

## **Suggestions for modification of Basic Algebra Syllabus**

### ***Objective:***

Motivate students to study in a way that ensures

- medium term learning sufficient to perform well on the final assessment
- long term learning so they are able to use the mathematics they learn well beyond the end of the course

### ***Observed impediments to achieving the objectives:***

- Perceived unwelcoming atmosphere in Emporium
  - o reports of rude instructors; dismissive, impatient assistants; goldfish bowl
  - o food and drink restrictions
  - o electronic device restrictions (music)
- Student reluctance to ask questions of assistants
- Resentment of our hour and progress requirements
- Cramming before final assessments/insufficient spacing of learning
- Students generally do not use the non-assessment review opportunities in ALEKS
- Inappropriate use of devices like calculators
- Other types of cheating
- Progress rates outside the “sweet spot” of 3-5 topics learned per hour
  - o excessively low progress rate (e.g. fewer than 2 topics per hour) strongly associated with poor performance
  - o excessively high progress rate (e.g. more than 6 topics per hour) also associated with poor performance
- Insufficient time on task
  - o numbers of students with D/F/W would be slashed by 50% if these students worked one extra hour a week

### ***Assessment issues reported or observed last year***

- Students resent having to relearn topics that are not confirmed as mastered in the progress assessments
- Some students show very substantial drop-back on the final assessment
  - o often linked to cramming, at the end or in waves
  - o sometimes linked to enormous numbers of hours
  - o sometimes linked to cheating in progress assessments and/or provisional mastery judgments
  - o sometimes linked to excessively slow learning progress (anything lower than 2 topics an hour is a red flag; normal progress should be 3-5 topics an hour)

**I'm going to list some proposals to change how we run the Emporium. The aim is to improve motivation by relaxing rules that have caused problems, introducing rewards for achievement and effective learning strategies, and removing penalties.**

**Our experience last year was that penalties are not effective; other institutions report the same; motivation experts agree.**

### ***Atmosphere Improvement Proposals:***

- **Allow electronic devices in the Emporium** except for mass assessment days, but:
  - No loud music
  - Nicely remind students that cheating will bite them in the butt later
- **Allow progress assessments from anywhere:**
  - Permits reasonable progress in new scheduling format
  - Already done at some of the RCs for this reason
- **Remove the overall hour and topic requirements:**
  - Hours are not good predictors of success
  - Topics are good predictors of success, but penalties have not been effective
- **Promote high initial assessment performers immediately:**
  - The very few students who score very high on the initial assessment should be moved immediately to the next level
  - Suggest 85% as the threshold – literally a handful of students affected
  - Students who initially scored at a very high level level tended to do very little work

### ***Learning Improvement Proposals:***

- **Strongly encourage low initial assessment performers to drop back immediately to the previous course:**
  - Success rates were very low (ABC rates below 50%, often well below) for students with initial assessment *topics* (not percentages) below:
    - 30 in 10021 (but students below 50 are at risk in 10022)
    - 100 in 10022 (remember 154 of the 256 topics come from 10021)
    - 40 in 10023 (but students below 60 should be monitored carefully)
    - 40 in 10024
  - This will be a hard sell, but the students who do not drop back are unlikely to succeed without substantial effort. It's not impossible, but it does require great dedication
- **Insist on the importance of spaced learning and offer *incentives* for this**
  - **Progress target of 20 topics per week**
    - This should be a target, not a requirement - with rewards for achieving the goal, but no explicit penalties for falling short
  - **Reward consistent Emporium participation in weeks 2 through 6**
    - ***One participation point for each week with 3 hours recorded in the Emporium (MAX 5 PARTICIPATION POINTS)***
      - Full class attendance is 3 hours 20 mins
      - Data can be generated and recorded automatically from Excel downloads

- **Reward consistent work outside the Emporium in weeks 2 through 6**
  - ***One homework point for each week with 3 hours recorded beyond an initial 3 hours in the Emporium (MAX 5 HOMEWORK POINTS)***
    - D/F/W and F/W rates would have been halved if weaker students had worked one more hour a week; most worked fewer than 5 hours a week
    - Data can be generated and recorded automatically from Excel downloads
  
