

Group Model Building to Aid Student Decision Making

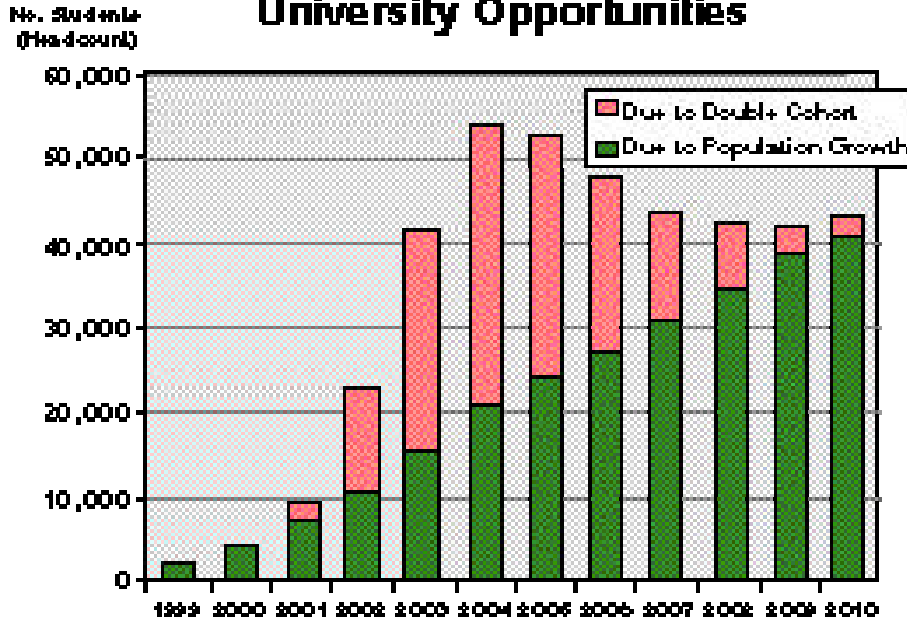
The Double Cohort: The Elimination of Grade 13 in 2003 in Ontario

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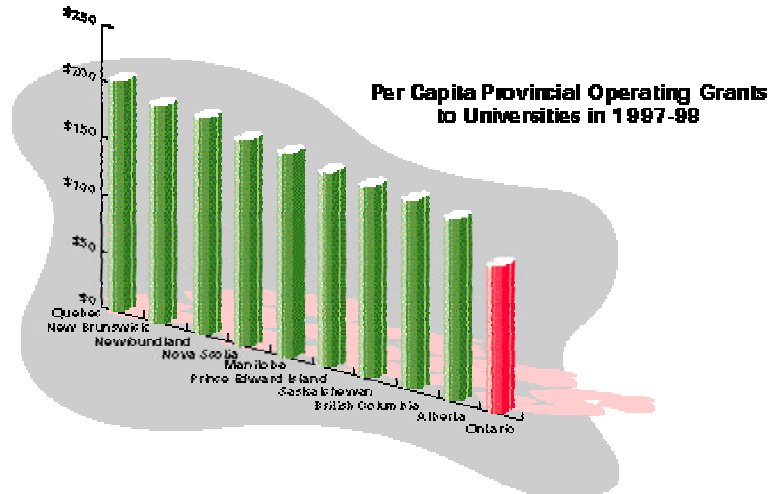
Additional Students Seeking University Opportunities



