resulting in the development of advanced technologies for solving global societal challenges (Giesenbauer et al. 2020, Ahmad 2020). Higher education imparts knowledge and skills to students that could be the inputs towards the professional growth of an individual and industries (Barnett 1992). India stands third, next to China and the United States, as the largest higher education system validated in terms of size and diversity. However, India stands first measured in terms of the number of educational institutions (Agarwal 2006). All India Survey on Higher Education (AISHE) annual report of 2015-16, there are 109.4 lakh students enrolled in Arts and Humanities, 43.8 lakhs in Science, and 42.5 lakhs in Engineering and Technology (Government of India, 2015-2016). Their study also reported a very low percentage of out-turn (conversion of students to graduates) from Engineering and Technology (Shinde et al. 2018). According to AISHE 2021-22, the students enrolled in engineering and technology are 39.04 Lakh from 2610 institutions [<https://aishe.gov.in/aishe/viewDocument.action?documentId=353>]. In addition, the All India Council for Technical Education (AICTE) has granted permission not only to start new engineering colleges but also to increase the sanctioned intake for the different programs of the existing institutions (Kamat and Kttur 2019). This critically raises unemployment and total opportunity cost, which hinders economic growth (Upadhayay and Vrat 2016). Industry feedback given to engineering disciplines that graduates lack in applying the technical skills and knowledge gained to real engineering problems and unemployed graduates always cause loss to the industry, academia, and students (Upadhayay and Vrat, 2016). In view of the above, attention must be paid to quality assessment of the technical education system in making graduates attain the highest skills and knowledge, which in turn makes graduates employable. The present work focussed on attributes to be considered by the institutions that make students/graduates employable.

## METHODOLOGY

Many regulatory bodies and research councils are responsible for ensuring quality in the higher education system in India. The following regulatory bodies are working for quality assessments and accreditation of technical institutes towards higher education are the University Grant Commission (UGC), AICTE, the National Board of Accreditation (NBA), and the National Assessment and Accreditation Council (NAAC) (Sharma et al. 2015). Each regulatory bodies have distinct and common roles and responsibilities in regulating and quality enhancement in higher education (Varghese et al. 2019): a) quality assurance (UGC: general higher education; AICTE: technical education; NAAC: institutional accreditation; NBA: individual program) (Patil et al. 2015, Verma 2016), b) UGC and AICTE set standards and norms for distinguished educational aspects including curriculum, teaching, and infrastructure (Singh, 2022), whereas NAAC and NBA assess compliance against the defined standards via. Accreditation (benchmark institutions and programs against national and international standards) processes (Reddy et al. 2024). c) Funding and development (UGC fund for university development (Paudel et al. 2020), AICTE fund for technical institutions) to promote infrastructure, research, and innovation (Bhardwaj et al. 2022). The accreditation influences the funding decisions made by UGC and AICTE (Kumar et al. 2020). d) All regulatory bodies (NBA, NAAC, UGC, and AICTE) encourage institutions to attain the highest autonomy level that fosters innovation and improvement in teaching and research (Naim et al. 2024, Gupta et al. 2021). e) The regulatory bodies recommend the government that set standards and shape educational policy and practices (Naim et al. 2024). f) All regulatory bodies encourage to adoption of new technologies and pedagogical methods that promote research, innovations in delivering, and assessments of the higher education system (Marks et al. 2022, Arkorful et al. 2015). NBA and NAAC rendered services as expert members towards accreditation for institutes or individual programs, and their opinion is treated as valid. Therefore, accreditation of institutions or programs plays a pivotal role that impacts students' knowledge and skills, leading to enhanced employability.



The fishbone diagram depicts various factors that influence different aspects of an educational institution, influencing graduate quality and institutions. The major causes that influence the quality of technical institutions are discussed below:

### Admissions and its Process

The admission process, entrance exam, and diversity in admissions influence the quality of technical institutions (Zwick, 2019; You et al., 2013; Rosinger et al., 2021). The admission strategies and policies of an educational institution significantly shape its demographic makeup, educational quality, and reputation (Knight, 2008). The strategies suggested by experts for improving quality admissions through brainstorming sessions are explained below:

1. **Branding of the College:** Our effective branding highlights our unique institutional values of academic excellence, cutting-edge research, and a supportive environment (Oakleaf, 2010; Gasman et al., 2014). This strong and positive brand perception attracts prospective students who are a good fit for our institutional culture and values, fostering a sense of belonging and alignment with our institution.
2. **Organizing Career Development Programs:** Career development programs explain institutional support (career counselling, internships, job placement services, and alumni networking events) for shaping career and practical learning environments that attract prospective students and their parents to get quality admissions (Arnold 2018; Beneke 2011). Conducting such programs showcases the institutional role in facilitating successful career paths and preparing students for industry-leading to building assurance and attracting prospective students for admission.
3. **Mutual interaction through visits from school to college and vice versa:** Establishing strong interactive relationships between schools and colleges through mutual visits significantly drives and improves admissions (Felten et al., 2020). It is noteworthy that when school students visit colleges, they get exposed to campus culture, and learning about the academic and social environment could motivate them to apply for admissions (McClafferty et al., 2002; McDonough, 1997). However, when college representatives visit schools, they can directly interact with potential students, answer their queries, and build relationships.
4. **Budget allocation:** Allocating funds towards marketing, student scholarships, facility upgrades, and quality faculty recruitment can enhance the institution's reputation (Beneke et al., 2011; Paradeise et al., 2013). Allocating a budget for branding efforts, career development programs, and outreach initiatives ensures that the college can attract prospective students to apply in large numbers and ensure choice for the institution to select quality students for admission (Springer et al., 2023; Trilokeka et al., 2013; Paradeise et al., 2013).
5. **Stakeholder Engagement (Parents, Industry, and Students):** Engaging various stakeholders is essential in shaping the perceptions and attractiveness of the institution (Miotto et al., 2020; Prell et al., 2010). Addressing actively the parent's concerns and highlighting the institutional strength through information sessions, parent-teacher meetings directly influence their decision about college applications (McDonough, 1997; Hernandez, 2019). Industry-academia collaboration (internships, guest lectures, and research projects) enhances the curriculum with practical insights that demonstrate the commitment towards employability and innovation (Borah et al., 2019; Christiansen et al., 2024). In addition, alumni satisfaction and their success stories serve as powerful testimonials toward the institution's reputation (Strayhorn, 2018; Kuh et al., 2006). Involving alums in councils, feedback surveys, and promotional activities ensures a vibrant and supportive environment that could create a competitive learning environment (Baroncelli et al., 2022).
6. **Feedback Mechanisms:** Collecting regular feedback from current students, alumni, parents, industry experts, employers, and faculty and action taken on feedback continually help institutions in

improving institutional practices and values (PS et al., 2023; Maiya et al., 2023). Implementing a robust feedback-collecting and acting system ensures transparency of institutional values that attract prospective students and parents.

