

The JEE conundrum revisited: a time for course correction

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The current status of the problems and challenges facing the system of admission to the undergraduate programmes in centrally funded science and technology institutions is discussed with respect to the reforms that this system was subjected to in 2012–2013, and the suggestions contained in the recent report of the ‘Committee of Eminent Persons’ (CEP)¹. The consequences of the changes that were implemented are assessed especially in the context of an earlier, detailed article².

In 2010, the Kapil Sibal-led Ministry of Human Resource Development (MHRD), Government of India (GoI) attempted to ‘reform’ the Joint Entrance Examination (JEE) system which is the gateway to the ‘prestigious’ Indian Institutes of Technology (IITs), and some other top tier institutions, for their undergraduate programmes. The proposed changes involved the ‘imposition’ of a single, country-wide entrance examination for admission to all undergraduate programmes and the inclusion of marks obtained in the board examinations of class 12, into the student ranking criteria used for making admission merit lists. The ostensible reasons for these reforms were a reduction in stress that students feel in appearing for multiple admission tests, and also that giving importance to board examinations would lead to a suppression of the pernicious hold that coaching classes have over the entrance examinations, because classes in schools would now become important. While proposing these changes there was all sorts of political posturing³ as to how the new admission scheme would help students from rural areas, poorer socio-economic backgrounds and girl students because they could not afford costly coaching.

In the debates that arose around these proposals, it was pointed out that the logic relating to cause and effect in these propositions was flawed because of many reasons: there were no ground data to support the claim that students wanted fewer examinations or that stress was due to the number of examinations, and not because of the absolute scarcity of seats. There was a remarkable inability to observe by the proponents of these reforms, that inclusion of board examina-

tion marks would not lessen the influence of coaching classes but do the opposite by extending the coaching to school material as well. These issues were analysed in great detail in 2012 (ref. 2).

A status report

What finally came to be implemented in 2013 was that the existing All India Engineering Entrance Examination (AIEEE) was renamed as JEE (Main) and the IIT JEE was renamed JEE (Advanced). Admission to all Central Government-funded institutions (CFTIs), other than the IITs, i.e. National Institute of Technology (NITs) and some others, was to be made on the basis of a score obtained by combining the marks obtained in JEE (Main) – with 60% weightage, and ‘normalized’ board marks – with 40% weightage (the normalization details may be found in ref. 4). The IITs escaped being subjected to inclusion of board marks because of sustained opposition from their faculty, who were unwilling to let go the control of JEE (Advanced) and which is still the sole criterion for admission to the IITs. Thus, the IITs saved themselves from any ‘imposition’, but the NITs became the testbeds for trying out whimsical policy experiments.

States do not agree: more confusion and more stress

Not all states joined the single examination bandwagon and continue to conduct their own Combined Entrance Test (CET). Here is a sampling – Karnataka⁵, Bihar⁶, Telangana⁷ and Tamil Nadu⁸; a bigger list may be found in ref. 9. Maharashtra has declared its intention to secede from the JEE (Main)¹⁰ – creating ample student stress¹¹ – and the official reasons given are illuminating, namely, eliminating coaching costs for JEE (Main) which is based on Central Board of Education (CBSE) syllabus (whereas CET is based on Maharashtra board syllabus, so no extra coaching is needed for a different system), getting rid of the need to cope with the vast CBSE syllabus (compared

to the less ambitious Maharashtra board syllabus), obviating the need for focusing simultaneously on board exams and JEE (Main), and creating a common physics and chemistry paper if the CET is combined with that for medical college aspirants. So, as is obvious from this logic, a significant number of students are comfortable with the local board ecosystem and would not like to venture to study a different (more vast) syllabus for reasons of cost (coaching) and duplication of effort (board and JEE).