Abstract

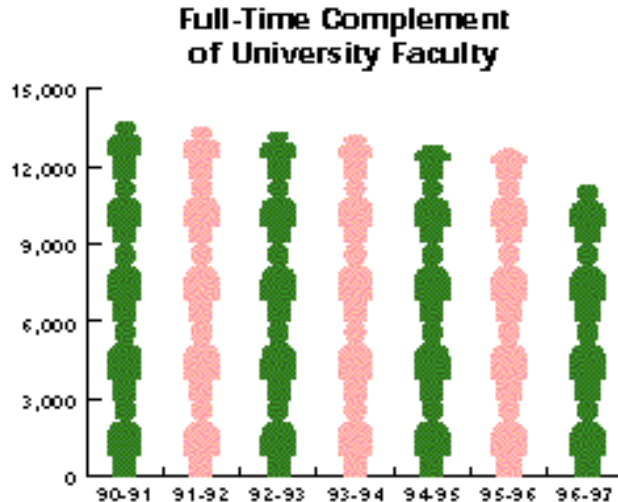
The goal of this project was to use System Dynamics to find policy levers so fewer students drop out of or fail High School and College or University when “The Double Cohort” hits. In 2003 the current grade 13 will be eliminated so that the grade 12 & 13 High Schools graduates in Ontario will be applying to Post Secondary Institutions [see chart above]. It is possible that many students will not be able to enter a Post Secondary Institution, Degree program of their choice or find it difficult to find a job. Six students worked with me to identify what they could be prepared for 2003. While the Government’s “SuperBuild” Fund will result in a total of \$1.8 billion invested to create more than 73,000 new student spaces in Ontario’s colleges and universities it is projected by the Government that in 2003 there will be 150,000 more students trying to enter first-year college, university or the job market. Using three scenarios we analysed how students would behave under stress & the implications of their choices. We conclude with likely futures and policy recommendations that could reduce the student failure rate. This work is being presented to the School Council, Parents, Administration and Students. [All bar graphs pie charts are from <http://www.uwo.ca/wnews/centre/cohort.htm>]

