

## Improving Freshman Students' Success Using "Tracking"

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# **“Ability grouping” led to an improvement in the academic success of first year students in an Indian college**

## **Introduction**

The most difficult challenge for teachers is to ensure value-addition to all their students, despite variations in students' cognitive abilities, emotional stabilities, and motivation levels. As the variations increase, difficulties of teachers increase. One solution is to reduce the variation by “ability grouping” or “career tracking” students, a method that was used in high schools. to "Ability grouping" is proven effective by multiple researchers" [1-4]. There are alternate views, too, such as Han [5] showing clear evidence that early tracking increases educational inequality; supplemented with weaker evidence that it reduces performance. Van Elk et al. [6] found that early tracking has a detrimental effect on completion of higher education for students at the margin of the Dutch high and low tracks, and the negative effects of early tracking are larger for students with relatively high ability or students with a higher socioeconomic background.

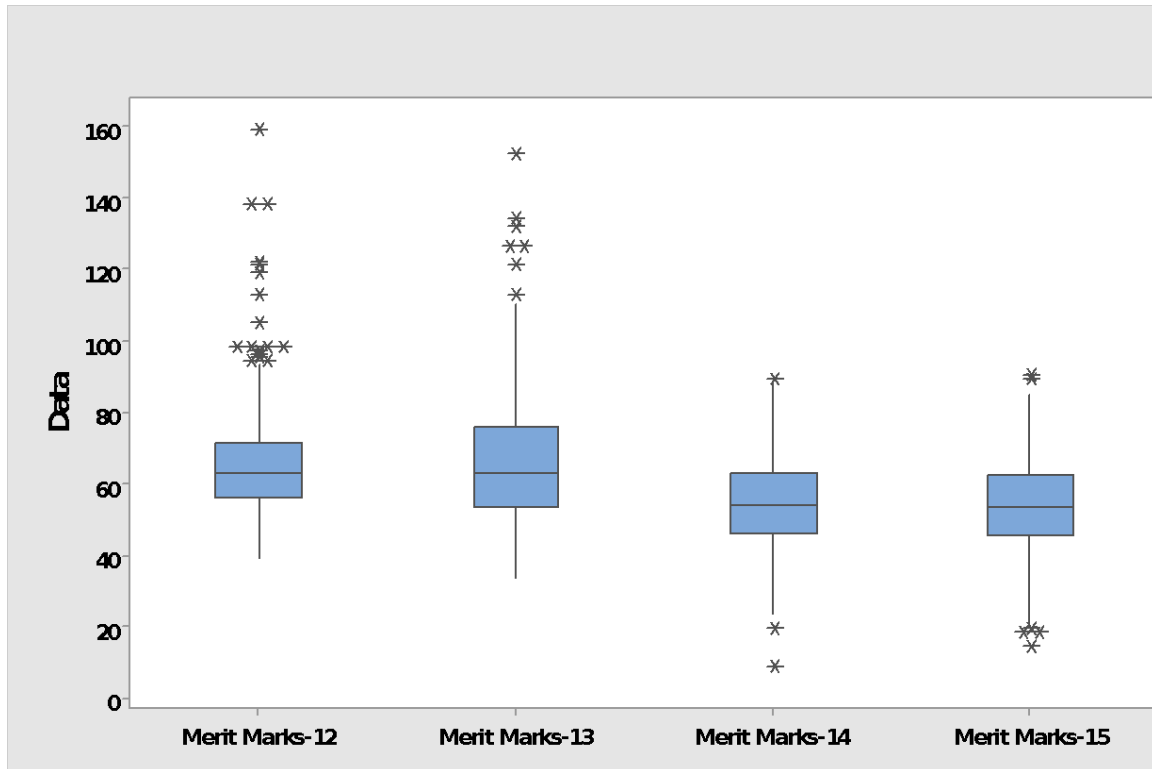
Tieso [1] defines grouping types such as between-class Joplin grouping that involves pre-assessment of specific skills and prior knowledge and assignment of students to a different teacher for instruction in that skill or content area. She also cautions that grouping practices alone will have only small to moderate effects on achievement, if they are not complemented with appropriately modified and differentiated curricula. Page [2] points out that permanent assignment to segmented groups can lead to vicious cycle of lower expectations from teachers and students. Gamron suggests re-grouping based on reassessment of students' capabilities and enabling students to cover gaps in learning using tutorials. He describes tracking as “curriculum tracking” and grouping as “ability grouping” [7]. For the remainder of the discussion, we will use the word “ability grouping” to connote both “ability grouping” and “career tracking”.