- **Schedule two proctored assessments in the Emporium and provide up to 5 BONUS POINTS for good progress**
  - This helps space out the learning and will motivate the 20 topics per week target
  - Suggested schedule:
    - First assessment at the end of week 3 (session 6 if class periods are 100 mins)
      - Could be either progress or comprehensive
    - Second assessment at the beginning of week 6 (session 11 if class periods are 100 mins)
      - Should be comprehensive to practice for the final
  
- **Reward confirmed gains in the pie on scheduled assessments with BONUS points**
  - ***First scheduled assessment:***
    - ***1 point for 40 topic gain since initial assessment***
    - ***2 points for 50 topic gain since initial assessment***
    - ***Max of 2 BONUS points for first scheduled assessment***
  - ***Second scheduled assessment:***
    - ***1 point for 80 topic gain since initial assessment***
    - ***2 points for 100 topic gain since initial assessment***
    - ***3 points for 120 topic gain since initial assessment***
    - ***Max of 3 BONUS points for second scheduled assessment***
  - Data can be generated and recorded automatically from Excel downloads
  - The rules for the second assessment do allow procrastinators some leeway, but better for them to start work for a week 6 assessment than for a week 8 assessment
  
- **Reward review**
  - ***Allow two attempts on the comprehensive final assessment provided there is at least one day and 5 ALEKS hours or a gain of 10 topics between assessments***

**Computation of final grade:**

- **Threshold condition: students can only earn a C or better if they score at least 73% on their best final assessment**
- **Grades for students scoring 72% or less on their best final assessment are computed directly from this score on the usual grading scale; all attendance, homework, and bonus points are forfeited**
- **Grades for students scoring 73% or more on their best final assessment are computed on the usual grading scale from the percentage**
  - **The greater of best final assessment and  $(total\ points/110)*100$**
  - This can be computed automatically
  - Total points are the sum of best final assessment score, bonus points, participation points, and homework points
    - Final assessment up: to 100 points
    - Emporium participation: up to 5 points
    - Homework: up to 5 points
    - Performance bonus points: up to 5 points

**Impact of rewards and bonuses on grades:**

- No impact for grades of C- or lower (72% or lower on final assessment) because of the threshold condition
- For students scoring at least 73% on the comprehensive final assessment, there are 10 possible participation and homework points and 5 possible bonus points. Any grade increase will be hard earned. The table below should not be publicized.

Score on final assessment (lower cuts for the grade)	Grade on final assessment	Points needed to trigger grade increase
73	C	12
77	C+	11
80	B-	11
83	B	13
87	B+	12
90	A-	12
93	A	-