Invasion of the coaching industry

Coaching classes have invaded the school system. Integrated schools – that combine teaching for boards and for the JEE – now operate openly and respectably, despite all the frowning by some boards in not ‘permitting’ such an arrangement; see a circular from CBSE¹² and reports of how it was flouted openly¹³. In fact, these schools are now most sought after by aspirants and coaching classes display lists of collaborating institutions – some quite reputed – very proudly¹⁴, and willing participants are from all kinds of boards – central and state. Coaching package costs have soared, more than doubled for integrated packages and the figures now hover between Rs 5 and 8 lakhs for a 2-year course, depending upon the reputation of the school and the coaching class. It is not as if this was not anticipated; it was stated quite plainly, with evidence, before that, ‘this new importance of board examinations will drive students into the clutches of coaching classes even more intensely and desperately. ... A classic case of the cure being worse than the disease’². There is no change in the intrinsic quality of the schools themselves – the strategy is, if you can’t beat them join them. Reports have appeared regularly and frequently, with rich details of increasing enrollments and escalating costs with respect to coaching institutions^{15–17}.

The JEE continues to be based on the multiple choice questions (MCQ) pattern – which is most susceptible to coaching.

This is what makes coaching classes so 'effective' and attractive to 'customers'. The MCQ pattern encourages a certain brute force, pattern recognition type of approach and even tricks, much of these being responsible for the disconnect between conceptual learning and examination 'cracking' ability. Serious advice on how to 'crack' the JEE examination (in addition to speed practice) shows how problems are to be approached using a combination of guesswork, gambling, easiest topics suggestions, topic to avoid lists, order in which to attempt, what to memorize, and some more 'intelligent' techniques¹⁸.

And, finally, those who can are escaping this system. We now have brain drain at the school exit level¹⁹, with even the middle class now seeking admission abroad, for their children.

Normalization games and unsolved mysteries

It was mentioned earlier², that board marks, at least for some boards, do not have the kind of integrity needed for these to be used in making merit lists. Have the central and state governments taken any measures to curb examination malpractices? This very contemporary and iconic picture²⁰, and the statements in its aftermath²¹, say a lot about how we, as a society, treat ethical issues.

The other issue that had been flagged was whether the marks obtained in board examinations can be compared across boards (and hence can be normalized)². School boards can be utterly different from each other in every possible way: coverage of the syllabus; style of instruction and examination; the relative emphasis on quantitative, qualitative and descriptive material; marks distribution shapes, and more. Therefore, elementary statistics theory would suggest that such comparisons are meaningless. The issue of normalization of board marks thus continues to baffle many and create intense heartburn²², simply through the tyranny of artificially generated numbers. It may be recalled that the Indian Statistical Institute Kolkatta (ISI) distanced itself from the scheme that is being used for generating the admissions merit list²³. So pained was ISI with this fiasco that you can find this whole story with a frame-by-frame storyboard on their website²⁴; it fearlessly lays out the subver-

sions that have affected various committee deliberations (note 1). This should also remind us of the U-turn that the Ramasami committee made in reaching its final conclusions². To the advice given by ISI²⁵, 'Since the subject scores do not appear to be comparable, the question of combining them for comparability of aggregate scores across the boards does not arise', Ramasami went on to famously remark²⁶, 'We are very clear that what we have done is fine. We don't have to accept what the experts recommended. What they say does not become law.' Such irrationality has still not been called into account.

Even more importantly, and expectedly, some school boards, to add heft to their 'social standing', are caught up in a ridiculous 'war' leading to incredibly inflated board examination scores. Grade inflation and liberal marking are now the order of the day with toppers getting aggregates of 99% plus, and the number of students obtaining such scores increasing drastically. For instance, this year the central boards' toppers' scores were 99.75% (ISC)²⁷ and 99.2% (CBSE)²⁸, with state boards also getting onto the 95-plus bandwagon: Maharashtra HSC topper with 96.92% (ref. 29), Tamil Nadu with 99.33% (ref. 30). The bunching of so many students in the high marks territory will render any percentile-based scheme, to allot ranks using statistically insignificant differences between neighbouring students, largely meaningless. The ridiculousness of the situation is captured well in these pieces^{31,32}.