Key Words: K-12, Modelling as Brainstorming, Double Cohort, Ontario



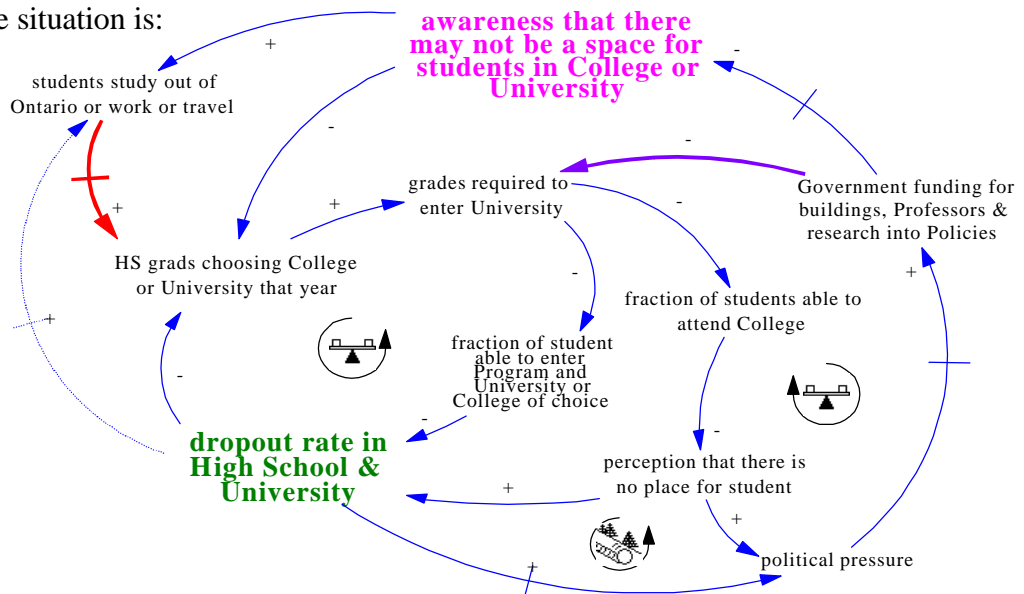
Background Information

The Ontario Ministry of Education and Training announced the elimination of Grade 13 about 5 years ago when they introduced a new Curriculum and Evaluation System for all Ontario K-12 Schools. However they did not announce how they would deal with the doubling of High School graduates in 2003 until last year. From a Systems view this was already too late. To compound problems the Teaching Unions and Government have had a very rocky relationship as there have been many contractual and funding changes made simultaneously that have made full implementation of the new curriculum impossible. Although the Government has stated that its *Superbuild* Fund will help ensure that every willing and qualified student has access to post-secondary education they have, as of yet, put no money aside to hire new professors. Not only will more students apply to Post Secondary Institutions in 2003 there is a general demographic shift upwards in the number of university-aged people wanting a post-secondary education. Although it is expected that Arts and humanities programs will be able to stretch facilities to accommodate a surge of students some programs that require specialised facilities, like Computer Science, or have caps on numbers from Professional Certification bodies, like Law, will not be able to accept many more students. George Granger, registrar of McMaster University, has suggested that raising admission standards might be one way for universities to handle an increase in applications. Ontario Universities are at the bottom in comparison with every other Canadian jurisdiction in terms of funding, student/faculty ratio and tuition fees [see chart above]. Although the Post Secondary Institutions have stated that they will not discriminate against the younger [current Grade 10] students in terms of entrance marks in turns out that the new evaluation method has a risk of reducing the marks given to students in the new curriculum. It is expected that they will have a tougher time when they get into College as they'll be competing with students who are a year older. Grade 10s have also been dealing with a new curriculum and all its attendant problems for two years in a row. Furthermore to make life for the students difficult the Provincial Government is downloading costs so the tuition costs are rising significantly while reducing financial assistance (see graph above). The number of University Professors has decreased over the past decade by 15% when the student population has increased by over 20% (see chart below). It is projected that within the next 10 years about 50% of the University/College Professors will retire at a time when there is no pool of available young talent in many Faculties.



Our Model Building Process and Goals

Six grade 11 students & I met every lunch from December to June. Most of our meeting time was used to brainstorm new ideas, consider different points of view & assign tasks for the upcoming week. We used BOTs & Causal Loops on the blackboard to clarify our discussions. (using the model building steps of Maani & Cavana, 2000) Any modelling was done individually based upon these discussions. Systems Thinking allowed us to focus on the relationships between the most important variables of this system and examine how they affected each other. Thus, while the model is itself of interest, our main goal was to promote discussion that would allow the uncovering of plausible futures and policy recommendations for our students and parents so they will be emotionally prepared for possible tough choices in 2003. Although there is a lot of writing in Ontario about this issue none of the reports we could find focussed on the student perspective and the increased risk of failure, giving up & dropping out at High School and College/University. To make this relevant to the students and parents of our School and City we focussed on finding causes for changes in the drop out rate and then finding ways to reduce this rate. We presented this work at Dynamiquest in May, to our School Council in June and then hope to present our work to the School Board and a public forum at our School in October. A causal loop of the situation is:



Data for our Model

We were unable to obtain statistics about High School student drop out rates, College & University acceptance rates & marks, rates of students choosing to study out of Province or go to work, University drop out rates. We phoned and emailed Statistics Canada, the local School Board office, the Ministry of Education in Toronto, the two Professors responsible for a Government report on the double cohort [Alan King of Queen's University & Jean Claude Boyer of the University of Ottawa] - all without success. We then decided that we would do a survey in our school of the 500 grade 10 & 11 students and informally ask other students we all knew to get a handle on what choices they are thinking of making for their futures. The results are:

Question	Gr 10 - % yes response	Gr 11 - % yes response	Comment
1. thought about issue	80	90	Great!
2. affect me?	80	80	Good
3. post HS in ONT	60	70	Note change
4. delay to work 1 year	35	25	Note change
5. apply out ONT	45	30	Note response to escape -5% of grade 13s said yes to this!
6. extend HS by 1 yr	15	-	Few
7. grad HS in 4 yrs instead of 5	-	30	A lot plan to escape problem
8. your mark is high	35	40	Problem only effects marginal kids
9. seek alternative	65	70	Most will not work harder when faced with a challenge
10. study in ONT if marginal mark	20	20	Many will try to leave the problem
11. present our results to you	75	75	They would like to see us in action
12. think grade 11 have advantage	60	60	Gr 11 has an advantage