7. **Scholarship Schemes:** Institutions offering scholarships based on merits, need, or specific talents (cultural, sports, arts, and so on) attract diverse applicants and highlight the commitment to support student achievement and ease financial burdens (Giancola et al., 2016; Meara et al., 2007). The said scheme attracts a broader range of students.
8. **Mentoring Schemes:** Well-structured mentoring scheme between students-faculty-senior peers ensure proper guidance and a supportive environment that values personal growth and academic success, making the institution a preferred choice for prospective students (Okolie et al., 2020; Husband et al., 2009).
9. **Institutional Awards:** Recognizing individuals and rewarding them for outstanding achievements (academics, leadership, social service, and so on) fosters a culture that publicizes the institution's commitment to rewarding high performance and attracting ambitious students (Fung et al., 2016; Kok et al., 2017).
10. **Bridge Courses:** Bridge courses attract prospective students admitted from diverse educational backgrounds that promise a smoother transition and support in closing educational gaps (Thiem et al., 2022).

### Teaching-Learning Process:

The graduate outcome is primarily dependent on the quality teaching-learning process. The key parameters that affect the graduate outcome are discussed below,

1. **Curriculum design:** The curriculum design must align with the industry standards and needs and future trends that ensure students acquire the required skills and knowledge to excel in their fields (Nowrozy et al., 2024; González-Pérez et al., 2022).
2. **Pedagogical Strategies:** Innovative teaching modes such as active learning, blended learning, flipped classrooms, project-based learning, and technology-driven learning impact greater learning experience and improve graduate outcomes (Boss et al., 2022; Aithal et al., 2023).
3. **Qualified Faculty:** Recruiting qualified faculty possessing theoretical and practical subject knowledge inspires and motivates students, fostering critical thinking and problem-solving and inculcating innovative ideas among the student community for real-world challenges (Rohm et al., 2019; Madden et al., 2013).
4. **Monitoring the teaching-learning process through attainment mapping:** Student outcomes are measured against predefined objectives and learning goals (Mølsted et al., 2021). Monitoring ensures the teaching-learning process is effective and ensures continuous improvement to meet high educational standards that could directly influence graduates' quality and desired competencies (Hénard et al., 2012; Ferns et al., 2015).
5. **Mapping college academic calendar with the university:** Strictly adhering (timely delivery of course, assessment schedules) to the college with university academic calendar minimizes conflicts and maximizes learning opportunities. Aligning helps smooth the functioning of college operations, reduces administrative disturbances, and improves student satisfaction. A structured academic calendar ensures better planning and effective implementation of curriculum and contributes to educational quality and institution repute.
6. **Partnering Industries for Research and Development:** Industry-academia collaboration ensures that students are exposed to real-world problems and cutting-edge technologies (Kayyali et al., 2024;

Malhotra et al., 2023). Collaboration helps students to engage in research, leading to innovations and enhancing employable and entrepreneurial skills (Borah et al., 2021; Ishengoma et al., 2016).

7. **Expert talks by industry-academia:** Expert talks introduce students to the latest trends (beyond the curriculum that could bridge the gap between theory and practice) and diverse perspectives in specific fields (Berliner, 1994). Conducting such talks ensures active engagement of students with leading professionals towards career progression (Danielson, 2007; Barkley et al., 2020).
8. **Engagement with Professional Bodies:** Institution involvement with professional societies or bodies helps to stay up-to-date with the standards and expectations of industries [Quinn et al. 2009, Churchman et al. 1999]. Professional bodies render networking opportunities, resources, and industry insights that enrich the student learning experience and prepare students for professional careers (Tull et al., 2023).
9. **Faculty-to-Student Ratio:** A lower faculty-to-student ratio (impacts teaching quality, student engagement, and satisfaction) ensures students receive more personalized attention and guidance toward academic and professional progression (Dahri et al., 2024).
10. **Workshops:** Conducting regular workshops or student development programs ensures students acquire hands-on skills and reinforces their learning through practical application (Yelamarthi et al., 2014). The workshops can also be designed, tailored, made equipped with the latest trends to meet desired skills relevant to industry demand and the job market (Ahmad, 2020; Okolie et al., 2020).
11. **Regular Field Visits:** Field or industry visits ensure students are exposed to real-world perspectives (understand insights into industry practices, challenges, and operations) that could map the theoretical knowledge (Morag et al., 2012). In addition, regular interactions with working professionals increase practical insights, ensure overall development, and attract potential employers (Gomez-Lanier, 2017; Samuel et al., 2022).
12. **Assessment and Feedback:** Conducting regular assessments and taking constructive feedback are essential for student learning skill enhancement and remaining competitive in the global market (Clark, 2012; Malik et al., 2018).

The above components provide a robust framework for higher educational institutions to produce high-quality graduates towards industry-ready and improve institutional reputation globally.

## Infrastructure

Institutions possessing state-of-the-art infrastructure (classrooms, laboratories, high-speed internet, online learning platforms, digital libraries, sports complexes, student centers and accommodations, eco-friendly buildings, energy-efficient systems and facilities, advanced technologies, and equipment) directly impact educational and learning outcomes. Thereby attract and retain talented student-faculty community offering high-quality education in preparing graduates to meet the desired skills of global workforce. In addition, memoranda of understanding (MOUs) with industries, research and development centers, in-house industries, start-ups, comprehensive internship programs, digital library and e-resources, on-campus hostel and canteen Facilities, project labs and R&D labs, medical and parking facilities, and seminar hall play a crucial role in enhancing the educational experience, graduate quality and building Institutional repute.

1. **Industry and research and development collaborations:** By establishing R&D centers and fostering industry collaboration, we can ensure that our students are not just learning but actively solving real-world problems using cutting-edge technologies (Prasad et al., 2021; Elmuti et al., 2005). These effective collaborations can open doors for our students, providing them with opportunities for paid internships, project sponsorships, and participation in research that directly caters to industry needs (Saltz et al., 2013). These practices are designed to prepare our students for professional roles and, in turn, attract employers who are eager to tap into our graduates' potential. In-house Industries

and Start-up Incubation: In-house industries established centers of excellence and start-up incubators at campus expose students to apply learning through practical scenarios leading to innovations and enterprise development (Murray, 2019; Shekhar et al., 2023). The above practices boost both problem-solving and entrepreneurial skills among their graduates.

1. **Internships:** Facilitating institutional partnerships and structured internships offer exposure (teamwork, communication, and time management) to a professional environment to ensure graduate success in the workplace (Atkinson, 2016; Henderson et al., 2017).
2. **Digital Library and E-resources:** State-of-art library facilities ensure students are up-to-date with cutting-edge technologies, research, and global development in fields (Chigwada, 2021; Ani, 2021; Moran et al., 2017).
3. **Project Labs:** The dedicated project labs ensure students undergo hands-on experience in a resource-rich environment wherein graduates can test theories and build prototypes (Pawar et al., 2020; Coggan et al., 2022; Wanner et al., 2021).
4. **On-campus Hostel and Canteen Facilities:** Good living (computer, gym, sports area) and dining (cafeteria, food) conditions help attract a broader demographic of students and play a significant role in their overall educational experience and performance (Simpeh et al., 2020; Simpeh et al., 2020).
5. **Medical Facilities** (Patrick, 1988; Sapri et al., 2009): Our on-campus medical facilities are not just about providing immediate healthcare access for emergencies and routine check-ups. They are about ensuring the health and well-being of our students, faculty, and staff, thereby minimizing academic disturbances and supporting graduate success. Institutions with state-of-the-art healthcare facilities and caring and health-related academic programs ensure practical learning opportunities for students in these fields, demonstrating our commitment to their holistic development.
6. **Parking Facilities** (Barata et al., 2011): Well-managed logistics and parking facilities ensure that students, faculty, and visiting professionals reduce daily stress and improve punctuality for classes and events. Efficient logistics and parking solutions play a vital role in the daily experience of campus attendees that will enhance overall satisfaction and engagement with the institution.
7. **Seminar Halls:** The state-of-the-art facilities in the seminar hall, equipped with modern technology and accommodating large audiences serve as vital space to host academic (conferences, workshops, guest lectures, and expert talks) and extracurricular (cultural) activities. The facilities above and activities ensure external participants visit the campus, resulting in networking opportunities among student communities.