The CEP report

Board marks

Mercifully, the CEP report has recommended eliminating the weightage given to board examination marks for creating admission merit lists. The stated reasons¹ for this recommendation are a general belief that 'students are going for coaching for Board exams also' (why does it have to be a 'belief'; it should have been possible for the institutions or the ministry to get some real numbers), and 'difficulties in normalization' but was that not rather obvious when the whole story began? There was enough evidence that the normalization of board marks, and its inclusion in the admission scheme, was based on half-baked, ad-hoc,

and surreptitiously planted statistical notions.

Coaching classes

The report also delves into reasons why coaching is undesirable but seems to have a very naive understanding about the way coaching is embedded into the education ecosystem. Their first objection is that the 'purpose of education is refinement of the mind not passing an entrance examination.' While that sounds profound, one is left to wonder which school boards actually promote 'refinement of the mind' when numerous critiques of the Indian education system specifically point to rote and uncreative learning as being the very essence of Indian school pedagogy³³. So when every education agency's purpose seems to be to teach the 'art' of cracking an examination, coaching classes win hands down since they seem to do a much better job of it.

The report also mentions that the 'students are forced to waste a lot time commuting in order to avail the benefit of "good" coaching'. Of course, we do not know the basis of this 'concern'. Commuting, one would surmise, would be passé in the age of coaching towns, coaching centers parading as schools and respected 'integrated' schools.

In order to reduce the influence of coaching classes on the admission process, it has been suggested that, 'an online portal be set up for students to take mock tests while preparing for the JEE. The Corporates and the Government can use the services of good schools as well as good coaching institutes themselves to set up online coaching classes with interactivity' (emphasis mine). However, this makes no sense because there are so many portals and mock examinations (free and paid) already available over on the web. Also, which 'Corporates' is this statement referring to? Will the government set up these portals? If good coaching institutes were to set up these portals then are we eliminating coaching classes or legitimizing them? There is more confusion than instruction in this recommendation. Ultimately, mock examination portals will not reduce coaching. This is too simplistic an assumption. Students go to coaching classes to be taught by good teachers, have access to large problem banks, a disciplined regimen, and so on, not just for practicing mock examinations.

Another recommendation concerns the setting up of a regulatory body that oversees coaching classes. They have even given it a nice name – All India Council for Coaching for Entrance Examinations (AICCEE), whose job will be to ‘demand that Coaching Institutes are well equipped and maintain healthy and best practices as well as charge regulated fees’. Whereas this is a welcome measure – given the cruel environment of the coaching class and the rising rates of suicides^{34–36} – it is still a tall order. Even if one were to generously assume that somehow a typical state regulatory authority could be established – against the financial clout of the coaching industry – what kind of ‘best practices’ would it really enforce? Ironically, MHRD itself has declined to do any regulation in the past, passing the issue off as the respective state governments’ concern³⁷. The hardest thing is to regulate the ‘fee’ because it is what makes the industry so lucrative. As usual, the report just makes the suggestion, without raising any of the issues and the measures that would be needed to implement this.

The aptitude test and national testing service: old wine in a new bottle

The seemingly most important CEP recommendation, to curb the coaching class dependence, is about conducting an aptitude test that will serve as a filter to limit a single JEE examination to the top 4 lakh students. The summary recommendation is¹, ‘A National Testing Service shall be set up by early 2016, mandated to conduct an Aptitude Test, which should test the scientific aptitude and innovative thinking ability. The Aptitude test may be offered 2 or more times in a year and would be an online test. The testing shall test the scientific thinking and cannot be gamed through coaching.’ The idea of an aptitude test was also ‘debated’ in 2012–2013, at the time of the previous ‘reforms’, but then finally dropped. The same argument, that it would measure ‘raw intelligence’, was suggested by the Ramasami committee as well and it was also stated that such an aptitude test would be un-coachable! So what is new? The ‘un-coachable’ attribute of this examination sounds almost magical. It would be fantastic if we could just declare an examination as coaching-proof and it became so. For that matter