Interestingly, all this research is carried out in the high school systems and not in any post-secondary, and specifically in engineering systems. We believe that the ability grouping concept was used exclusively in school systems due to the wider variation in the abilities of students present in a typical high school system. We have a similar situation in many engineering colleges in India. The college freshman students have a wide spectrum of cognitive abilities, which is indicated by their performance at the entrance examinations. At our college, the examination marks ranged between 20 to 120 (out of 200) over the four years of study. Every year, the ratio between the highest and lowest marks was not less than 4. Figure 1 shows the details of the scoring pattern of the students admitted at our college over the last four years. Further, freshman passing percentages at our college were in lower 30s during the academic years 2010-11 to 2012-13. This motivated us to think of “ability grouping” to increase the passing percentage in the academic year 2013-14.

## **India's higher education system**

India's higher education system is the third largest in the world, next to the United States and China [8]. Its main governing body at the tertiary level is the University Grants Commission (UGC), which enforces standards and oversees functioning of the universities [9]. These universities have a set of affiliated colleges in designated regions and are responsible for overseeing functioning of the colleges including accreditation, and management of diverse academic activities such as initiation of education programs,

enforcement of present curriculum, and supervision of examinations. AICTE (All India Council of Technical Education) governs the technical education system in India, which in 2016-17 had 3,291 institutes with an intake of 15,56,360 students, but enrolment of 7,78,813 students [10]. The employability of these students upon graduation, though, was abysmally low at 18% [11].



**Figure 1: Box plot of scoring pattern, at the entrance examinations, from 2012 to 2015, at our college**

## Method

We formed divisions as per entrance examination scores and allocated better teachers to divisions with poor performers. The teachers were asked to follow the mastery approach i.e. focus more on understanding. We kept the same divisions for all courses. s based on consistent student evaluations of teaching effectiveness and performance of their students in university examinations. Kulik et al. [12] did meta-analysis of findings from 108 controlled evaluations to conclude that mastery learning programs have positive effects on the examination performance of students in colleges. Further, they found that the effects appear to be stronger on the weaker students in a class, and they also vary as a function of mastery procedures used, experimental designs of studies, and course content.

Since performance of students in previous examination decides their ability to understand topics in current classes, we requested the teachers to study details of the past performances of their students (high school courses and performances, therein, performances at other competitive examinations) and plan their courses accordingly. They introduced tests to assess students' understanding of pre-requisite topics and developed course plans including the use of appropriate pedagogical methods. For each class, the same teacher was responsible for both lectures and tutorials, which facilitated more contact time with the students resulting in better academic integration. The teachers prioritized learning (as assessed by the students' responses in classes and tutorials, performance in assignments and tests) over completion of

the syllabus. Students were engaged during tutorials with ability-appropriate challenges that were supplemented by adequate support. The tutorial batch sizes had approximately 20 students that allowed the faculty to provide personalised support to all the students. In the second semester, we regrouped students based their academic performance in the first semester.

The “ability grouping” method and its rationale was explained to the students at the beginning of the semester. All students were made aware that their allocation to lower divisions is for their benefits, is not permanent, and will change as their performance improves, which helped counter their potential demotivation. While we faced students’ resistance in the first year of deploying the method, students experienced the benefits and accepted the system in the latter years. We also had a contingency measure in place to tackle potential demotivation - a local guardian system. As per the system, each faculty member takes up responsibility of around 20 students to work on their academic, social and professional integration.

## Results

We introduced the “ability grouping” in the academic year 2013-14 and found passing percentages increasing every year by around 4%, with the university passing percentages languishing at the same levels as before (Table 1). Prior to 2013-14, our passing percentages were approximately the same as that of university passing percentage. The table below provides percentages for 2012-13. (Table 1). It is worthwhile to mention that in a university affiliated system, the university sets syllabi and supervises end semester examinations, which contributes to 80% of the final assessment, resulting in valid comparison of performances of different university colleges.