The desired infrastructure facilities at the institution significantly impact graduate outcomes and the overall repute of the institution.

## Curriculum and Quality Assessments

Educational Quality assessments play a significant role in judging the quality of graduate outcomes and institutional repute (Materu, 2007; Fernandes et al., 2022). In India, NAAC and NBA are accreditation bodies that do quality assessments against pre-set standards (ensure a baseline of quality) that the institution must meet in order to achieve accreditation status (Gholap et al., 2019). Active involvement of stakeholders (students, alumni, industry and academic experts, parents, and faculty) in designing and reviewing curricula ensures educational courses or programs relevant to technological and industry needs (Aithal et al., 2016; Asiyai, 2015). Curriculum benchmarking with reputed or leading institutes ensures that maintaining curriculum standards is competitive and fosters continual improvement (Tasopoulou et al., 2017; Chawla et al., 2016). The assessment methodology significantly impacts the graduate outcome. The assessment focussed on analytical skills and real-world application problems rather than the traditional memorizing route, ensuring students undergo critical thinking, leading to innovations (Sasson et al., 2018; Luna, 2015). In addition, diverse assessment strategies (oral and poster presentations, written exams, quizzes, practical demonstrations, and theoretical analyses) enhance learning outcomes and prepare students to undergo

diverse challenges in their professional careers (Frejd, 2013). Institutions adopting such methods improve employability skills in the job market.

### Placement and Career Cell

Brainstorming session conducted with experts concluded the following roles, responsibilities and activities to be conducted by the cell for enhancing student's employability and institutional success. a) The cell must establish and maintain a healthy relationship with industry peers, companies, and alumni for expert talks, ensuring the curriculum is aligned with industry needs and recruitment drives. b) Organize workshops, seminars, and training sessions concerning resume writing, interview preparedness, communication skills, and technical proficiencies relevant to the industry. c) Career counseling advisors help students determine their strengths, passions, and career paths. d) Facilitate internships and summer training programs to students who gain hands-on-experience in the field of study. e) Organize job fairs and campus recruitment drives for employers to meet and interview students. f) Placement cells must actively engage alumni for mentorship, advice, and job leads that ensure a supportive network for current students looking for a job search process. g) conduct mock interviews, resume-building sessions, industry-interaction sessions, soft skill sessions, and career workshops to ensure students understand employer expectations, skills required in making more informed career choices.

Placement to engineering students is the primary attention wherein institution ranking is decided, which in turn affects admission in recent times. It is also true that reputed companies do visit campus drives based on the quality assessment and accreditation given by the NBA and NAAC teams. Good placements for students are also influenced by the teaching-learning process, curriculum design with reference to industry needs, and institution facilities (infrastructure) provided for enhancing the knowledge and skills of students. This clearly dictates that the placement and carrier cell directly or indirectly influence the quality of individuals (students) and institutions.

The various attributes of placement and carrier cell influence the student's performance in terms of job offers is discussed below (Scott and Yates, 2002):

**Knowledge and skills:** In general, when a company visits for a campus drive, they normally start with preplacement talks (to introduce the year of establishment of company, their products and services, key persons, employees, and strengths), followed by aptitude tests (subjective and objective, logical reasoning, mathematical, mental ability and so on), group discussions (for knowing communication and thinking ability), face-to-face technical interview and finally human resource (to know personality, strengths, weaknesses, handle the job role, background, and finally to understand the right person who fit for this job). In addition, a few companies also conduct tests to know the capabilities (i.e., personal, interpersonal, intellectual, professional, and generic) of the students. Personal (individual) tests are conducted to know the strengths and limitations, confidence and willingness to take responsibility and risks on new projects, calmness under pressure, sense of humor, and taking hard decisions. Interpersonal (working in a group) skills are tested to know the willingness to listen to different points of view before making a decision, the ability to develop and use the network with colleagues in resolving problems, the ability to work with senior staff and their absence, motivate others, and contribute positively in team-based projects. Intellectual capability is to test the ability to handle the situation for unexpected problems based on previous experience (knowledge gained during the course) and trace out alternate courses of action to resolve problems. Profession skills to know the technical expertise relevant to the industry and the role of risk management when undergoing projects. General skill test to know how effectively information technology is used to communicate and perform key works, ability to manage chair and participate in meetings, presentation skills to clients, help others in the workplace, and organize work with effective time management.

**1. Academic scorecard:** In recent times, the academic score card has been used for preliminary



screening of candidates from many job aspirants. Further, academic scorecards partly tell their knowledge level and consistency.

1. **Awards:** Awards recognize the personal and professional development of a student, which helps to know the true spirit and involvement (either in academics or beyond that).
2. **Value-added course:** Value-addition courses enhance the skills and knowledge of students in a particular field, which are conducted as certification courses in relevance to the industry.
3. **Internships:** Internships generally help to bridge the gap between academics and practices in industry. Internships also help to gain professional experience, and many students receive job offers based on their performance during internships.

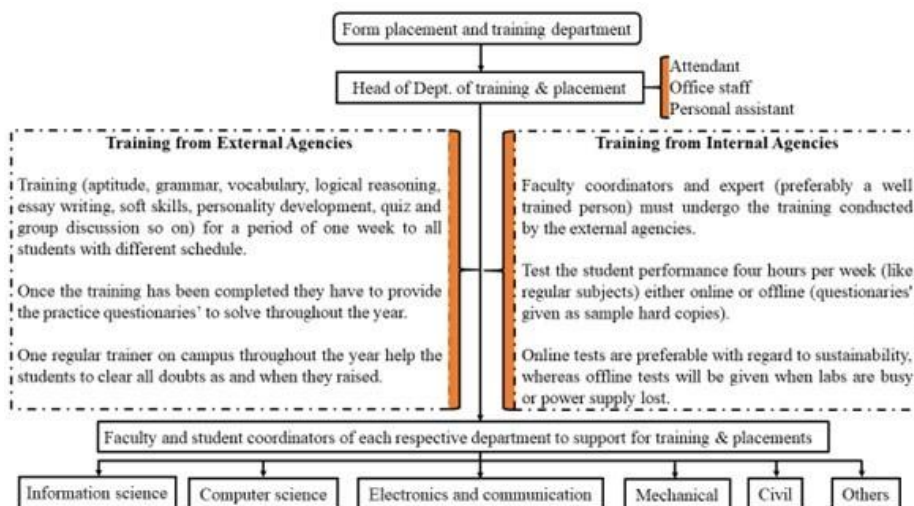
### Framework for enhancing the training and placement with structured cell