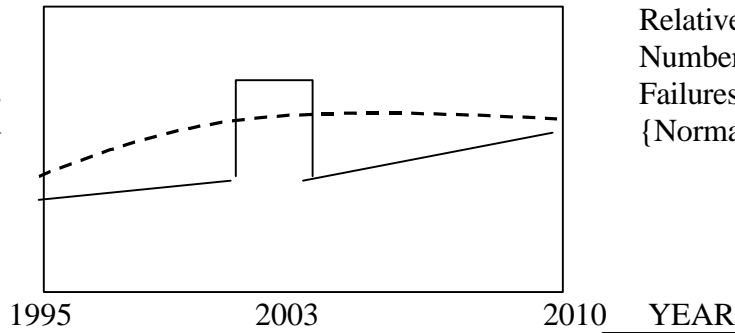
Model with Scenarios

Using these results & many articles we found on the web we built 3 scenarios of what the impact of the Double Cohort could be: pessimistic, plausible and optimistic. Some of the questions we asked as we built the model were: What are the physical & time limits? Who is our audience? How complex should the model be to meet our needs? What data do we need? Do we model only Ottawa area schools? What is our time frame? Some of variables we considered including were: # current grade 10 & 11 students, # kids currently in University & College programs including split between programs which are easy to have more kids in versus programs which have less flexibility as lab space needed, failure/drop out rates, preference given to admittance of current grade 11 kids over current grade 10 kids or NOT, political pressure to provide more \$ to Universities/Colleges, Government funding rate, # kids taking a year off to travel/work, University failure rate, fraction of graduates who choose University/College/Work, entry marks required for University/College programs - will the required mark change ? strength of local economy? From this limited list this was a very complex issue which we had to simplify so that our intended audience of students and parents could grasp the essence of our final policy recommendations. Next are the original BOT, & Stock & Flow Diagrams that got us started.

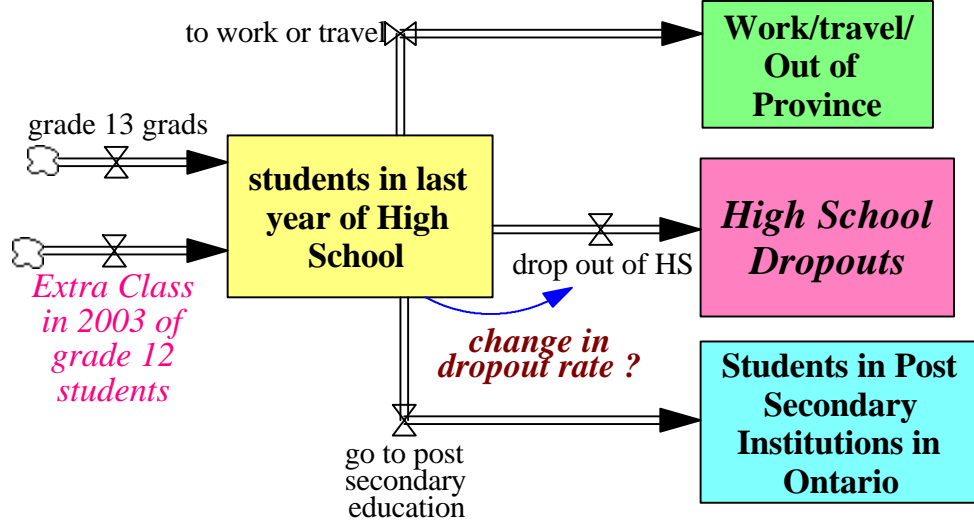
BOT:

Relative Number of High School Graduates {Normal is 100%}

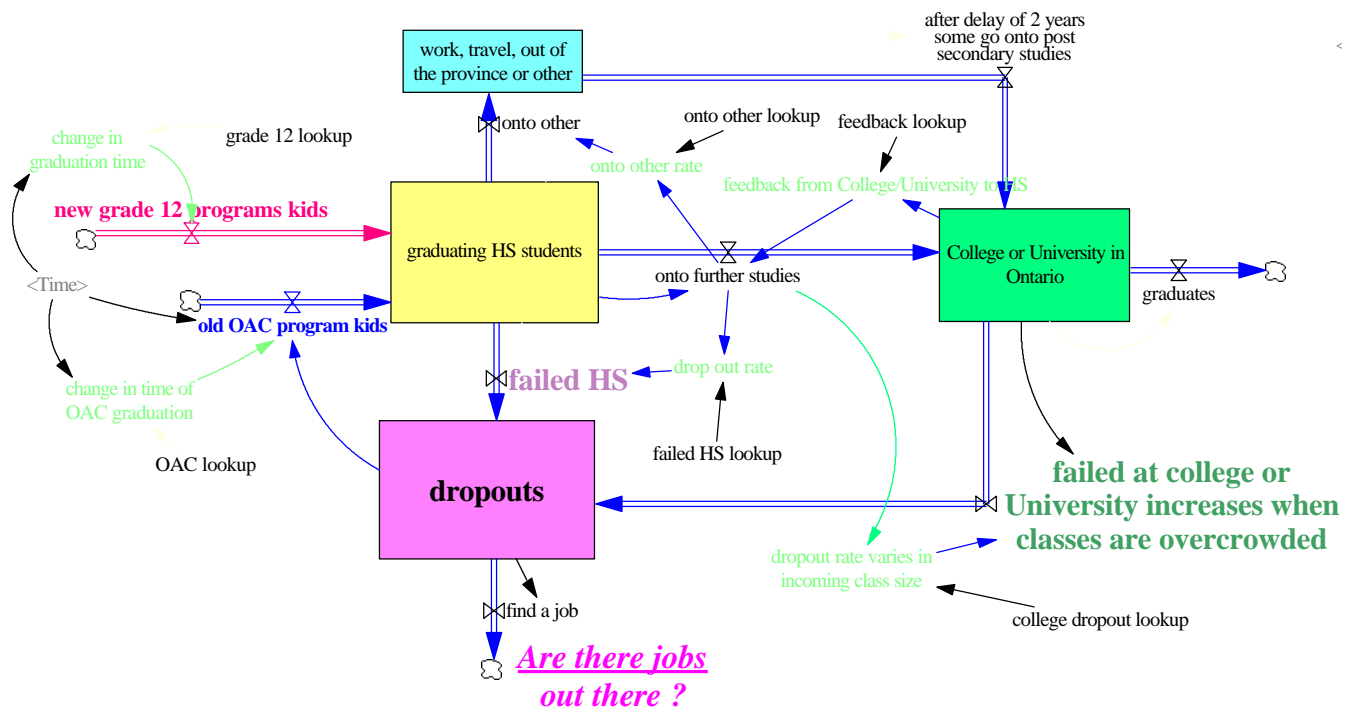
Desired Results is the dotted line & Feared is the solid line



Relative Number of Failures at University {Normal is 25%}



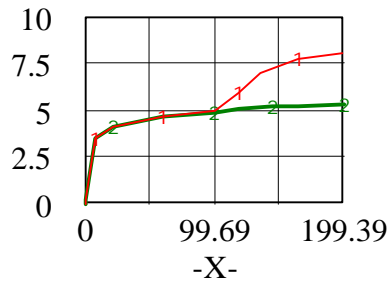
The scenarios with our final model are shown next. An important detail is that lookup functions were used to vary the HS drop out rate, University failure rate & fraction that choose “Other” as the flow of students to College/University changed. It is important to note that the model and results are purposely not comprehensive but were developed to communicate to students and parents so they will be emotionally prepared to make tough choices in 2003.