**Data on Student Performance – Incoming Freshmen Placed by ALEKS**

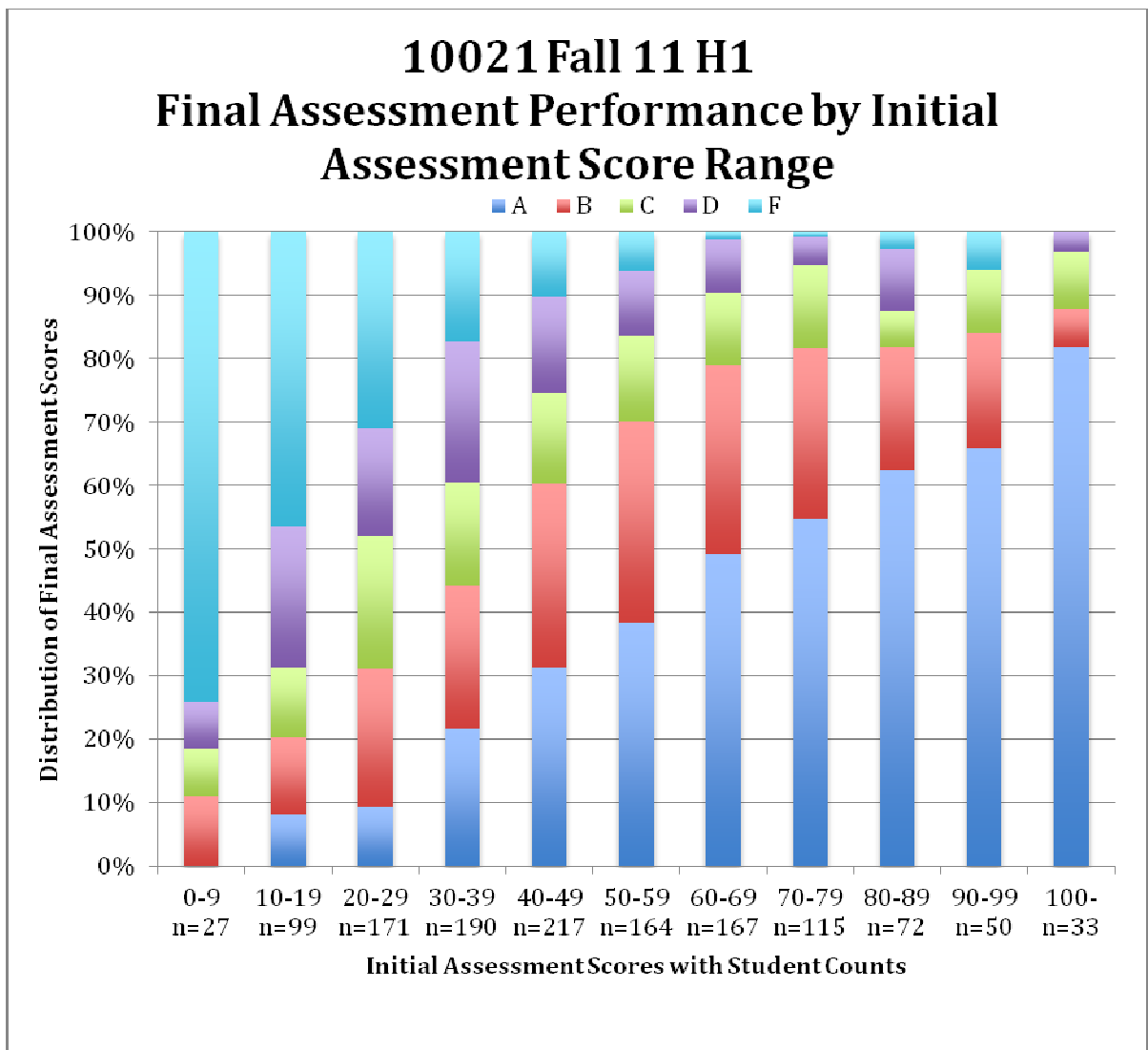
**10021 Fall 11 H1: 1305 students placed by ALEKS**