The brainstorming session has been conducted to define the detailed framework for enhancing the training and placement of students at an institute level when the employer comes for the recruitment drive. The steps involved in performing the said task are discussed below,

1. Formation of placement and training (including internal and external trainers) cell. The team establishes a well-defined structure and process plan in conducting drives and training, assigning roles and responsibilities to team members. The team must be headed by the placement officer of an institute, followed by each program department faculties (i.e., civil, mechanical, and so on). Separate seat allocation for department faculty representatives must be provided in the placement departments. Each faculty representative must have supporting student coordinators of the same department. The framework model of a whole team (placement head, office staff, attendant, faculty, and student coordinators of different departments) working towards a single goal (i.e., maximize job offers) in a structured path is presented in Fig. 2.
2. The role of the office staff is to prepare eligible and non-eligible student databases for the pre-final year and share the same with placement officers, in turn to the company/industry based on the eligibility criteria defined by the organization. They must also maintain records of tentative and mutually convenient dates for campus drives. After completion of the placement drive, the following documents must be maintained: date and time of campus drive, recruitment team members (include number, name, and designation), place of drive, eligible student list and placed, expenses (airfare, hotel accommodation with place, day allowances, etc.), other college students (if pooled campus drive), date and time of arrival and departure, note to pre-final years and others (if any). Finally, maintain the copy of the reports of faculty coordinators with filled details presented in a format (refer to Appendix 1).
3. The role of the personal assistant is to support the faculty coordinators and placement head in making necessary arrangements with regard to venue, resources, food, water, mike or speakers, transportation, photographs, and others (if any) during the campus drive.
4. The faculty coordinator's responsibility is to file a report as per format and assist the placement team during the drive (refer to Appendix 1). The selection of faculty coordinators is done based on the firm visiting the campus. If an IT firm/company is visiting for a drive, the faculty coordinator must be of either computer science or information technology. The faculty coordinators should assist and be with the team, starting from welcoming them to campus, followed by preplacement talk, technical, group discussions, final human resource rounds, and till they exit the campus. For this to happen, the faculty coordinators must be informed of the schedule five days prior to their drive visits. In addition, the selection of a faculty coordinator for the drive must be based on the minimum class or contact hours to be altered such that regular academic activities need not be disturbed.
5. Faculty coordinators make sure that the student, once attending the campus drive, must complete all stages of the recruitment process. At any instant of time he/she must not leave the middle stage during campus drive. According to an expert (senior campus placement officer) opinion, leaving at the middle stage could result in negative feedback on the college and may put a block list for any future

drives.

6. External agency teams (trainer number depends on the number of students) visit the campus for training with a focus mainly on personal skills (technical, logical reasoning, verbal, non-verbal, communication, personality, group discussion, and so on). Once they have trained for one week of 40-50 hours, they must conduct online tests and assessments for a minimum period of four hours (like regular theory classes). Separate labs with enabled internet facilities help to conduct online tests and make it easier for evaluation. Further, they must also provide the logic involved in solving problems. In addition, hard copies of quaternaries also need to be given when there is an unexpected problem (like loss of power and internet, and computer labs are busy). During the test, faculty coordinators must monitor the attendance and performance and clear doubts as and when raised. Note that recruitment of expert trainers from external agencies to work on college campuses could help to resolve doubts and logically solve problems. The said methods could help to clear the aptitude or written tests, group discussions, and so on.
7. Faculty coordinators of the respective departments must coordinate with the team that came for the campus recruitment drive with a stage starting from welcome, followed by a preplacement talk, written test, group discussion, and technical and final human resource round. The faculty coordinator must give the filled report of the campus drive presented in Appendix 1. The report which includes the product/services (specialists) in which the company is working, number of rounds, group discussion topics, type of questionnaires' (i.e., syllabus) given during the tests, probable area of questions (i.e., either explanation on mini projects, subjects, general, skill and knowledge and so on) raised in the technical round, and finally discussions with human resource rounds. A survey collection of 50-100 students could give detailed insight into the company's requirements. This report could serve as input for pre-final year students with regard to areas of preparation when the same company is visiting the campus for drives next year.
8. Most companies are interested and ask questions based on awards (if any), projects, and internships carried out during the course. Students could easily explain their project with confidence as they are experts. Experience in working with training and placement drives as faculty coordinator, it was suggested to motivate students to do projects and internships that could help to clear technical rounds during placement drives.



**Fig. 2** Generic framework for successful implementation of training and placement

## CONCLUSIONS

Increased sanctioned intakes and approval for new colleges resulted in students' un-employability.

Institution ranking in recent times is decided based on outcome-based education. Accreditation bodies access the quality of technical institutes based on five attributes (main cause), namely admission, teaching-learning process, infrastructure, curriculum, examination placement, and carrier. A fishbone diagram has been drawn to know the various sub-causes and their effect on the performance of the quality of students and the institute. Brainstorming sessions concluded that the placement and career of students could be directly or indirectly affected by the other attributes. The generic framework model has been proposed to enhance the student's placement. Formation of separate placement teams (placement officer, office staff, personal attendant and assistant, faculty and student coordinators) being primary attention. External agency training followed by a series of tests (four hours per week) throughout the semester conducted by faculty coordinators and regular recruitment of external experts on campus could help to clear the doubts and preliminary rounds (i.e., written tests) of campus drive. The survey report done (collection of 50-100 students) by faculty coordinators could help to know the overview of company requirements. In addition, a detailed report that includes company strengths, probable questions (technical, generic, aptitude, logical reasoning, and so on), and major focus areas could help the pre-final year students when the same company is visiting the campus for drives in the next year. Experience in placement and recruitment drives and interaction with students who completed the drive realized that the recruitment team showed keen interest in knowing the student projects, awards received (if any), and internships. Formation of a placement team on campus to assist and support the training and placement drives. Conducting a series of tests (online and offline) throughout the course, motivating students to undergo projects, the inclusion of faculty coordinators in the placement teams, internships, and awards, and maintaining previous survey reports that could help to improve the placement of students.

## REFERENCES

1. Agarwal, P. (2006). Higher Education in India: The Need for Change. ICRIER Working Paper, Indian Council for Research on International Economic Relations, No. 180.
2. Barnett, R. (1992). Improving higher education: Total quality care. Open University Press, 1900 Frost Rd., Suite 101, Bristol, PA 19007.
3. Government of India, Report on all India survey on higher education (2015–16), Ministry of Human Resource Development, Department of Higher Education, New Delhi, 6, 2016, pp. 281
4. Kamat, V, B., & Kittur, J, K. (2019). Devising smart strategic framework for assessment of quality in engineering education. International Journal of System Assurance Engineering and Management, 1-26.
5. Scott, G., & Yates, K,W. (2002). Using successful graduates to improve the quality of undergraduate engineering programmes. European journal of engineering education, 27(4), 363-378.
6. Sharma, S., & Sharma, P. (2015). Indian higher education system: challenges and suggestions. Electronic Journal for Inclusive Education, 3(4), 1-6.
7. Shinde, D, D., Ahirrao, S., & Prasad, R. (2018). Fishbone diagram: application to identify the root causes of student–staff problems in technical education. Wireless personal communications, 100(2), 653-664.
8. Upadhaya, L., & Vrat, P. (2016). Analysis of impact of industry-academia interaction on quality of technical education: A system dynamics approach. Computers & Industrial Engineering, 101, 313-324.
9. Giesenbauer, B., & Müller-Christ, G. (2020). University 4.0: Promoting the transformation of higher education institutions toward sustainable development. Sustainability, 12(8), 3371.
10. Jolly, P. (2024, March). Innovation, Enterprise and Physics Education: Weaving Paradigms for World of Work. In Journal of Physics: Conference Series (Vol. 2727, No. 1, p. 012015). IOP Publishing.
11. Olaniran, B, A., & Agnello, M, F. (2008). Globalization, educational hegemony, and higher education. Multicultural Education & Technology Journal, 2(2), 68-86.
12. Ahmad, T. (2020). Scenario based approach to re-imagining future of higher education which prepares students for the future of work. Higher Education, Skills and Work-Based Learning, 10(1), 217-238.