To have the model “speak” to our audience all the detailed linkages in white so they were not visible. A key part of our learning through model building was that the behaviour of students would change as the acceptance rate and failure rates at University varied. Some of the lookups used to build in these behaviours were [x-axis is relative # HS students trying to attend College & the y-axis is the failure or dropout rate]:

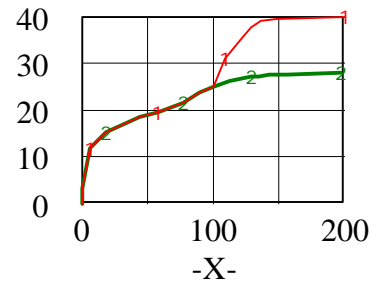
new scenario B — 1 — 1 — 1 —
 new scenario C — 2 — 2 — 2 —

failed HS lookup



new scenario B — 1 — 1 — 1 —
 new scenario C — 2 — 2 — 2 —

college dropout lookup



The 3 scenarios will now be explained then results of some key flows shown with all 3 scenario results at once so that the relative difference that changes student choices make.

Scenario A – Worst Case/ Do Nothing Scenario

In this scenario it is assumed students & Government blindly move on without any fundamental changes to their pre-Double Cohort behaviour. Specifically this means that grade 12 students and grade 13 [OAC] students both do not make changes to either delay or accelerate their time of graduation or try to study out of Ontario or work temporarily. Post Secondary Institutions are forced to raise their entrance marks to reduce the inflow of students & fail more students in the first year as there is insufficient capacity [space or professors or money] to take them into a more specialize second year program which requires smaller classes. While the Government does give some extra resources to Institutions through the SuperBuild Fund it is not sufficient to deal with the shortage of Professors.

Scenario B

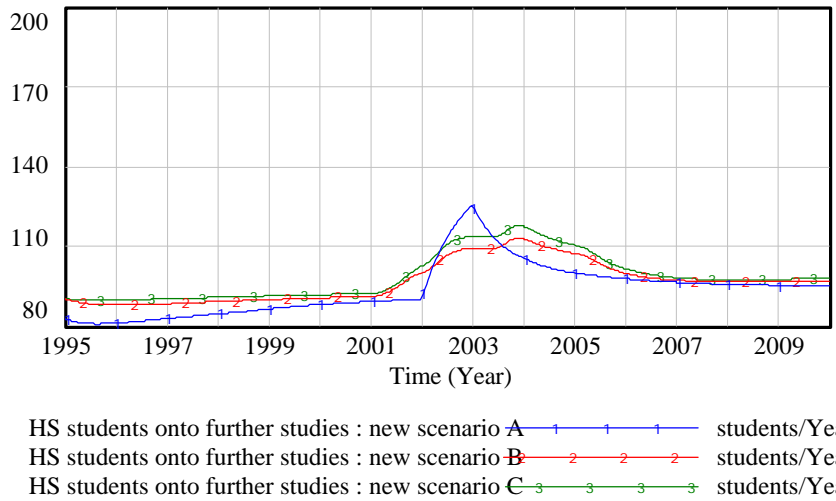
Students make some “smart” decisions: double the usual amount choose to go to “other” – study out of Ontario or go to work temporarily; many OAC students graduate 6 months or 1 year early, many grade 12 students delay graduation by 1 year to increase their odds of success at College/University. This flattens out the amplitude of the pulse of students applying to Universities over a longer period of time.

Scenario C

Students and the Government/Universities & Colleges both make realistic decisions such as: students make the same decisions as in Scenario B but now the Government puts in extra money for facilities that cover all capital and maintenance costs, put in enough money before the Double Cohort hits to hire enough staff. The assumed result of these changes is that entrance marks are NOT raised to reduce inflow of students & students in FIRST year are accepted into the degree program they want so that the failure rate at University does not increase.