**- At least 200 should have been in 10020 according to the placement guidelines**

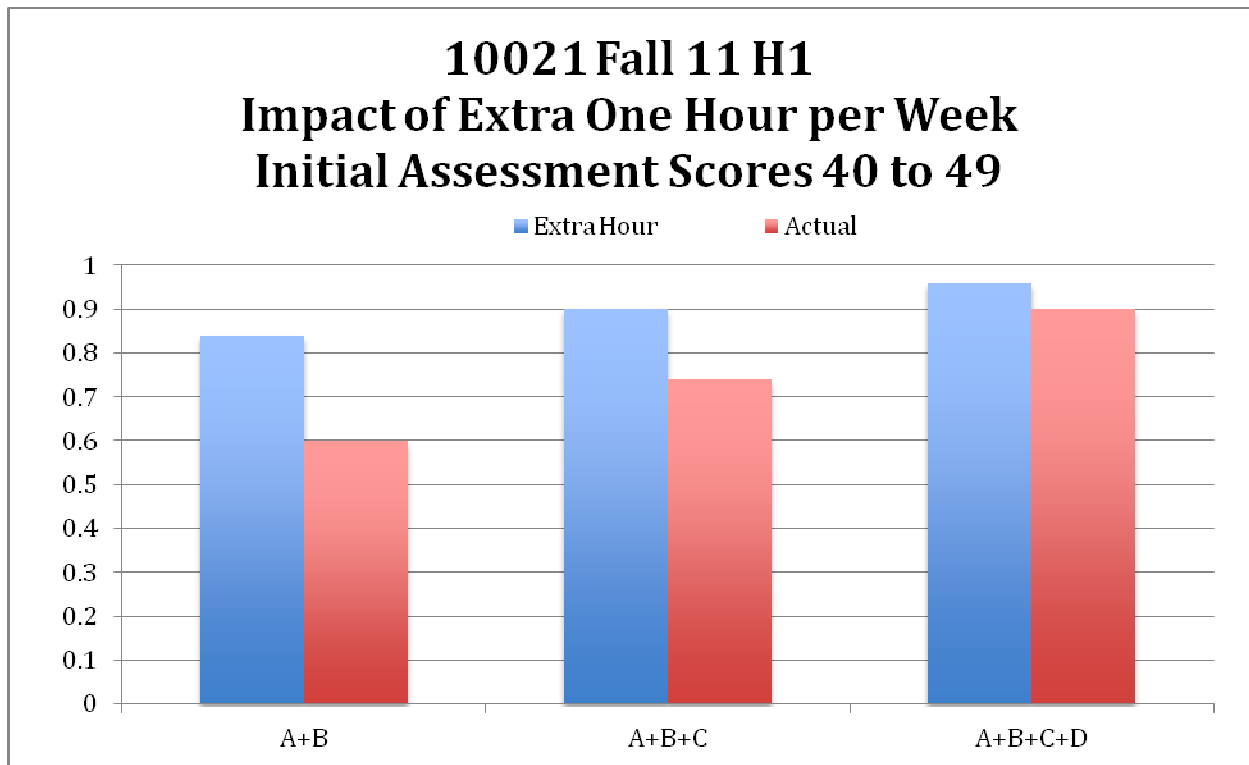
**10023 Fall 11 H1: 1487 students placed by ALEKS**

**- At least 120 were should have been in 10022 according to the placement guidelines**

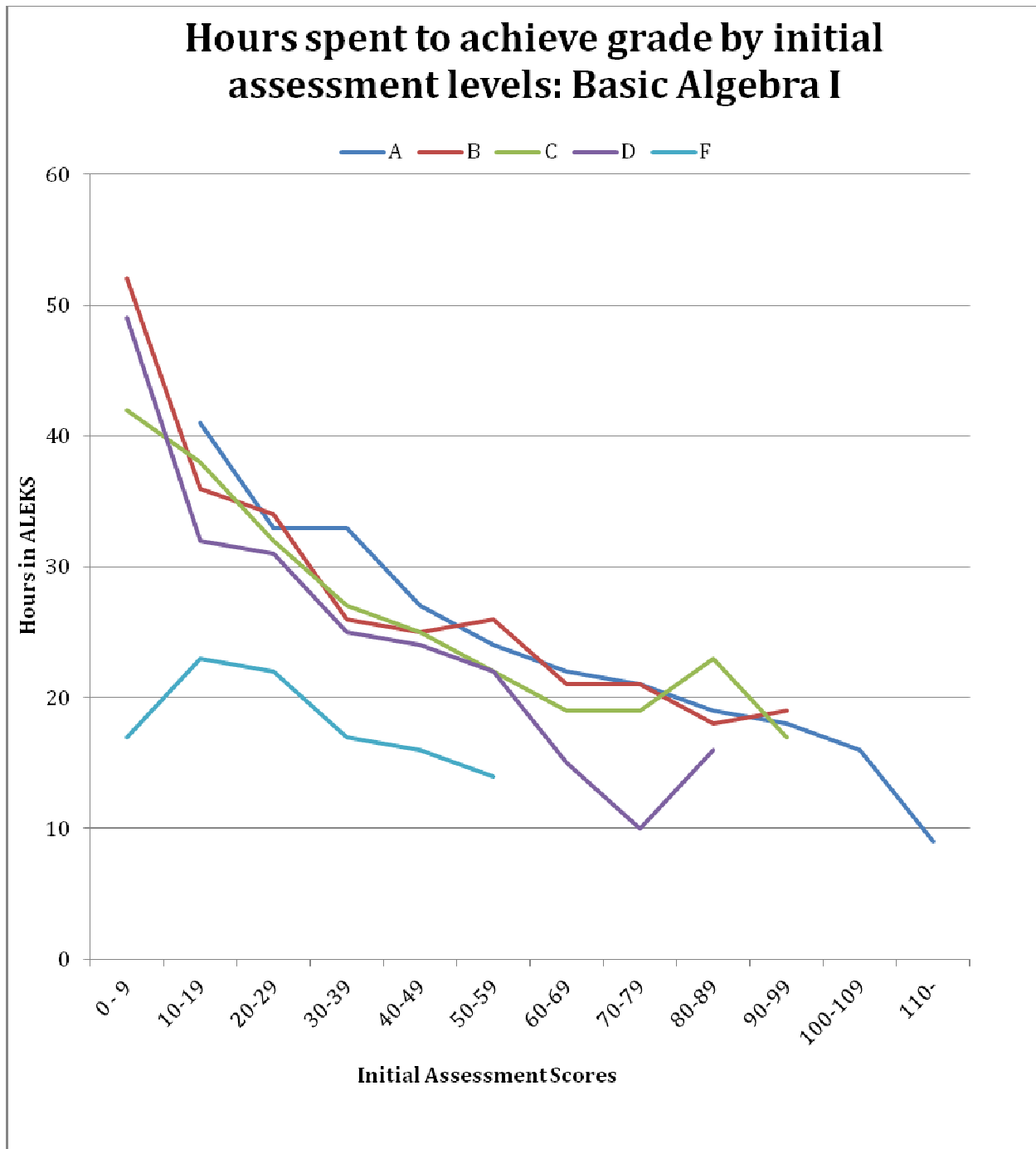
The chart below shows how initial assessment scores (horizontal axis; number of known topics out of 154 total topics) related to final assessment score distribution (vertical axis; A: 90%-100%; B: 80%-89.9%; C: 73%-79.9%; D: 60%-72.9%)