13. Indrawati, S, M., & Kuncoro, A. (2021). Improving competitiveness through vocational and higher education: Indonesia's vision for human capital development in 2019–2024. *Bulletin of Indonesian Economic Studies*, 57(1), 29-59.
14. Barrichello, A., Morano, R, S., Feldmann, P, R., & Jacomossi, R, R. (2020). The importance of education in the context of innovation and competitiveness of nations. *International Journal of Education Economics and Development*, 11(2), 204-224.
15. Blundell, R., Costa Dias, M., Joyce, R., & Xu, X. (2020). COVID-19 and Inequalities. *Fiscal studies*, 41(2), 291-319.
16. Römgens, I., Scoupe, R., & Beusaert, S. (2020). Unraveling the concept of employability, bringing together research on employability in higher education and the workplace. *Studies in Higher Education*, 45(12), 2588-2603.
17. Rios, J. A., Ling, G., Pugh, R., Becker, D., & Bacall, A. (2020). Identifying critical 21st-century skills for workplace success: A content analysis of job advertisements. *Educational Researcher*, 49(2), 80-89.
18. Pring, R. (2021). Education as a moral practice. In *The RoutledgeFalmer Reader in the Philosophy of Education* (pp. 195-205). Routledge.
19. Ramzan, M., Javaid, Z. K., & Fatima, M. (2023). Empowering ESL Students: Harnessing the Potential of Social Media to Enhance Academic Motivation in Higher Education. *Global Digital & Print Media Review*, VI, 2, 224-237.
20. Kilag, O, K, T., Evangelista, T, P., Sasan, J, M., Librea, A, M., Zamora, R, M, C., Ymas, S, B., & Alestre, N, A, P. (2023). Promising Practices for a Better Tomorrow: A Qualitative Study of Successful Practices in Senior High School Education. *Journal of Elementary and Secondary School*, 1(1).
21. Lumby, J., & Foskett, N. (2016). Internationalization and culture in higher education. *Educational Management Administration & Leadership*, 44(1), 95-111.
22. Chickering, A, W., & McCormick, J. (1973). Personality development and the college experience. *Research in Higher Education*, 1, 43-70.
23. Mahdi, O, R., Nassar, I, A., & Almuslamani, H, A, I. (2020). The Role of Using Case studies Method in Improving Students' Critical Thinking Skills in Higher Education. *International Journal of Higher Education*, 9(2), 297-308.
24. Bravo, A., Porzecanski, A., Sterling, E., Bynum, N., Cawthorn, M., Fernandez, D. S., & Vogler, D. (2016). Teaching for higher levels of thinking: developing quantitative and analytical skills in environmental science courses. *Ecosphere*, 7(4), e01290.
25. Chan, C, K, Y., & Tsi, L, H. (2023). The AI Revolution in Education: Will AI Replace or Assist Teachers in Higher Education? arXiv preprint arXiv:2305.01185.
26. <https://aishe.gov.in/aishe/viewDocument.action?documentId=353>
27. Gupta, B, L., & Choubey, A, K. (2021). Higher education institutions—some guidelines for obtaining and sustaining autonomy in the context of NEP 2020. *Higher Education*, 9(1).
28. Naim, A., Saklani, A., Khan, S. A., & Malik, P. K. (Eds.). (2024). *Evaluating Global Accreditation Standards for Higher Education*. IGI Global.
29. Kumar, P., Shukla, B., & Passey, D. (2020). Impact of accreditation on quality and excellence of higher education institutions. *Investigación Operacional*, 41(2), 151-167.
30. Bhardwaj, A., & Kumar, V. (2022). Web and social media approach to marketing of engineering courses in India. *International Journal of Business Innovation and Research*, 27(4), 541-555.
31. Paudel, P, K., Giri, B., & Dhakal, S. (2020). Is research in peril in Nepal? Publication trend and research quality from projects funded by the University Grants Commission-Nepal. *Accountability in Research*, 27(7), 444-456.
32. Reddy, J, S., Sharma, R., & Gupta, N. (2024). The accreditation paradigm: a comparative analysis of accreditations for management programmes. *International Journal of Educational Management*, 38(1), 73-95.
33. Singh, P. (2022). Impact of ICT driven QA framework on the institutions of higher learning: India.

- International Journal of Information and Education Technology, 12(3), 225-231.
34. Verma, A. (2016). A review of quality assurance in higher education institutions. *International Journal of Research in Humanities, Arts and Literature (IMPACT: IJRHAL)*, 44(5), 55-66.
  35. Patil, J., & Pillai, L. (2015). Quality assurance in Indian higher education: role of NAAC and future directions. In *India Higher Education Report 2015* (pp. 137-162). Routledge India.
  36. Varghese, N, V., & Malik, G. (2019). Institutional autonomy and governance of higher education institutions in India. In *The governance and management of universities in Asia* (pp. 43-55). Routledge.
  37. Marks, B., & Thomas, J. (2022). Adoption of virtual reality technology in higher education: An evaluation of five teaching semesters in a purpose-designed laboratory. *Education and information technologies*, 27(1), 1287-1305.
  38. Arkorful, V., & Abaidoo, N. (2015). The role of e-learning, advantages and disadvantages of its adoption in higher education. *International journal of instructional technology and distance learning*, 12(1), 29-42.
  39. Frank, J, R., Taber, S., van Zanten, M., Scheele, F., Blouin, D., & International Health Professions Accreditation Outcomes Consortium. (2020). The role of accreditation in 21st century health professions education: report of an International Consensus Group. *BMC medical education*, 20, 1-9.
  40. Gaston, P, L. (2023). Higher education accreditation: How it's changing, why it must. Taylor & Francis.
  41. Fishman, T, T. (2024). US Accreditation and Quality Assurance: Standards and Processes; Issues and Opportunities. In *Second Handbook of Academic Integrity* (pp. 877-892). Cham: Springer Nature Switzerland.
  42. Banerjee, S., & Samaddar, B. (2020). Importance of international accreditation for institutions and the role of private certification bodies. *Asian Journal of Management*, 11(3), 279-284.
  43. Apgar, D. (2022). Linking social work licensure examination pass rates to accreditation: The merits, challenges, and implications for social work education. *Journal of Teaching in Social Work*, 42(4), 335-353.
  44. Fakunle, O. (2021). Developing a framework for international students' rationales for studying abroad, beyond economic factors. *Policy Futures in Education*, 19(6), 671-690.
  45. Moshtari, M., & Safarpour, A. (2024). Challenges and strategies for the internationalization of higher education in low-income East African countries. *Higher Education*, 87(1), 89-109.
  46. Knight, J. (2007). Cross-border Higher Education: Issues and Implications for Quality Assurance and Accreditation, In *GUNI Series on the Social Commitment of Universities 2: Higher Education in the World (2007)*, Accreditation for Quality Assurance – What is at Stake?, 134–46. New York, NY: Palgrave/MacMillan.
  47. Gupta, B, L., & Choubey, A, K. (2021). Higher education institutions–some guidelines for obtaining and sustaining autonomy in the context of NEP 2020. *Higher Education*, 9(1).
  48. Maiya, A, K., & Aithal, P, S. (2023). A Review-based Research Topic Identification on How to Improve the Quality Services of Higher Education Institutions in Academic, Administrative, and Research Areas. *International Journal of Management, Technology, and Social Sciences (IJMITS)*, 8(3), 103-153.
  49. Fernandes, J, O., & Singh, B. (2022). Accreditation and ranking of higher education institutions (HEIs): review, observations and recommendations for the Indian higher education system. *The TQM Journal*, 34(5), 1013-1038.
  50. Odjo, C, Z., Kaotia, C., & Oyewusia, A, O. (2024). Quality Assurance in West African TVET Institutions: A Brief. *Journal of Technical and Vocational Education and Training (TVET)*, 18(1), 38-55.
  51. Kumar, P., Shukla, B., & Passey, D. (2020). Impact of accreditation on quality and excellence of higher education institutions. *Investigación Operacional*, 41(2), 151-167.
  52. Slavinska, A., Palkova, K., Grigoroviča, E., Edelmers, E., & Pētersons, A. (2024). Narrative Review of Legal Aspects in the Integration of Simulation-Based Education into Medical and Healthcare