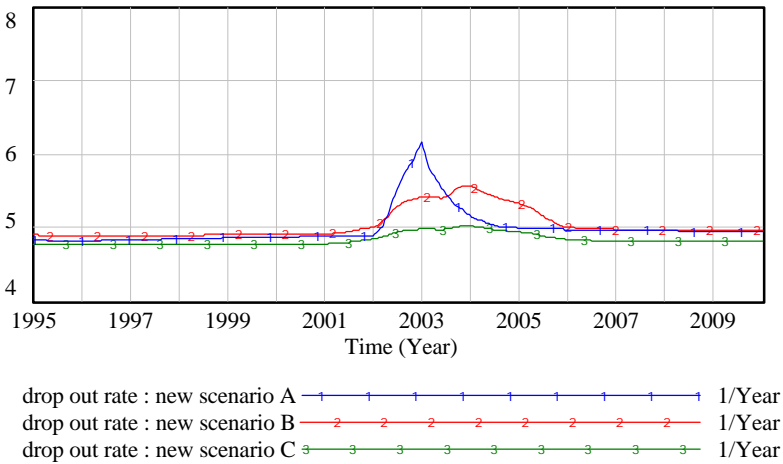
Some of the results are now shown.

Graph for HS students onto further studies

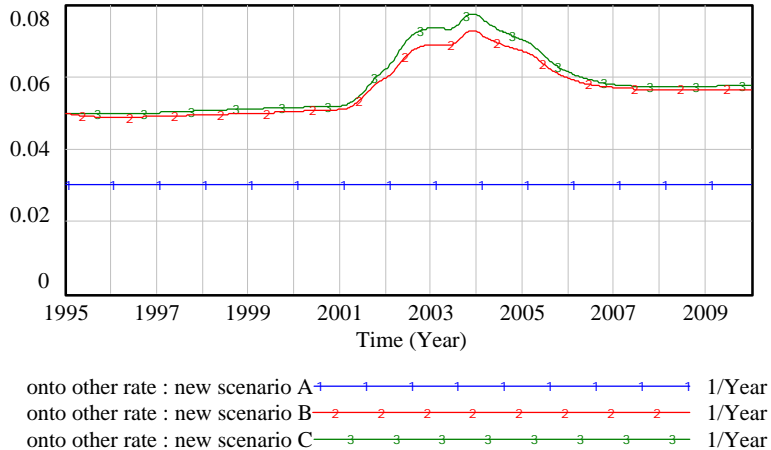


High School drop out rate:

Graph for drop out rate

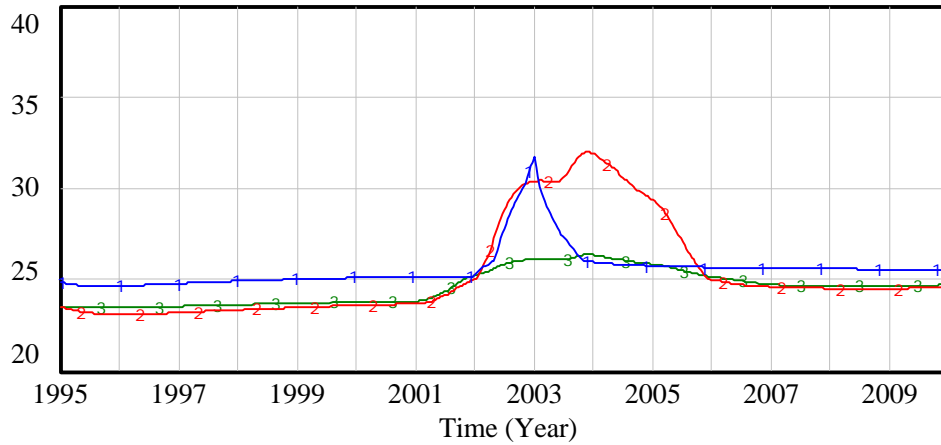


Graph for onto other rate



College/University Dropout Rates:

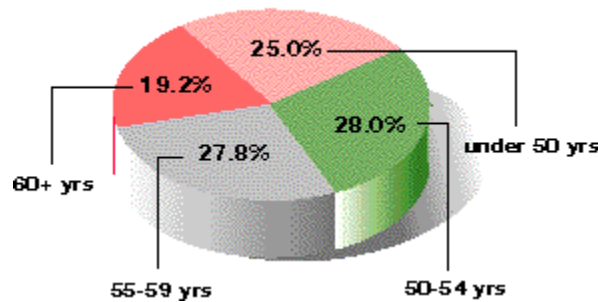
Graph for dropout rate varies in incoming class size



dropout rate varies in incoming class size : new scenario A — students/Year
 dropout rate varies in incoming class size : new scenario B — students/Year
 dropout rate varies in incoming class size : new scenario C — students/Year