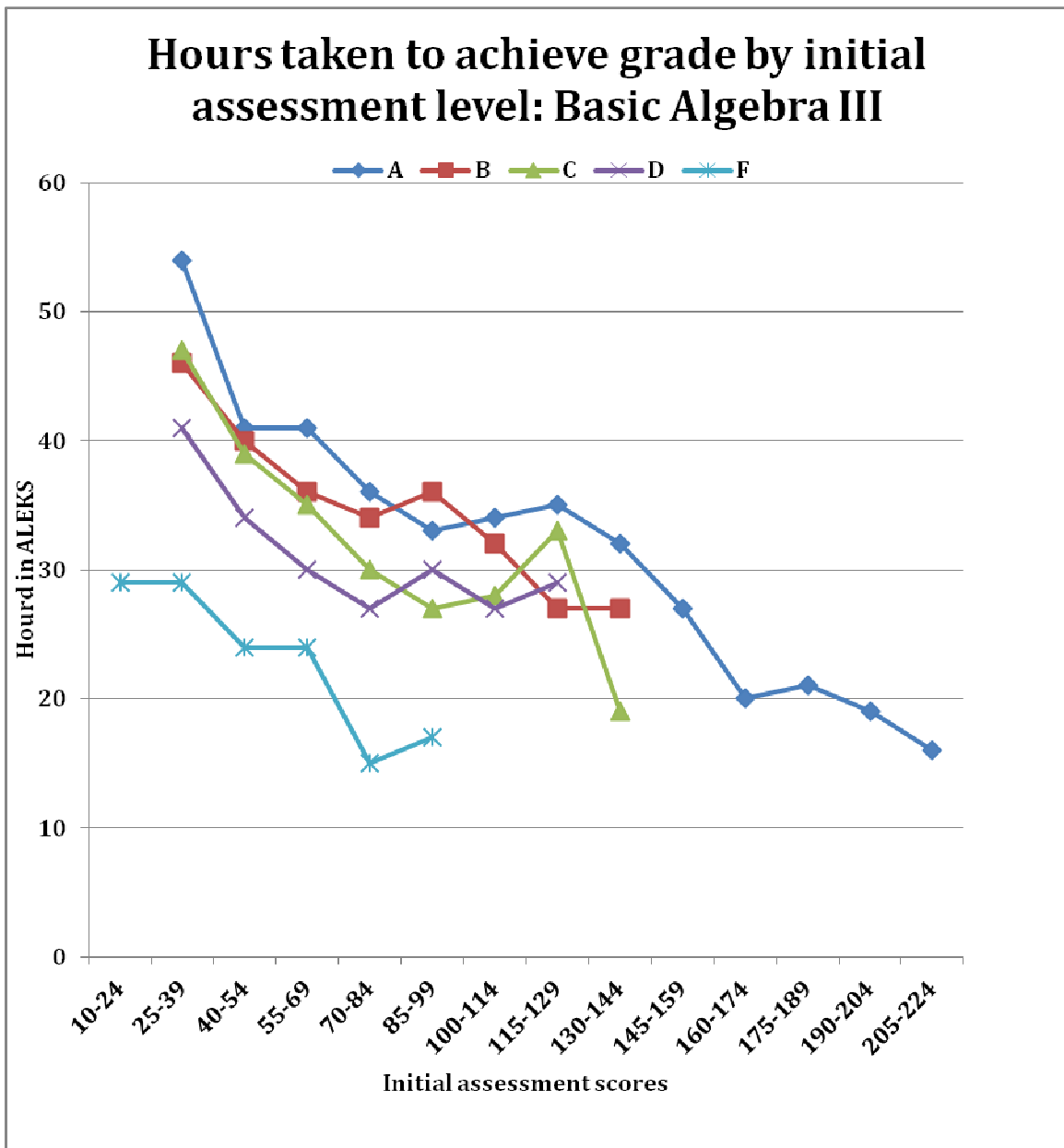
- The ABC rate is unacceptably low for students with initial assessment scores below 30
- **Recommendation: Students scoring below 30 on the initial assessment in 10021 should be strongly encouraged to drop back to 10020**
  - Recommendations for other courses are based on similar data
- The ABC rates increase rapidly as initial assessment scores increase, leveling off at about 85%-90% for the approximately one-half of the students with initial assessment scores at least 50. The ABC rates exceed 75% for the approximately two-thirds of the students with initial assessment scores of at least 40
- The AB rates are close to flat at about 80% for the approximately one-third of the students with initial assessment scores of at least 60; they exceed 70% for initial assessment scores of at least 50
- **University data indicates that for 10021 students to have a good chance of success in 10022, they should earn at least a B in 10021**
  - This indicates that students with an initial assessment score in the range 40 to 49 are seriously at risk for failure in the next course
  - The situation would change dramatically if they worked an extra 5 hours in ALEKS over the duration of the course