why not declare that the JEE itself ‘cannot be gamed through coaching’! There is no reason or design plan, presented in the report, that will make this examination as being ‘coaching-proof’. The plain truth is that there is no such thing as an examination that cannot be coached for. Even the American Scholastic Aptitude Test (SAT) has dedicated coaching classes available. If these are not advertized as much it is because the number of students who have an interest in pursuing studies abroad is far too small compared to the numbers who have an interest in the Indian entrance examinations like the JEE. However, SAT is an eminently coachable examination and in fact often the same coaching institutions that provide coaching for the JEE do so for SAT as well³⁸.

Next, the faith of the CEP in the SAT examination is touching. Statements like, ‘It is believed that the SAT examination is a very good measure of the aptitude of students that get into leading universities and institutes in USA. SAT is very well tried and tested system and has shown excellent correlation with the ability of students to succeed in college. It is also believed that coaching does not have a significant role in the performance of students in the SAT examination’ are wrong on facts, and this is discussed below. The committee should have done at least an elementary literature search before making such sweeping statements. There are two types of SAT examinations, namely, SAT I or the aptitude/reasoning SAT and SAT II or the subject SATs which test achievement in specific domains (like English, Mathematics, Physics, etc.). It can be safely presumed that the CEP report is referring to the first type which will apparently ‘test the scientific thinking’. Contrary to the ‘beliefs’ stated above, the SAT I is a much criticized examination in that it is based on the measurement of a discredited notion of *innate* mental abilities. And I cite from my previous article², ‘There is voluminous literature on this issue, ranging from the philosophical¹⁰ to specific analysis related to their use in college admissions: Coleman¹¹ reports that a large number of colleges in the United States do not use SAT I (SAT I is ‘reasoning’ SAT) for college admissions. Freedle¹² argues that SAT I is ‘culturally and statistically biased against African Americans, Hispanic Americans, and Asian Americans’. The extent to which

SAT I limits access, of racial and ethnic minorities in USA, to college education has been explored by Zwick¹³. In her book, Zwick¹⁴, cites a University of California study which concludes that student scores in SAT2 (subject SAT) correlate much better with college grades than SAT I. This study also suggests that the SAT2 score is much less influenced by the socio-economic background of the student, in comparison to the SAT I score. If we extend these observations to apply broadly to disadvantaged groups, based on class, caste or gender, in India, it is obvious that the aptitude test should not be instituted at all. Yet again, the stated concern about bridging gender and the urban–rural divides, will be accentuated by the proposed solutions (note 2).’ Here are the actual statistics³⁹ – ‘The UC data show that high school grades plus the SAT II account for about 21% of the explained variance in first-year college grades. When the SAT I is added to high school grades and the SAT II, the explained variance increases from 21% to 21.1%, a trivial increment’. So it needs to be asked again, why should the current JEE (Main) be replaced by the proposed SAT I-like aptitude test, as the first filter to access the final JEE (Advanced)?

Lastly, why do we need a new National Testing Service (NTS)? Can CBSE not administer tests? What about the National Council of Educational Research and Training (NCERT) which administered the National Talent Search examinations – which tested basic science knowledge after grade 10 and 12? Is it always necessary to create a new agency and its bureaucratic paraphernalia to solve an old problem?