Remember that these results are intended to help students and parents to “chew upon” and then make the best decision for the student in question. We realize that these results do look overly pessimistic and that within the next 2 years there is much that could change. However there are issues looming that could make things even worse: the looming mass retirement of Professors [see pie chart below]. The last time Canada hired Professors en masse was in the 1960’s – our pool of talent then was the USA. However, now the USA also faces a Professor shortage.

Age of Ontario's Full Professors



Likely Futures

Based upon our Research & Work we expect the following to occur:

- a large increase in the number of High School and College/University drop outs 2003 – 2007
- an unofficial increase in the entrance marks at Colleges & Universities
- many students choosing to study out of Ontario in 2003 – 2005
- a shortage of Professors in certain fields accelerated by the stresses created by the Double Cohort
- an echo of students applying to Colleges & Universities after 2005

- a lot of political pressure on the Government to “do something” in 2003 – they will – too little, too late
- many grade 13 students graduating 1 year early & grade 12 students working temporarily or staying in HS an extra year
- a large focus on building space but no extra funds to hire Professors in time to integrate them into teaching well
- and mostly lots of blaming of others, confusion and uncertainty

Policy Recommendations

We realize that most of the best decisions to reduce the size of the pulse of students needed to be made 5 years ago when the Government should have created pathways to encourage more grade 13 grads to graduate a year early and students in the new grade 12 program feel OK to take 5 years to complete High School. However given that we are only 2 years from “D-Day” our policy recommendations are below. We also realize that some of these suggestions would be politically difficult to implement.

- hire High School Grade 13 teachers to temporarily teach the first year College & University Courses [many Grade 13 & First Year College Courses are identical]
- use eLearning to reduce demands on physical space and increase the flexibility of Professors to teach & students to learn
- encourage part time student attendance
- encourage students to attend Colleges for practical skills programs that may be low in status but high in demand [as there is a looming trade skills shortage in Canada]
- grade 12 students delay applying to post secondary institutions if their marks are marginal [even if accepted as they are liable to be failed in the first year of study] by spending an extra year in high school [as they probably missed out on some course material as this curriculum is new] or working for a year
- grade 13 [OAC] students should try to graduate 1 year or even 6 months early
- all students, if they can afford it, should consider studying out of Ontario – even if they are accepted in Ontario
- the Government provide extra cash to support not only capital building programs but the hiring of Professors and on going maintenance costs of old buildings [whose average age is 30 years, this is not part of Superbuild]
- **expect the unexpected:** in this complex situation there will be delays and feedback distortions for many years to come so decision makers need to be prepared for surprises and act quickly when they come

Conclusions

Students in Ontario would be wise to NOT assume that all will be normal in 2003. Students should NOT assume that the Government will ensure that they will not become yet another “drop out statistic”. We came to the realization that this very complex [and expensive!] problem cannot be fixed by a simple cash infusion and that even if individuals take responsibility for making decisions for themselves there will be an increase in the drop out rate.

We also came to realize that while it would be easy for the Government to build more buildings it was much more difficult to hire Professors because so many will soon be retiring. Students, with support from their parents, must consider their options, be realistic about their chances, be clear about where they want to go in life and choose a course of action that will give them the best chance of achieving their desired goal. System Dynamics provided an excellent framework for the constructive dialogue between teacher, students & parents involved as they tunneled into the complex relationships of the Double Cohort. Our feeling is that the most important part of the work was not the actual model result, but how System Dynamics modelling enabled us to understand the relationships and implications of the Double Cohort. Systems Thinking made it possible for the students involved to develop a depth and subtlety of understanding to explain this complex issue so well that Government policy makers would find them impressive.

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