of Parental Involvement on Eighth Grade Achievement," *Sociology of Education*, Vol. 69 (1996), pp. 126-41; V.E. Lee and J.B. Smith, "Effects of School Restructuring on the Achievement and Engagement of Middle-Grade Students," *Sociology of Education*, Vol. 66 (1993), pp. 164-87; J.D. Willms, *Monitoring School Performance: A Non-technical Guide for Educational Administrators* (Lewes: Falmer Press, 1992).

11. H.M. Levin, "Accelerated Schools for Disadvantaged Students," *Educational Leadership*, Vol. 44, no. 6 (1987), pp. 19-21.

12 N.A.Madden, R.E. Slavin, N.L. Karweit and B.J. Livermon, "Effective Pullout Programs for Students at Risk," in R.E. Slavin, N.L. Karweit, N.A. Madden (eds.), *Effective Programs for Students at Risk* (Needham Heights, MA: Allyn & Bacon, 1989).

13. J.P. Comer, *School Power* (New York: Free Press, 1980); J.P. Comer, "Educating Poor Minority Children," *Scientific American*, Vol. 259, no. 5 (1988), pp. 42-48.

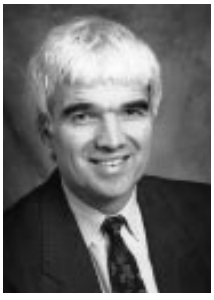
14. J.A. King, "Meeting Educational Needs of At-Risk Students: A Cost Analysis of Three Models," *Educational Evaluation and Policy Analysis*, Vol. 16, no. 1 (1994), pp. 1-19.

15. J.D. Coie and M.R. Jacobs, "The Role of Social Context in the Prevention of Conduct Disorder," *Development and Psychopathology*, Vol. 5 (1993), pp. 263-75; H. Yoshikawa, "Prevention as Cumulative Protection: Effects of Early Family Support and Education on Chronic Delinquency and its Risks," *Psychological Bulletin*, Vol. 115 (1994), pp. 28-54.

16. J.D. Hawkins and D.M. Lishner, "Schooling and Delinquency," in E. H. Johnson (eds.), *Handbook on Crime and Delinquency Prevention* (New York: Greenwood, 1987), pp. 179-221.

17. S.W. Raudenbush and W.S. Chan, *Growth Curve Analysis in Accelerated Longitudinal Designs with Application to the National Youth Survey* (East Lansing, MI: Michigan State University, 1991).

J. Douglas Willms is Professor and UNB/CIAR Research Chair, Atlantic Centre for Policy Research in Education, University of New Brunswick. **Elizabeth Sloat** is Research Associate, Atlantic Centre for Policy Research in Education, University of New Brunswick.



J. Douglas Willms

Elizabeth A. Sloat

by Kelly Bedard

STREAMING AND INEQUALITY: WHO WINS?

La répartition des étudiants en classes homogènes est un élément important de la politique d'éducation. L'âge des étudiants au moment d'être répartis en classes spécialisées et leur ventilation parmi les différentes classes ont une influence sur leurs résultats. Compte tenu de la variété des structures éducationnelles qui existent et de l'influence qu'exerce l'éducation sur l'accès des étudiants au marché du travail, il importe d'examiner les institutions auxquelles les enfants sont exposés avant d'être assez vieux pour faire leurs propres choix en matière d'éducation et de carrière. L'auteure trace un portrait de ce que nous savons au sujet de l'impact de la répartition en classes homogènes sur les résultats des étudiants.

Streaming is an important element of educational policy. Both the age at which students are streamed into specialized programs and the proportion of students placed in each stream influence student outcomes. Given the variety of educational structures that exist, and the influence that education has on labour market outcomes, it is important to examine the institutions that children are exposed to before they are old enough to make their own academic and career choices.

Most child-oriented institutions sort children into

"ability" specific groups at a relatively early age. Schools sort children into ability specific reading groups or classes, and sports leagues typically select the most promising young athletes from the intra-city (house) leagues to play on inter-city representative (rep) teams. These types of streaming mechanisms affect both the skills children accumulate and their own perception of their abilities.