**Table 1: Passing percentage of freshman students at our college and the university**

| Particulars               | AY 2012-13 | AY 2013-14 | AY 2014-15 | AY 2015-16 |
|---------------------------|------------|------------|------------|------------|
| Ability grouping          | NO         | YES        | YES        | YES        |
| Number of students        | 494        | 460        | 422        | 371        |
| Number of passed students | 193        | 167        | 170        | 164        |
| Our college passing %     | 33         | 36         | 40         | 44         |
| University passing %      | 29         | 27         | 29         | 26         |

We also checked the impact of the quality of intake students on the performance improvement. We had two parameters to check the quality – marks or ranks at the entrance examinations. In India, the government conducts entrance examinations and controls admission processes for all government and private colleges. The process has undergone some changes over these four years. In the academic year 2012-13, the process used the state level Common Entrance Test (CET) and state level ranks, whereas for the academic year 2013-14, it switched to the national level Joint Entrance Examination (JEE) marks but continued using state level ranks. We have, therefore, used the state level ranks to compare abilities of the incoming students. We believed it fair to assume that the cohorts of more than 100,000 students for different years would be statistically similar and decided to use ranks to check the quality of intake.

Further, there are multiple admission channels. While most of the admissions happen through the state admission process called Centralized Admission Process (CAP), some

happen through the national admission process and some others through a management quota. While the national and state governed admission systems have different ranks and cannot be compared, the management quota admissions are not based on any examination. The study includes only those students who were admitted through the state government admission process but excludes students who joined through other two channels. We provide the numbers of admissions through the three channels in the four years under study in Table 2.

**Table 2: Number of students through different admission channels**

| <b>Admissions through</b>  | <b>AY 2012-13</b> | <b>AY 2013-14</b> | <b>AY 2014-15</b> | <b>AY 2015-16</b> |
|----------------------------|-------------------|-------------------|-------------------|-------------------|
| National level process     | 78                | 79                | 39                | 38                |
| Management quota           | 31                | 18                | 10                | 26                |
| <b>State level process</b> | <b>494</b>        | <b>460</b>        | <b>422</b>        | <b>371</b>        |
| Total                      | 603               | 557               | 471               | 435               |

Using Minitab 18.0’s two-tailed t-test, we compared the ranks of the students, who were admitted through the state government admission process CAP, in all the four years (Figure 2). We found that there was no variation between 2012-13 and 2013-14 (p-value 0.1), and 2014-15 and 2015-16 (p-value of t-test was 0.71). However, there was a significant variation between 2013-14, and 2014-15 (p-value of t-test was 0.00). While we agree that we do not have a clear evidence of the same intake quality over the four years, we also did not have notable variations. As the college results show significant positive trends, more students tend to choose better performing colleges, which could have contributed to a major change in 2014-15. Since it is a competitive admission system, other factors such as opening of new colleges / closing of earlier colleges, changes in facilities and fee structures of other colleges influence the admission process. We are intrigued by the fact that the change in the intake quality in the academic year 2014-15 did not result in higher increase in the passing percentage of our college. It needs further study to ascertain the reasons. Nevertheless, it is fair to assume that the “ability grouping” has contributed to the changes in passing percentages.

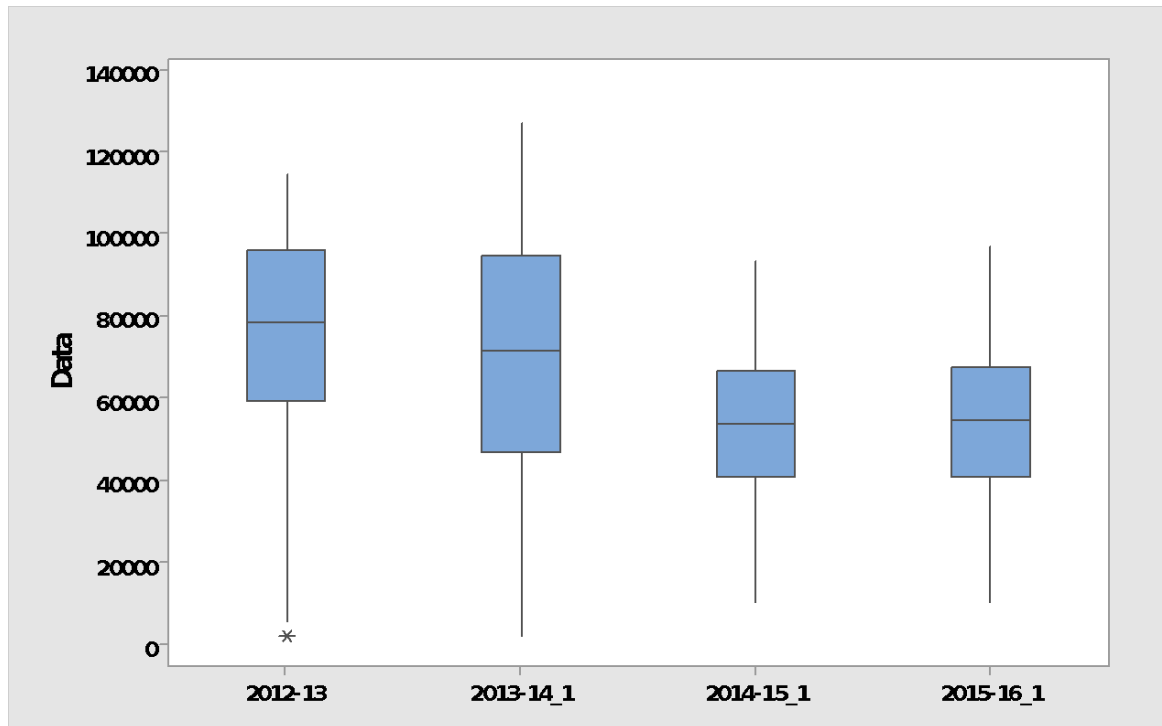
We attribute the steady increase in the passing percentages of students (4% every year) to maturity of the “ability grouping” system. The teachers would have become adept at using various aspects of the system such as assessing students’ capabilities, finding challenges of varying difficulty levels, coming up with new ways to teach difficult concepts.

