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# ENGINEERING TEACHING: STRENGTHENING AND MODERNIZATION

- *The performance of engineering professionals is closely associated with technological development and, consequently, with the country's growth.*
- *Brazil has a poor supply of engineering professionals. In addition to increasing supply, the country needs to tailor engineering courses to today's world of work.*
- *Improvements in education and the development of skills that meet the requirements of the productive sector are essential actions to strengthen industry and improve competitiveness conditions in the Brazilian economy.*

**Brazil faces the challenge of improving the quality of engineering courses and reducing their dropout rates. Engineering professionals play a key role in technological development.** Their performance has an impact on improving products and processes, on optimizing production management, on research carried out by companies, on development and innovation efforts, and on the development of entrepreneurs.

**Brazil has fewer engineers per head of population than its competitors, although it is graduating more engineers than in the recent past.** In response to pressures from the engineering market in the pre-crisis phase, there has been a significant increase in the supply of places in public and private universities.

Despite these results, **dropout rates fluctuate at levels close to 50%.** It is estimated that for every 1,000 candidates to engineering programs, 175 are admitted and only 95 complete these programs. The evaluations of higher education courses carried out by the Anísio Teixeira National Institute for Educational Studies and Research (INEP) reveal the weaknesses of engineering teaching: of the 1,538 courses evaluated in 2014, about 60% attained only the minimum satisfactory score and 15% were below this level.

**Even in schools of excellence there is room for improvement.** It is important to afford students the opportunity to attend programs based on a more multidisciplinary, systemic and entrepreneurial approach and in line with the needs of the economy and of society.

The recommendations to address these challenges are focused on three thematic areas: curriculum modernization, review of the processes for evaluating engineering programs, and improved teacher training courses.

SHARE OF ENGINEERING COURSES IN TOTAL UNDERGRADUATE COURSES

| Relative share of engineering courses in College rates | 2001 | 2015 | 2016 |
|---|---|---|---|
| Share of engineering courses (%) | 6.3% | 11.8% | 12.6% |
| Share of enrolments in engineering courses (%) | 6.5% | 15.1% | 15.1% |
| Share of engineering graduates (%) | 5.1% | 8.8% | 10.6% |

Source: INEP. Statistical Synopsis of Higher Education. Various years.

## Main recommendations

### Curriculum modernization

**1 The technical base should be reinforced and a more innovative approach to engineering teaching should be encouraged** through the adoption of curricula focused on formulating and solving problems, planning, management, entrepreneurship, teamwork, decision-making capacity in uncertainty environments, and critical and systemic thinking.

**2 The integration between engineering programs and the manufacturing sector should be enhanced.**

**3 The creation and use of laboratories to teach best practices** and of pilot projects for renewing engineering teaching and disseminating knowledge of successful international experiences **should be supported**.

**4 The use of the hybrid teaching model should be encouraged** by combining the use of digital technology with classroom interactions.

### Evaluation of courses and institutions

**5 Competitions such as Engineering Olympics,** in which students can work in teams in an interdisciplinary manner to address engineering challenges **should be supported**.

**6 The evaluation of engineering teaching programs should be improved.**

### Hiring, training, evaluation and promotion of faculty

**7 Mechanisms to evaluate the performance of engineering graduates should be defined.**

**8 The dissemination of professional master's programs in engineering should be supported** and academic master's programs should be geared towards engineers who intend to pursue a career in this area.

**9 Faculty should be trained with special attention to training in engineering teaching methodologies** that involve the active participation of students (projects, challenges, competitions and others).

**10 The career progression process should be improved** to include practical experiences in engineering as a criterion for faculty evaluation and promotion.

**11 Faculty award programs that encourage performance consistent with the current requirements of engineering teaching should be structured**, with special attention to the recognition of cooperation and partnership efforts between academia and the productive sector.

**12 University professors should be encouraged to work in companies.**

The full version of the document can be accessed through the QR code on the side or at: http://www.cni.com.br/eleicoes2018/downloads/ This summary is part of the series Proposals of Industry for the 2018 Elections comprising 43 documents. The series, which is based on the *2018-2022 Strategy Map for Industry* is a CNI contribution to the new federal administration and presents analyses and proposals of priorities to increase Brazil's competitiveness. 

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