While streaming is common, its long-term effects are not always well understood. Allen and Barnsley provide a good example. They show that relative age plays an important role in determining minor hockey team selection for young children, and that the oldest children within each cohort are more likely to have successful hockey careers. This results because the substantial variation in maturity within young cohorts makes it more likely that older children are selected for more competitive teams. Since these teams attract the best coaches, are allocated more practice time and play against higher caliber opponents, competitive team members acquire more hockey skills and increase their probability of being selected for competitive teams in the future. Team composition therefore continues to reflect the initial age effect long after maturity is a relevant selection factor. In 1982/83, 62 percent of NHL players had birthdays during the first half of the year compared with 50 percent of the Canadian population at large.[1]

Although the Allen and Barnsley hockey example clearly illustrates the potential impact of streaming, this institution reaches far beyond youth athletics. It is educational streaming that has the greatest long term implications. It is therefore imperative that certain fundamental questions regarding streaming mechanisms be addressed.

• How early in the educational process should streaming take place?

• How flexible should streaming be?

• Should stream placement decisions be re-evaluated at one, or more points after streaming?

• How big should pre-university streams be relative to more vocationally oriented programs?

Different countries (or regions) have come to very different conclusions. Some countries have rules designed to rigidly sort students into ability groups based on test scores, while other systems are designed to more subtly, and sometimes less rigidly, separate students into reading groups and later into "advanced" and general courses. Loosely speaking, European countries tend toward more rigid streaming at the program level, while North American schools typically favour subject-level streaming. Subject-level streaming is generally more flexible because students can be placed in different streams for different courses, and stream placement can be adjusted relatively easily. The age at which children are streamed and the proportion of the population placed in various programs also differ dramatically across countries. For example, students are sorted into streams leading to vocational and academic training at age 16 in Finland, France, Sweden and the UK, age 15 in Japan and Norway, and age 10 in Germany, while there are no formal (rigid) sorting dates of this nature in most parts of Canada and the US.[2]

There are two general arguments for sorting students into ability groups. The "one-dimensional" skill argument maintains that there are efficiency gains from separating students into more homogeneous ability groups because course material and progress can be more effectively targeted at aptitude. I have dubbed this the "one-dimensional" skill argument because the discussion usually centres on the impact of streaming on academic test scores. The alternative argument in favour of streaming is that students differ in their range of abilities and are, therefore, better served by programs that most closely match their skill sets and potential career paths. In other words, the "two-dimensional" skill argument maintains that streaming is beneficial because it allows more relevant skills to be taught to various groups of students. Although the "two-dimensional" view is concerned with efficiency, it emphasizes the multi-dimensionality of skill and the returns to matching training to skills and future occupations.

The one-dimensional skill argument

Proponents of streaming, be it a rigid structure where movement between streams is difficult (at least upward movement) or a more flexible streaming system (often at the subject level), argue that there are efficiency gains associated with teaching to more homogeneous ability groups. The basic argument is that students make the biggest gains when they are taught material appropriate to their current level, at a speed appropriate for their ability. Since separating students into ability groups allows teachers to target curriculum and speed more effectively, all students can be made better off, or at least achieve higher test scores.

However, not all studies support this "positive" view of sorting. For example, Arnott and Rowse find that classes with higher ability levels also have higher test score growth rates.[3] In other words, high ability students benefit from being in classes with other high ability students, but so do low ability students. In a similar vein, Gamoran and Mare compare the math test scores of academic and non-academic stream students in the US and find that streaming reinforces initial differences.[4] In fact, many studies find that ability based streaming widens the gap between streams.[5]

The key point is that streaming works through two major channels: peer groups and efficiency, the effects of which may move in opposite directions. In a very nice paper "Ability Grouping in Schools: The Tradeoff Between Efficiency and Peer Group Effects," Jamie Shkolnik shows that there are indeed efficiency gains from re-allocating existing school resources toward the students who benefit most from them.[6] If, for example, smaller classes disproportionately benefit higher ability students while more experienced teachers benefit less able students, then the re-allocation of resources

facilitated by streaming yields efficiency gains. However, peer group factors are also important. Since it is beneficial for all students to be grouped with high ability students, ability-based sorting benefits more able students at the expense of less able students. Shkolnik finds that the peer group effects stemming from streaming massively dominate the efficiency gains.

