Fathoming Fortune at Freedom

Super Computing Challenge

Final Report

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Team number 46

Freedom High School

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Executive Summery

Our project was an attempt to create a program that modeled our high school. It was going to show the social net work, and how social connections affect academic performance. We created a model that would show the theoretical results that we wished our model to present. We were hoping to show actual results from actual students but the data that we gathered was invalidated due to select teachers refusing to encourage their advisees to fill out the survey we created to get the necessary data for our comparison model. This was a major issue due to the fact that these students are some of the most sociable students in our school. To compensate for this, we will have to eliminate all data that is connected to these students, which will, no doubt, alter the results of our data.

Introduction

From the time that civilization began, people have had friends. More recently there are cliques, or groups of friends. One question that is prevalent among parents is, “are my child’s friends affecting their performance?” In the past this was a question of work performance, but now it is a question of academic performance. The answer seems to be that, yes, peers do affect performance greatly. The problem that we are investigate is whether or not your friends affect your grades at school. To do this we needed to gather information on the students at our school and a list of the friends that they hang out with at school. Now once we obtained that data we input into an Excel document. Once that was done we could see if a particular student has friends who earn good grades or bad grades. The friends they have will have some sort of influence on their overall grade. Therefore what we are looking for is a pattern with the student/friend relationship. This pattern is a student who has friends with good grades also makes good grades, or the opposite.

Description/Methodology

In order to actually collect the data we needed to make some surveys. The original survey consisted of questions that pertained to a student's friends in school and outside of school, their way of thinking, and their overall habits that could affect their learning process. However the teachers seemed that the survey was way too personal so we needed to make it simpler and less personal. Therefore the revised survey just asks for a student's name and their friends.

Model

Our model is fairly basic. A simple experiment designed to see how, or if, peers affect the points/grades being made at Freedom High School. The coding for the model was purposely simplified even more so it could be changed so the model as a whole could be tailored to suit other High Schools, colleges, or other learning facilities.

Sliders were put in place to more easily control and quickly change variables such as peer effect, the amount of influence one student could have on another, charisma, how influential each student is individually, or the number of links, or connections with others, that each student has. A pair of plots has also been introduced into the project model. One of them focuses on 'Point Distribution', plotting out how the points are dispersed throughout the student body, the size of which is determined by yet another slider that, for experimental purposes, can reach up to 1000 students. Again, the coding can be changed to increase the maximum if needed.

A second plot focuses on the average number of points made by groups of students. Under normal circumstances, the second plot peaks very early in the program, and then quickly starts to flatten out until the distribution is hardly any different from one second, or tick, to the next. This is about what we could expect, if successfulness were to spread to each student until they all made, or lost, nearly the same amount of points.

And finally, when setting up the program to run our model, we have created a button programed to setup the simulation 20 separate times. This is because the first setup creates a set number of students, for this case we'll say ten, in a single position, the center of the screen. When the setup program is run again, it creates another set number, another ten in our theoretical case, but then moves all the students to a random position on the screen and gives them a set

number of connections with their peers. For instance, if we setup the model twice, the second time each of the twenty available students will be in a random position and have a connection with a set number of other students, 5 connections for example, or between 2 numbers, such as between 1 and 12 connections.

Results

So far our research and results support the idea that spending time with successful, productive students makes you much more likely to succeed, while hanging out with unproductive individuals usually causes you to fail more than usual. While we still have some things to finalize, we can see some patterns within the data we have collected. Therefore we can infer that our data will hold true to our thesis.

Applications Used

For our project we are mainly using NetLogo and Microsoft Excel. With these programs we are able to make a model and compare it to the hard data that we have collected and see if the results are similar.

Most Significant Achievement

Our most significant achievement for our project would have to be getting all of the teachers to agree to help us out. By that we mean having them agree to hand out our surveys to the students at our school so that we could obtain data. Most of the teachers complied and did as we had asked, however there were some teachers that needed some convincing. Once we had persuaded them that the surveys were of importance to our project, we were able to collect the

data and compare the rersults to the model that we created.

Acknowledgements/ Thanks

Mr. Nick Bennett and Mr. Richard Foust have been of tremendous help to our project. Without these two people our project would not have turned out as well as it did. Nick helped us create, and update, our model. It seems like a small contribution in text but he was very helpful. With the model we now have, we are able to generate a much more accurate comparison to Freedom High School, and this allows us to model our data much better. Nick made the creation of our model look and sound much easier than what we had imagined. When our group was lost on where to go next on our project, Richard gave us some insight. Richard has provided our group with the nessesary materials and advice to help our group move forward. He has been a constant source of motivation and inspiration to this group. We are extremely thankful that these two people went out of their way to help us continue our project, however it is just not these two alone that we are thankful to. We are thankful to everyone who has helped our project become what it is now.

Program Code

```
breed [students student]


students-own [
  charisma
  advisement
  points
  tried?
  succeeded?
]


__includes ["triangular-distribution.nls"]


to setup
  clear-all
  set-default-shape students "person"
  create-students 2 [
    set advisement random 12
    set points 0
    ;setxy random-xcor random-ycor
    set charisma random-triangular 0 1 typical-charisma
    create-links-with other students
    update-color
  ]
  create-students number-students - 2 [
    set advisement random 12
```

```
    set points 0
    ;setxy random-xcor random-ycor
    let peer-links n-of (min list (count links) links-per-person ) links
    let peers (turtle-set [one-of both-ends] of peer-links )
    set charisma random-triangular 0 1 typical-charisma
    create-links-with peers
    update-color
  ]

end

to update-color
  set color 12 + 10 * advisement + (min list 6 (points / 8))
end

to layout
  layout-spring students links 1 5 5
end

to earn-points
  let peers link-neighbors with [tried?]
  let success-rate 0.5
  if (any? peers) [
    let success-weight sum [charisma] of peers with [succeeded?]
    let total-weight sum [charisma] of peers
    set success-rate success-weight / total-weight
  ]
```

```
  let success-probability peer-effect * success-rate + (1 - peer-effect) * 0.5
  ifelse (success-probability > random-float 1) [
    set succeeded? true
    set points points + 1
  ]
  [
    set succeeded? false
  ]
  set tried? true
end

to go
  if ticks >= simulation-length [
    ; stop
  ]
  ask students [
    set tried? false
  ]
  ask students [
    earn-points
  ]
  ask students [
    update-color
  ]
  tick
  update-plot
```

```
end

to update-plot
  let profile [points / ticks] of students
  set-current-plot "Points Distribution"
  set-histogram-num-bars int (20 * sqrt ticks)
  set-plot-x-range 0 1.05
  set-plot-y-range 0 length filter [? = first modes profile] profile
  histogram profile
  set-current-plot "Standard Deviation Over Time"
  plot Standard-Deviation profile
end
```