- **Recommendation: Identify and monitor 10021 students with initial assessment scores below 50 and very strongly encourage a work schedule to keep them on track to learn at least 20 topics per week. This should be an objective for all students, but this category of student may need to step up their hours to achieve the target.**
  - Similarly justified recommendation for 10023 students with an initial assessment score below 60.



- The chart above for 10021 shows that average time spent in ALEKS for students at different initial assessment levels to achieve the final assessment levels indicated.
  - A means at least 90% on the final assessment, B 80% to 89.9%, C 73% to 79.9%, D 60% to 69.9%.
  - These average times were mostly well below the 40 hours required.
  - Strikingly the average times spent did not differ significantly by grade.
- ***This indicates that a time requirement is ineffective and serves to penalize students who perform well, without motivating students who perform poorly.***
- The corresponding chart for 10023 tells a similar, though less extreme story.





- Initial assessment levels predict final assessment levels up to a point
  - Hours in ALEKS don't seem to predict much
  - Learning rate does relate to final assessment levels, but not in a completely straightforward way.
  - The table below is for 10023; similar patterns hold in 10022.
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- Students who learn fewer than 2 topics an hour have very poor success
  - Students who learn more than 6 topics an hour have worse success than students who learn fewer topics per hour
  - Across the courses, students seem to perform best when their learning rate is between 3 and 5 topics per hour; for 10023, the sweet spot seem to be 4 to 5 topics per hour.
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- **Recommendation: monitor students who learn fewer than 2 topics an hour and recommend they work with tutors.**