Henry Levin has also argued that placing "at risk" students in high ability classes can have a positive impact.[7] In North America, "at risk" students are routinely moved from the mainstream to remedial classes, or classroom curricula are tailored to their "ability" level. Since these children lag behind their peers to begin with, placing them in programs that progress at a slower speed only serves to widen the gap. Further, classifying these children as "slow" reduces the incentives for both teachers and students. If, however, the objective is to bring "at risk" children closer to average achievement levels, then accelerated learning is required. On these grounds, Levin suggests that "at risk" students might be best served by placement in honours streams where teacher expectations are high, the subject matter is challenging and interesting, and the peer group effects are positive.

In support of this view, Levin cites a recent experiment in which "at risk" students were randomly assigned to remedial, main stream and honours classes for seventh grade mathematics. At the end of the year, the "at risk" students placed in the honours math class were performing at a higher level than the "at risk" students placed in either of the other two streams.

The two-dimensional skill argument

The discussion, so far, has been largely restricted to a one-dimensional skill model; schools augment testable skills. Within this framework it is clear that there are both winners and losers, but it is not at all clear what the relative magnitudes and tradeoffs are. The water becomes still murkier if we expand our model to explicitly account for the multi-dimensionality of skill, uneven skill accumulation in schools and the value the labour market places on different skills.

Consider a strict academic test-based streaming system like the old British eleven plus system. At a specified age students write a set of exams that determine stream placement. Students scoring the top xth percentile are admitted into the pre-university (academic) stream and the rest of the population are relegated to the vocational stream. These types of rules, or institutions, have important implications. First, after the point of streaming, certain educational avenues are closed to some students since these systems are generally upwardly inflexible. Second, stream placement determines the mix of skills that are augmented and thereby alters the post-secondary education and occupational choice set, as well as future wage offers.

Even if academic-based streaming rules can be followed perfectly, some students will be placed in the "wrong" stream. An individual who is "below the line" academically is placed in a vocational program whether or not he is relatively better off there. If the academic stream is small, or elite, the proportion of mis-allocated individuals might be quite large. The proportion of the population placed in the wrong stream also depends on the correlation between skills. Academic-based streaming allocates students reasonably well if skills are negatively correlated because less academically skilled individuals are likely to have relatively more vocational skill. If, on the other hand, skills are positively correlated, streaming errors might be relatively frequent and academic-based streaming may do a relatively poor job of allocating students across programs.

Empirical evidence on the correlation between skills and the allocation of students across streams is relatively limited. However, using this type of model, and data from Germany, I find that skills are strongly positively correlated.[8] More precisely, the correlation between innate academic and vocational skills exceeds 0.5. These results suggest that a substantial number of students may be mis-streamed when stream placement decisions depend solely on academic achievement.

To this point, I have concentrated on the impact of streaming on skill accumulation, and the probability that students are placed in the wrong stream when academic-based streaming rules can be perfectly implemented. In reality, however, streaming rules can not be followed perfectly, and once errors occur they tend to propagate themselves. The results reported by Allen and Barnsley,[9] and discussed at the beginning of this article, are a perfect example. Further, the earlier streaming takes place the higher the probability of error. This result is not surprising since we gather information as children age, and this information allows us to make more informed decisions. Timing is especially important for slower maturing students. These students are at considerably higher risk of mis-streaming when streaming occurs early in the educational process.