- Curricula. *Laws*, 13(2), 15.
53. Gershuni, O., Orr, J. M., Vogel, A., Park, K., Leider, J. P., Resnick, B. A., & Czabanowska, K. (2023). A systematic review on professional regulation and credentialing of public health workforce. *International journal of environmental research and public health*, 20(5), 4101.
54. Kumar, P., Shukla, B., & Passey, D. (2020). Impact of accreditation on quality and excellence of higher education institutions. *Investigación Operacional*, 41(2), 151-167.
55. Dolce, V., Emanuel, F., Cisi, M., & Ghislieri, C. (2020). The soft skills of accounting graduates: Perceptions versus expectations. *Accounting Education*, 29(1), 57-76.
56. Gupta, B. L., & Gupta, P. B. (2023). Accreditation of diploma engineering programmes. *Asian Journal of Management*, 14(1), 81-93.
57. Amirtharaj, S., Chandrasekaran, G., Thirumoorthy, K., & Muneeswaran, K. (2022). A systematic approach for assessment of attainment in outcome-based education. *Higher Education for the Future*, 9(1), 8-29.
58. Reddy, J. S., Sharma, R., & Gupta, N. (2024). The accreditation paradigm: a comparative analysis of accreditations for management programmes. *International Journal of Educational Management*, 38(1), 73-95.
59. Spurlin, J., Rajala, S. A., & Lavelle, J. P. (Eds.). (2023). *Designing better engineering education through assessment: a practical resource for faculty and department chairs on using assessment and ABET criteria to improve student learning*. Taylor & Francis.
60. Gouia-Zarrad, R., Gharbi, R., & Amdouni, A. (2024, March). Lessons Learned from a Successful First Time ABET Accreditation of Three Engineering Programs. In *2024 IEEE World Engineering Education Conference (EDUNINE)* (pp. 1-6). IEEE.
61. Knight, J. (2008). *Higher education in turmoil: The changing world of internationalization* (Vol. 13). Brill.
62. Rosinger, K. O., Sarita Ford, K., & Choi, J. (2021). The role of selective college admissions criteria in interrupting or reproducing racial and economic inequities. *The Journal of Higher Education*, 92(1), 31-55.
63. You, Z., & Hu, Y. (2013). Walking a policy tightrope: The dilemma of balancing diversification and equality in Chinese college entrance examination reform. *Higher Education Policy*, 26, 309-324.
64. Zwick, R. (2019). Assessment in American higher education: The role of admissions tests. *The ANNALS of the American Academy of Political and Social Science*, 683(1), 130-148.
65. Beneke, J. H. (2011). Marketing the institution to prospective students-A review of brand (reputation) management in higher education. *International journal of Business and Management*, 6(1), 29.
66. Arnold, W. W. (2018). Strengthening College Support Services to Improve Student Transitioning to Careers. *Journal of College Teaching & Learning*, 15(1), 5-26.
67. Oakleaf, M. J. (2010). *The value of academic libraries: A comprehensive research review and report*. Assoc of Cllge & Rsrch Libr..
68. Gasman, M., & Commodore, F. (2014). The state of research on historically Black colleges and universities. *Journal for Multicultural Education*, 8(2), 89-111.
69. Felten, P., & Lambert, L. M. (2020). *Relationship-rich education: How human connections drive success in college*. Jhu Press.
70. McClafferty, K. A., McDonough, P. M., & Nuñez, A. M. (2002). What is a college culture? Facilitating college preparation through organizational change.
71. McDonough, P. M. (1997). *Choosing colleges: How social class and schools structure opportunity*. Suny Press.
72. Paradeise, C., & Thoenig, J. C. (2013). Academic institutions in search of quality: Local orders and global standards. *Organization studies*, 34(2), 189-218.
73. Trilokekar, R. D., & Kizilbash, Z. (2013). IMAGINE: Canada as a Leader in International Education. How Can Canada Benefit from the Australian Experience? *Canadian Journal of Higher Education*, 43(2), 1-26.