School education

The CEP report¹ harps intermittently on the need to improve school education in order to combat the influence of coaching classes. However, in saying this it simply dwells on the obvious, making generally trite statements that have no actionable components or are marred by vague wordings. And there is no accompanying social or historical context. For instance¹, ‘... best addressed by providing excellent facilities to school teachers including paying them well. Nationally we emphasize the importance of character building in education and the need to respect teacher socially. Of course, in

order to be effective, this should be put in practice, especially for those who preach.' Who will pay ('well') teachers? In which schools? The call to 'those who preach' is addressed to whom: school administrators, the ministry that funds public schools or political parties? Another recommendation says, '... that MHRD should take steps to improve the School education in the country. It should be of such a level that the need for coaching becomes redundant. MHRD can start with the reforms in the CBSE as this is directly controlled by MHRD.' The question to ask is, if coaching is needed because the 'level' of CBSE syllabus is too low or if the JEE is deliberately made tough to be an elimination examination? So one does not even know what is being talked about. From an eminent committee it would be expected that some detailed suggestions would be made as to how to go about 'improve the school education' and what kind of numbers – in terms of schools, students, money, time – are involved, why, what has been done in the past, has failed.

The bigger picture: who needs science and engineering

The CEP report generously says, 'Currently, the desire of students to get into an IIT is too intense as there is a big gap in quality between them and the next level of institutions in the country. It is, therefore, imperative that the standard of the next level institutions – NITs, other CFTIs and State level institutions, be increased as soon as possible. This will greatly reduce the dependence of coaching institutions in the country. In his context, there is a dire need to improve the standards of the state-level institutions, many of which were still respectable just four decades ago'. The apparent logic of this suggestion is that the scarcity factor will be ameliorated since students will now aspire to go to these much improved versions of existing 'lower level' colleges (that were 'still respectable four decades ago'?). The government is doing much 'better' than that already by setting up new institutions of the highest level – the IITs. It is of course not clear how this rejuvenation of the 'next' level institutions will happen, nor does the committee shed any light on it, given the severe faculty shortages in even in the established IITs⁴⁰, the difficulties in find-

ing faculty for the new IITs, and the recent diversion of 'regular' funds from existing institutions to the newer ones⁴¹.

Even more importantly, committees of this stature should also provide directions about the number of science and engineering seats that are really needed in the IITs and the 'next' level institutions, given the lack of sufficient engineering jobs available and the distortions that this scenario wrecks on the internal functioning of the institutions⁴². What is the point of spending so much public money to create so many engineers, a majority of whom opt for non-engineering professions? The CEP would have been the right forum to have debated these questions given its mandate of re-designing the admissions system, so this is indeed a missed opportunity.

What more should we do

In the immediate term, redesign in eliminating or at least drastically reducing MCQ questions from the entrance tests is urgently needed. This question-answer format is the 'most coachable'. This single measure alone will destroy a significant amount of gaming and pattern-recognition based coaching. The question of eliminating MCQ pattern in the first, filter examination (JEE Main) is more difficult because of its scale but some creative committees should work on hybrid questions – which need working like long questions but can still be machine evaluated.

From the big picture perspective, the most important action item is to get a feel for the 'student mind' and the ground reality that provides its social context. It is therefore of utmost importance that the most significant stakeholders, namely, the students graduating from the school system, in whose name and interest all these systems are made and changed, are surveyed in large numbers. I reiterate² that such an exercise must be undertaken to obtain invaluable field data and help map a variety of patterns – what is wrong with schools: quality of teaching, syllabus, evaluation modes, rote versus creative learning, the strengths and weaknesses of private versus public schools; the need for coaching, costs and social anxieties of the admission process, and so on. We still do not know what are the most stressful factors that affect students in this phase of life. The need of the hour is

to demand a task force that conducts these surveys and presents detailed remedies to rejuvenate school education, in mission mode – where do we stand in terms of the numbers and status of school teachers, infrastructure and funding requirements of this sector, and importantly, an action plan. The importance of educational reforms cannot be overemphasized and are needed with an urgency even greater than economic reforms⁴³ because we seem to be manufacturing incompetence on a grand scale.

Reported social biases^{44–46}, like, why some boards do better than others in terms of more of their students getting admissions, or that urban, rich students faring relatively better in admission outcomes, and measures needed to encourage gender parity, remain unaddressed and urgently deserve attention.