In addition, the earlier streaming occurs the greater the propensity for early errors to propel themselves into the future. Children who are told they are "less able" early in their school career are likely to build this information, regardless of its validity, into their own beliefs about their abilities. Sociologists have long claimed that students learn about their own abilities from their success at school. "The self-fulfilling prophecy notion suggests that initial levels of achievement will persist because students who do well early will come to see themselves as achievers while those who do poorly will lower their expectations for themselves."[10] Assuming that students make post-secondary choices to maximize their expected wealth (or utility), updating upon imperfect streaming decisions increases the probability that any given student will remain in the sector associated with the stream in which he was placed. This occurs because students know that teachers place them in the stream deemed "appropriate" for their abilities. The imperfect decisions made by schools may therefore have important implications for higher education

choices, occupational choices, and ultimately the distribution of wages and social welfare.

Although streaming hurts some people, and like all institutions is prone to error, one should not forget that some students benefit substantially. Individuals who are placed in advanced classes benefit from positive peer group effects and efficiency gains. Students placed in, or choosing programs that are well suited to their relative skill mix and future employment are also winners. The losers are those placed in low streams, or wrong programs, and those who receive negative signals from the streaming process and under-achieve as a result.

Implications for educational policy

Since education is within the domain of public policy, some have argued that school policy should be used to pursue social objectives such as raising wages and reducing earnings inequality. Although these prescriptions may sound appealing, there is little evidence to suggest that the desired outcomes would necessarily result. When considering the role that school policy plays in determining the distribution of wages it is important to remember that over the course of an individual's life some decisions are forced while others are freely chosen. Therefore, a school policy change intended to increase worker productivity may also encourage some students to make different career choices. The interaction between these forced and freely chosen decisions determines the impact that school policy changes have on the distribution of earnings.

The fundamental question is: what is the objective of public education? Are schools valuing average outcomes, the outcomes of the most able, or the outcomes of the least able? And are schools judged to be successful based on test scores or labour market outcomes? It seems to me that we must have a firm set of objectives as well as a clear understanding of the impact of various streaming mechanisms before we can make truly informed policy.

Endnotes

1. Jeremiah Allen and Roger Barnsley,"Streams and Tiers: The Interaction of Ability, Maturity, and Training in Systems with Age-Dependent Recursive Selection," *Journal of Human Resources*, Vol. 28, no. 3(1993) pp. 649-659.

2. More detailed information about education systems across countries can be found in *Education at a Glance, OECD Indicators*, 1996.

3. Richard Arnott and John Rowse, "Peer Group Effects and Educational Attainment," *Journal of Public Economics*, Vol. 32 (1987) pp. 287-305.

4. Adam Gamoran and Robert D. Mare, "Secondary School Tracking and Educational Inequality: Compensation, Reinforcement, or Neutrality?" *American Journal of Sociology*, Vol. 94 no. 5 (1989), pp. 1146-83.

5. James E. Rosenbaum, *Making Inequality: The Hidden Curriculum of High School Tracking* (New York: Wiley, 1976); Stephen J. Ball, *Beachside Comprehensive: A Case-Study of Secondary Schooling* (Cambridge: Cambridge University Press, 1981); Gamoran and Mare "Secondary School Tracking and Educational Inequality"; Jeannie Oakes, *Keep Tracking: How Schools Structure Inequality* (New Haven: Yale University Press, 1985); and Arnott and Rowse "Peer Group Effects and Educational Attainment."

6. Jamie L. Shkolnik, "Ability Grouping in Schools: The Tradeoff Between Efficiency and Peer Group Effects," University of California, San Diego, mimeo, 1996.

7. Henry M. Levin, "The Economics of Education for At-Risk Students," in *Essays on the Economics of Education*, (Kalamazoo, U.E.: Upjohn Institute for Employment Research, 1993).

8. Kelly Bedard, "Educational Streaming, Occupational Choice, and the Distribution of Wages," McMaster University, mimeo, 1997.

9. Allen and Barnsley "Streams and Tiers."

10. Doris R. Entwisle and Leslie Alec Hayduk, "Young Children's Academic Expectations," in *Research in Sociology of Education and Socialization*, Vol. 4 (1983), pp. 75-99.

Kelly Bedard is on a post-doctorate fellowship at McMaster University, Faculty of Economics.

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