### **Conclusion**

The paper discusses the “ability grouping” method at an Indian rural engineering college, which had very wide variations in performances as measured by entrance examinations ranks and wanted to improve its passing percentage. Over three years of implementation, the method did provide the expected result and the passing percentages steadily climbed by 4% every year to reach 44% in the academic year 2015-16.

The “ability grouping” is not researched in higher education but only in high school education, wherein researchers do not recommend tracking due to the fear of alienating and demotivating poor performers, and the lack of benefits of role modelling and guidance from better performers. We don’t deny that; however, we argue that more factors come into play and influence class dynamics when the learning abilities of students vary significantly. In regular

divisions of relatively better performing students, poor performers fail to understand lectures, hesitate to ask questions to teachers or peers due to the fear of micro-aggression, and lose interest in the course and program. This is especially true when the teaching relies more on traditional lecturing, and evaluation primarily relies on comprehensive examination. On the other hand, when the poor performers are a part of a separate division, where they receive adequate support, they may learn better, feel better, and perform better. We argue that “ability grouping” can be used even in other branches of higher education, provided they have wider variations in students’ performances.



**Figure 2: Box-plot of ranks of the students, admitted through the state government admission process CAP in academic years 2012-13 through 2015-16**

We addressed the potential risks of possible demotivation and alienation of lower division students by using a fall-back system - a local guardian system. We need to analyse the interactions that the local guardians had with students on this issue. We agree that the poor performers may have to rely on other mechanisms such as ‘out of class’ interactions using their social network to get benefits of role models and guidance from better performers.

The lower performing divisions may not be able to cover the entirety of the prescribed syllabus. Further, the students of those divisions may not be able to self-learn uncovered topics and may have trouble fulfilling prerequisites for the next course(s). This certainly is a drawback; however, the situation may not be different, if we don’t adopt this method. As discussed earlier, poor performers may have inadequacies in their learnings in mixed classes and may not be able to fulfil the pre-requisites. To minimize this impact, we encourage better students to undertake self-learning in summers. However, we agree that this does not completely take care of the issue.

There is also the lack of effective and easy to use “ability grouping” methods. Grouping based on aggregate performance may give rise to issues in individual courses. A student with overall poor performance, may be very good in a course. Therefore, it would help to do grouping based on requirement of individual courses. However, this entails logistical

challenges in managing different groups for each course and we will have to find solutions to overcome them. Also, we need to explore using different assessment methods such as concept inventories to know preparation of students for different courses. We need to be sensitive to the efforts involved in such exercises and availability of the required resources.

Many educators favour integrating classrooms as opposed to tracking. However, successful integration requires highly skilled teachers, who can address needs of students at different skill levels and who can truly practice active and cooperative learning. Due to a paucity of such skilled teachers, implementing integration across the college is not viable. We are working on developing teachers with better pedagogical skills and ability to use more evidence based strategies, however it will require some time.

There are reports on early tracking in schools having adverse impact on inequality and time required for completing the higher education. Since we have been practicing this method for the last 4 years, we need to study the long-term impact of grouping on the students from the early batches. It would be also beneficial to qualitatively analyse students' and teachers' perspectives including the impact of the method on self-efficacy and engagement of the "ability grouped" students.

We don't deny that the "ability grouping" is a controversial method. Further, we don't have a strong enough evidence of its success at our college. However, the steady improvement in the academic performance over the last four years prompted us to share our findings and open a discussion on this atypical practice.

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