74. Springer, S. P., Morgan, J. V., Griesemer, N., & Reider, J. (2023). Admission matters: What students and parents need to know about getting into college? John Wiley & Sons.
75. Baroncelli, A., Bolzani, D., & Landoni, M. (2022). Mapping the engagement of alumni organisations in entrepreneurship education and support at UK universities. *The International Journal of Management Education*, 20(2), 100648.
76. Kuh, G. D., Kinzie, J. L., Buckley, J. A., Bridges, B. K., & Hayek, J. C. (2006). What matters to student success: A review of the literature (Vol. 8). Washington, DC: National Postsecondary Education Cooperative.
77. Strayhorn, T. L. (2018). College students' sense of belonging: A key to educational success for all students. Routledge.
78. Christiansen, B., & Even, A. M. (Eds.). (2024). *Advancing Student Employability Through Higher Education*. IGI Global.
79. Borah, D., Malik, K., & Massini, S. (2019). Are engineering graduates ready for R&D jobs in emerging countries? Teaching-focused industry-academia collaboration strategies. *Research Policy*, 48(9), 103837.
80. McDonough, P. M. (1997). *Choosing colleges: How social class and schools structure opportunity*. Suny Press.
81. Hernandez, J. C. (2019). Leaking pipeline: Issues impacting Latino/a college student retention. *Minority student retention*, 99-122.
82. Prell, C., Reed, M., Racin, L., & Hubacek, K. (2010). Competing structure, competing views: the role of formal and informal social structures in shaping stakeholder perceptions. *Ecology and society*, 15(4).
83. Miotto, G., Del-Castillo-Feito, C., & Blanco-González, A. (2020). Reputation and legitimacy: Key factors for Higher Education Institutions' sustained competitive advantage. *Journal of Business Research*, 112, 342-353.
84. Meara, K. O. (2007). Striving for what? Exploring the pursuit of prestige. In *Higher education: Handbook of theory and research* (pp. 121-179). Dordrecht: Springer Netherlands.
85. Giancola, J., & Kahlenberg, R. D. (2016). *True Merit: Ensuring Our Brightest Students Have Access to Our Best Colleges and Universities*. Jack Kent Cooke Foundation.
86. Husband, P. A., & Jacobs, P. A. (2009). Peer mentoring in higher education: A review of the current literature and recommendations for implementation of mentoring schemes. *The Plymouth Student Scientist*, 2(1), 228-241.
87. Okolie, U. C., Nwajiuba, C. A., Binuomote, M. O., Ehiobuche, C., Igu, N. C. N., & Ajoke, O. S. (2020). Career training with mentoring programs in higher education: facilitating career development and employability of graduates. *Education+ Training*, 62(3), 214-234.
88. PS, N., & Aithal, P. S. (2023). How Internal Quality Assurance System is Re-defined in Private Universities—A Case of Srinivas University, India. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, 8(1), 234-248.
89. Maiya, A. K., & Aithal, P. S. (2023). A Review based Research Topic Identification on How to Improve the Quality Services of Higher Education Institutions in Academic, Administrative, and Research Areas. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, 8(3), 103-153.
90. Kok, S. K., & McDonald, C. (2017). Underpinning excellence in higher education—an investigation into the leadership, governance and management behaviours of high-performing academic departments. *Studies in higher education*, 42(2), 210-231.
91. Fung, D., & Gordon, C. (2016). Rewarding educators and education leaders in research-intensive universities.
92. Thiem, K. C., & Dasgupta, N. (2022). From precollege to career: Barriers facing historically marginalized students and evidence-based solutions. *Social Issues and Policy Review*, 16(1), 212-251.
93. González-Pérez, L. I., & Ramírez-Montoya, M. S. (2022). Components of Education 4.0 in 21st century skills frameworks: systematic review. *Sustainability*, 14(3), 1493.

94. Nowrozy, R., & Jam, D. (2024). Embracing the Generative AI Revolution: Advancing Tertiary Education in Cybersecurity with GPT. arXiv preprint arXiv:2403.11402.
95. Aithal, P, S., & Maiya, A, K. (2023). Innovations in Higher Education Industry–Shaping the Future. *International Journal of Case Studies in Business, IT, and Education (IJCSBE)*, 7(4), 283-311.
96. Boss, S., & Krauss, J. (2022). Reinventing project-based learning: Your field guide to real-world projects in the digital age. *International Society for Technology in Education*.
97. Madden, M, E., Baxter, M., Beauchamp, H., Bouchard, K., Habermas, D., Huff, M., & Plague, G. (2013). Rethinking STEM education: An interdisciplinary STEAM curriculum. *Procedia Computer Science*, 20, 541-546.
98. Rohm, A, J., Stefl, M., & Saint Clair, J. (2019). Time for a marketing curriculum overhaul: Developing a digital-first approach. *Journal of Marketing Education*, 41(1), 47-59.
99. Mølstad, C, E., Prøitz, T, S., & Dieude, A. (2021). When assessment defines the content—understanding goals in between teachers and policy. *The Curriculum Journal*, 32(2), 290- 314.
100. Hénard, F., & Roseveare, D. (2012). Fostering quality teaching in higher education: Policies and practices. *An IMHE guide for higher education institutions*, 1(1), 7-11.
101. Ferns, S., & Lilly, L. (2015). Driving institutional engagement in WIL: Enhancing graduate employability. *Journal of Teaching and Learning for Graduate Employability*, 6(1), 126-143.
102. Ishengoma, E., & Vaaland, T, I. (2016). Can university-industry linkages stimulate student employability?. *Education+ training*, 58(1), 18-44.
103. Borah, D., Malik, K., & Massini, S. (2021). Teaching-focused university–industry collaborations: Determinants and impact on graduates’ employability competencies. *Research Policy*, 50(3), 104172.
104. Malhotra, R., Massoudi, M., & Jindal, R. (2023). An alumni-based collaborative model to strengthen academia and industry partnership: The current challenges and strengths. *Education and Information Technologies*, 28(2), 2263-2289.
105. Kayyali, M. (2024). Career Development in Higher Education: Best Practices and Innovations. In *Advancing Student Employability Through Higher Education* (pp. 1-19). IGI Global.
106. Barkley, E, F., & Major, C, H. (2020). Student engagement techniques: A handbook for college faculty. John Wiley & Sons.
107. Berliner, D, C. (1994). Expertise: The wonder of exemplary performances. *Creating powerful thinking in teachers and students*, 161-186.
108. Danielson, C. (2007). *Enhancing professional practice: A framework for teaching*. ASCD.
109. Tull, A., Hirt, J. B., & Saunders, S. (Eds.). (2023). *Becoming socialized in student affairs administration: A guide for new professionals and their supervisors*. Taylor & Francis.
110. Quinn, A., Lemay, G., Larsen, P., & Johnson, D, M. (2009). Service quality in higher education. *Total Quality Management*, 20(2), 139-152.
111. Churchman, R., & Woodhouse, D. (1999). The influence of professional and statutory bodies on professional schools within New Zealand tertiary institutions. *Quality in Higher Education*, 5(3), 211-226.
112. Dahri, N, A., Yahaya, N., Al-Rahmi, W, M., Vighio, M, S., Alblehai, F., Soomro, R. B., & Shutaleva, A. (2024). Investigating AI-based academic support acceptance and its impact on students’ performance in Malaysian and Pakistani higher education institutions. *Education and Information Technologies*, 1-50. <https://doi.org/10.1007/s10639-024-12599-x>
113. Okolie, U, C., Nwajiuba, C, A., Binuomote, M, O., Ehiobuche, C., Igu, N, C, N., & Ajoke, O, S. (2020). Career training with mentoring programs in higher education: facilitating career development and employability of graduates. *Education+ Training*, 62(3), 214-234.
114. Ahmad, T. (2020). Scenario based approach to re-imagining future of higher education which prepares students for the future of work. *Higher Education, Skills and Work-Based Learning*, 10(1), 217-238.
115. Yelamarthi, K., & Drake, E. (2014). A flipped first-year digital circuits course for engineering and technology students. *IEEE Transactions on Education*, 58(3), 179-186.
116. Malik, R, S. (2018). Educational challenges in 21st century and sustainable development. *Journal of*