Any new design of an admission scheme into science and engineering undergraduate programmes – including whether there should be one or two examinations - should be based on what we learn from the above exercises. The design process must be truly consultative and involve institutional faculty as key stakeholders in these decisions. Past decision making has usually been marred by lack of sincerity of purpose, and a certain caving in by institutional leaders to political whims and this has often caused much resentment⁴⁷. Whimsical and frequent tinkering with the admissions system only ends up creating more opportunities for coaching classes to step in as solution providers to the 'latest twist' in the admission process³⁶, and launch newer schemes and packages!

Rationally, the implementation of any new admission scheme must be slow and spread over a few years so that all boards reach a certain critical level of integrity and similarity in terms of the science, mathematics syllabi, teaching and examining styles – something that was recommended earlier². Is it so hard to sell the idea of a universal curricula in science and mathematics, to state governments? This surely must count as true 'national interest'. Only such an approach will result in some synchrony between the different examination boards, most crucially the state boards, who may then be willing to abandon their own admission tests. The question of whether to include board marks, or, alternatively, eliminate the entrance examinations, should come after the cleanup. The new system should

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greet a well trained generation of students who are familiar with a new pedagogy.

The government and policy makers need to chart out an economic and industrial agenda that makes engineering education relevant by providing well paid, globally competitive jobs that can absorb engineers from the IITs. Only this can spur the zest and excitement for learning in our campuses. That the IITs remain the most sought after institutions in the country should not engender a naive public view that students (and society) love engineering and that these premier institutes of learning are producing engineers who are driving the progress of the country. The reality is that the IITs are simply places which dominantly provide access to a hefty pay-package or a ticket to foreign shores, very likely, and tragically, without much connect with engineering or science.

Notes

1. Some excerpts, selected from the rather extensive documentation available on the ISI website, may be found here: http://www.che.iitb.ac.in/faculty/am/Public/JEE_2015/ISI_excerpts.html
2. Details of references cited in this quote may be read from the reference list in ref. 2.

1. http://mhrd.gov.in/sites/upload_files/mhrd/files/upload_document/Report-of-Committee.pdf
2. <http://www.currentscience.ac.in/Volumes/103/01/0029.pdf>
3. <http://www.ibnlive.com/videos/india/fac-the-nation-sibal-transcript-483508.html>
4. http://www.cbse.nic.in/attach/Normalization%20Formula_2013.pdf
5. <http://www.karnataka.com/education/exam-dates-cet/>
6. <http://admission.aglasem.com/bcece/>
7. <http://www.deccanchronicle.com/150120/nation-education/article/telangana-draws-its-own-common-entrance-test-dates>
8. <http://www.sarvgyan.com/articles/tnea-2015>
9. <http://admission.aglasem.com/entrance-exams/common-entrance-exams/>
10. <http://timesofindia.indiatimes.com/home/education/news/Maharashtra-back-to-CET-for-engineering-from-next-year/article-show/46239931.cms>
11. <http://www.dnaindia.com/india/report-as-maharashtra-government-sits-on-state-cet-decision-jee-coaching-classes-have-both-hands-full-2089513>
12. http://cbseaff.nic.in/cbse_admin_aff/writeraddata/2015-16Circular/Circular/Circular%20No.20.pdf
13. <http://timesofindia.indiatimes.com/home/education/news/CBSE-bans-coaching-for-JEE-schools-look-to-dodge-rule/articleshow/31127829.cms>
14. <http://www.raoiit.com/tie-ups.php>
15. http://www.business-standard.com/article/management/iit-jee-format-a-boon-for-coaching-schools-112070500020_1.html
16. <http://www.thehindu.com/news/cities/chennai/coaching-centres-score-after-jee-changes/article4310297.ece>
17. http://www.business-standard.com/article/economy-policy/no-slowdown-for-iit-coaching-institutes-despite-new-jee-pattern-s-stress-on-xii-114110600021_1.html
18. <http://iitandkota.blogspot.in/p/15-tips-to-cheat-at-mcqs-in-iit-jee.html>
19. http://articles.economicstimes.indiatimes.com/2014-05-25/news/50083583_1_iits-computer-science-cornell
20. <http://indianexpress.com/article/india/india-others/bihar-cheating-happened-last-year-too-no-one-noticed/>
21. <http://www.mid-day.com/articles/cheating-free-exams-not-possible-in-bihar-says-bihar-education-minister/16076174>
22. <http://www.hindustantimes.com/education-news/jee-mains-ranks-declared-normalization-formula-frustrates-many-students/article1-1238197.aspx>
23. http://www.telegraphindia.com/1130801/jsp/nation/story_17182255.jsp#.VW1Nv82Ud9N
24. http://www.isical.ac.in/~jeexiscore_normal/
25. <http://www.cse.iitk.ac.in/users/dheeraj/jee/ISI-report-aug11.pdf>
26. <http://www.hindustantimes.com/education-news/iit-admn-reforms-panel-ignored-experts-concerns/article1-882375.aspx>
27. <http://www.hindustantimes.com/high-school/countrywide-girls-outshine-boys-in-icse-and-isc-results/article1-1348426.aspx>
28. <http://www.hindustantimes.com/high-school/cbse-to-announce-class-12-results-on-monday/article1-1350799.aspx>
29. <http://timesofindia.indiatimes.com/city/mumbai/87-9-is-Maharashtra-HSC-best-score-in-a-decade/articleshow/47449548.cms>
30. <http://www.eenadunews.in/2015/05/tamil-nadu-12th-toppers-2015-tn-2-ranks.html>
31. <http://timesofindia.indiatimes.com/home/education/news/New-poor-score-in-boards-Anything-less-than-90/articleshow/47762882.cms>
32. <http://blogs.timesofindia.indiatimes.com/toi-edit-page/inflated-grades-deflated-education/>
33. http://img.asercentre.org/docs/Publications/ASER%20Reports/ASER%202014/fullaser2014mainreport_1.pdf
34. <http://indianexpress.com/article/india/india-news-india/an-express-series-part-one-why-an-18-yr-old-signs-off-her-note-mein-aaj-apni-life-khatam-karti-hoon/>
35. <http://indianexpress.com/article/india/india-news-india/kota-coaching-factory-panic-calls-14-hr-days-morning-night-mares/>
36. <http://indianexpress.com/article/india/india-news-india/school-system-is-the-reason-why-kota-will-remain-necessary-evil/>
37. <http://www.thehindu.com/news/national/states-not-centre-should-regulate-coaching-centres-hrd-ministry-files-affidavit-in-supreme-court/article6332125.ece>
38. <http://www.iitianspace.com/education-abroad/mumbai-education-abroad.php>
39. <http://issues.org/18-2/atkinson-2/>
40. <http://indianexpress.com/article/india/india-news-india/42-in-kharagpur-roorkee-39-in-bombay-faculty-short-across-iits/>
41. <http://timesofindia.indiatimes.com/home/education/news/Ministry-of-HRD-has-shrunk-budgets-of-IITs-to-re-distribute-these-to-create-new-IITs-Dr-VK-Saraswat/articleshow/49638346.cms>
42. <https://casi.sas.upenn.edu/iit/anuragmehra> or <http://www.thehindubusinessline.com/opinion/the-iits-have-lost-their-way/article6350641.ece>
43. <http://www.thehindu.com/opinion/lead/the-impact-of-institutional-decay/article-6410189.ece>
44. <http://www.hindustantimes.com/India-news/NewDelhi/IIT-JEE-tilted-towards-CBSE-4-cities/Article1-1109564.aspx>
45. <http://archive.indianexpress.com/news/iit-jee-success-skewed-in-favour-of-urban-high-income-students/1152700/0>
46. <http://forbesindia.com/blog/technology/iit-jee-distortion-why-cbse-rich-urban-students-fare-better>
47. http://www.telegraphindia.com/1120609/jsp/nation/story_15589082.jsp

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