- Sustainable Development Education and Research, 2(1), 9-20.
117. Clark, I. (2012). Formative assessment: Assessment is for self-regulated learning. *Educational psychology review*, 24, 205-249.
  118. Gomez-Lanier, L. (2017). The Experiential Learning Impact of International and Domestic Study Tours: Class Excursions That Are More Than Field Trips. *International Journal of Teaching and Learning in Higher Education*, 29(1), 129-144.
  119. Morag, O., & Tal, T. (2012). Assessing learning in the outdoors with the field trip in natural environments (FiNE) framework. *International Journal of Science Education*, 34(5), 745-777.
  120. Samuel, A., Thomas, R. J., McGouran, C., & White, G. R. (2022). Experiencing the macromarketing dimensions of sustainability: lessons learned from field trips to the ultra novel. *Journal of Marketing Education*, 44(3), 322-336.
  121. Henderson, A., & Trede, F. (2017). Strengthening attainment of student learning outcomes during work-integrated learning: A collaborative governance framework across academia, industry and students. *Asia-Pacific Journal of Cooperative Education*, 18(1), 73-86.
  122. Atkinson, G. (2016). Work-based learning and work-integrated learning: Fostering engagement with employers. National Centre for Vocational Education Research.
  123. Prasad, S., & Bhat, R. S. (2021, April). India industry-university collaboration-a novel approach combining technology, innovation, and entrepreneurship. In 2021 IEEE Global Engineering Education Conference (EDUCON) (pp. 373-380). IEEE.
  124. Elmuti, D., Abebe, M., & Nicolosi, M. (2005). An overview of strategic alliances between universities and corporations. *Journal of workplace Learning*, 17(1/2), 115-129.
  125. Saltz, J., Serva, M. A., & Heckman, R. (2013). The GET immersion experience: a new model for leveraging the synergies between industry and academia. *Journal of Information Systems Education*, 24(2), 121.
  126. Murray, A. (2019). Supporting academic entrepreneurship: a blueprint for a university based business incubator. *Journal of Higher Education Service Science and Management*, 2(2), 1-9.
  127. Shekhar, H., Satyanarayana, K., & Chandrashekar, D. (2023). Role and contributions of an incubator in academic intrapreneurship—An examination. *Technovation*, 126, 102821.
  128. Moran, B. B., & Morner, C. J. (2017). *Library and information center management*. Bloomsbury Publishing USA.
  129. Chigwada, J. P. (2021). Quality assurance of library and information services in the fourth industrial revolution to achieve the sustainable development goals. In *Examining the impact of industry 4.0 on academic libraries* (pp. 149-164). Emerald Publishing Limited.
  130. Ani, O. E., & Ahiauzu, B. (2008). Towards effective development of electronic information resources in Nigerian University Libraries. *Library management*, 29(6/7), 504-514.
  131. Pawar, R., Metri, R., Sawant, S., & Kulkarni, S. (2020). Evolving product development skills through group based activity instructions in engineering exploration course. *Procedia Computer Science*, 172, 314-323.
  132. Coggan, J., & Rennick, C. (2022). Development and implementation of an integrative and experiential design project: Design, build and test a scanning tunneling microscope. *International Journal of Engineering Education*, 38(1), 25-35.
  133. Wanner, M., Schmitt, M., Fischer, N., & Bernert, P. (2021). *Transformative innovation lab: handbook to facilitate students' real-world laboratory projects to promote transformative and transdisciplinary competencies*. Wuppertal Institut für Klima, Umwelt, Energie.
  134. Simpeh, F., & Shakantu, W. (2020). An on-campus university student accommodation model. *Journal of Facilities Management*, 18(3), 213-229.
  135. Patrick, K. (1988). Student health: Medical care within institutions of higher education. *JAMA*, 260(22), 3301-3305.
  136. Sapri, M., Kaka, A., & Finch, E. (2009). Factors that influence student's level of satisfaction with regards to higher educational facilities services. *Malaysian Journal of Real Estate*, 4(1), 34-51.

137. Simpeh, F., & Shakantu, W. (2020). On-campus university student housing facility services prioritisation framework. *Facilities*, 38(1/2), 20-38.
138. Barata, E., Cruz, L., & Ferreira, J, P. (2011). Parking at the UC campus: Problems and solutions. *Cities*, 28(5), 406-413.
139. Frejd, P. (2013). Modes of modelling assessment—A literature review. *Educational Studies in Mathematics*, 84, 413-438.
140. Sasson, I., Yehuda, I., & Malkinson, N. (2018). Fostering the skills of critical thinking and question-posing in a project-based learning environment. *Thinking Skills and Creativity*, 29, 203-212.
141. Luna Scott, C. (2015). *The Futures of Learning 3: What kind of pedagogies for the 21st century?*. UNESCO Educ. Res. Foresight ERF Work. Pap. Ser. 2015, 15, 1–21
142. Chawla, S., & Lenka, U. (2016). Organisational level antecedents of learning organisations for Indian higher educational institutes: An exploratory study. *International Journal of Management in Education*, 10(1), 24-44.
143. Tasopoulou, K., & Tsiotras, G. (2017). Benchmarking towards excellence in higher education. *Benchmarking: An International Journal*, 24(3), 617-634.
144. Asiyai, R, I. (2015). Improving Quality Higher Education in Nigeria: The Roles of Stakeholders. *International Journal of higher education*, 4(1), 61-70.
145. Aithal, P, S., & Kumar, P, M. (2016). Opportunities and challenges for private universities in India. *International Journal of Management, IT and Engineering*, 6(1), 88-113.
146. Gholap, P., & Kushare, P. (2019). A Comparative study of Accreditation Grades of NAAC vis-a-vis NBA for Quality Improvement of Higher Education in India. *International Journal of 360 Management Review*, 7(02), 72-84.
147. Fernandes, J, O., & Singh, B. (2022). Accreditation and ranking of higher education institutions (HEIs): review, observations and recommendations for the Indian higher education system. *The TQM Journal*, 34(5), 1013-1038.
148. Materu, P, N. (2007). Higher education quality assurance in Sub-Saharan Africa: status, challenges, opportunities and promising practices. World Bank Working Paper No. 124. Washington, D.C: WorldBank.

**Appendix 1: Report on Recruitment Drive**

<b>Date of recruitment drive:</b>		<b>Place of Recruitment:</b>	<b>Faculty-coordinator:</b>
About the Company:			
Vision and Mission:			
<b>Organization Type</b>	<b>Private or Govt.</b>	<b>Year of Establishment</b>	<b>Product/services</b>
Number of Employees		Level of Company	CEO/Managing Director
Training Period		Number of vacancies	Number of Jobs offered
Job Location		Salaries offered	Expected area
Others (if any)			
<b>Selection process</b>			
<b>Aptitude tests</b>	<b>Group discussion</b>	<b>Technical interview</b>	<b>HR interview</b>
			<b>Others (if any)</b>

Numerical reasoning				
Verbal reasoning				
Diagrammatic	Jet airway crisis			
Situational judgement	New India 2020			
Psychological tests	Make in India	Projects under taken: Example:		
Inductive reasoning	Industry 4.0	Casting, moulding, machining, forming, stress strain curves, theory of failures, law of thermodynamics, cryogenics, sustainable manufacturing, design for manufacturing, C, C++, Catia, Creo, Hypermesh, Ansys etc		
Cognitive ability	Social media: curse or boon			
Mechanical reasoning	Facebooking: A time pass activity			
Inductive reasoning	Surgical strike			
Spatial awareness tests.	Air strike etc.			
Error checking tests.				
Company feedback on hospitality		Company feedback about the Students		Students feedback to prefinal years.
Emerging Areas Student should focus		Students strengths and weaknesses		

Signature of Faculty Co-ordinator