Fashion Trends in a Middle School

Supercomputing Challenge Summer Institute

Final Report

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Capshaw Middle School

Team #01

Team Members:

Theresa Anaya Burney

Peter Colehour

Susan Gibbs

Thansewi J. Martinez

Teacher:

Ms. Makoena Monese

Sponsor:

Ms. Makoena Monese

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Executive Summary

Middle school students arrive at school wanting both to conform to fashion norms and to be recognized as individuals, and having a relative degree of shyness or sociability. Students in a middle school have been following the trends of society based on fashion runways and music of the times that media exploits, limited by parental consent. They bring to school attitudes and fundamental beliefs about what is "in" and what is "not." StarLogo is attractive to middle school students' skill level, and students can use this program to study trends.

In this project, we researched how many students in an average population tend to be resistant to trends and found data on "tipping points" to the spread of trends. We ran trials manipulating the percentage of a middle school population that is relatively resistant to a trend, and determined how that affects the speed of the spread. This model imitates the real-world school environment in changing the number of contacts made by individual students (relative shyness), by recognizing that one individual can start and spread a trend, but also recognizing that the percentage of resistant students is the factor which will determine the speed of the trend's spread.

This project has provided an example that can be manipulated to include many topics that are relevant in the middle school: bullying, spread of disease, the susceptibility of individuals to alcohol, drug, and tobacco use, and sexual activities. This project also facilitated our understanding of how one individual can change the perceptions and attitudes of others.

Introduction

By 1999, nearly all young people had access to at least one TV, VCR, and CD/tape player in their home. Today 8 in 10 young people live in homes with cable or satellite TV, and video games. Internet access has grown over a 5-year period, and today, 74% of 8-to-18 year-olds have Internet in their homes, and this applies across all major ethnic and socioeconomic groups. During the 90's, the average young person spent 6 to 7 hours each day using media to include TV, videos/DVDs/Movies, print media, audio media, computers, and video games. What has changed since 1999 is young people's total

exposure to media – now, they spend 8 to 9 hours a day using it. Because of this increase among young people, the media has targeted them as primary consumers.

Hip-hop culture and geographical location in an urban or major metropolitan area affects the purchasing interests of young people. The overall implication of research from relevant trade, business, and government sources is that young consumers follow the hip-hop trends when making decisions in a wide range of areas, including fashion.

The hypotheses of this project are:

1. The StarLogo model will graph a curve of the spread of a trend, comparable to an infection model.

2. The lower the initial percentage of followers, the slower the trend will spread.

3. A tipping point may exist in the initial percentage of followers, above which the trend will spread much more quickly.

Project Proposal

Statement of the Problem

The purpose of this project was to model how trends spread among middle school students. Research showed that a fashion trend spreads because social norms (hip-hop culture, parental approval or limits, etc.) that students experience affects decisions about what they wear. The research supported our initial belief that a fashion trend spreads in the same pattern as an epidemic. Shyness of the population in a middle school is about 30% and this plays a role on the speed of the spread of a trend. We wanted to see if a tipping point exists and what percentage of a typical middle school population is resistant to the spread of a trend.

Project Description

A simple version of the model was created in StarLogo and a graph of the StarLogo data was developed and refined in Mathematica. The StarLogo model will allow students to perform multiple trials of the spread of the trend at different levels of relative resistance (from 90% "followers" and 10% "freethinkers" to the opposite percentages). The model was refined to change variables to reflect the results of our research, which showed that middle school students come with predisposed attitudes and beliefs about trends in their world, to use scaled color to show the current level of susceptibility of each student, to show that approximately 30% of middle school students are shy; and to collect data at defined time intervals (and so allow that data to be studied and manipulated in Mathematica). As an extension of this project, we hope to create a version of this program in StarLogo TNG, to introduce the model to students in a more appealing version and increase initial interest in the modeling process. Mathematica is being used

for the purpose of analysis and presentation. The Mathematica notebook shows the growth of a trend using differing time sets (seconds).

Analytical Methodology

Mathematical Bases

The following equation was used to graph the expected number of susceptible individuals who will become infected in the time interval Δt:

$$\frac{\partial P_I}{\partial t} = rcP_I(1 - P_I)$$

r = Probability of infection , given a single significant contact
c = Probability that any given individual has significant contact with any other individual, in a unit time interval
P_I = The infected population

For this model, we assumed rc = 1.

Conclusions

Results

After analyzing the data, the following hypotheses were found to be correct.

1. <u>The StarLogo model will graph a curve of the spread of a trend, comparable to an infection model</u>. (Table 1). The data from the StarLogo simulation was exported into the Mathematica notebook and graphed. This graph supports the findings that the spread of a trend will resemble the infected and non-infected populations in a disease model. (Table 2)

Table 1

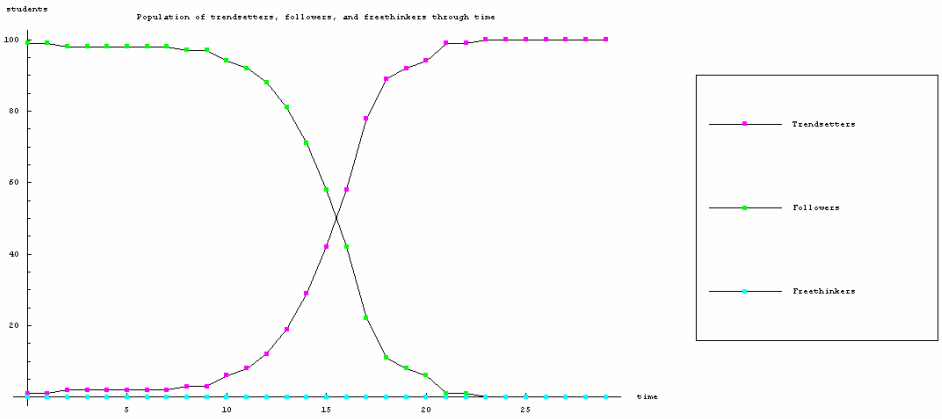
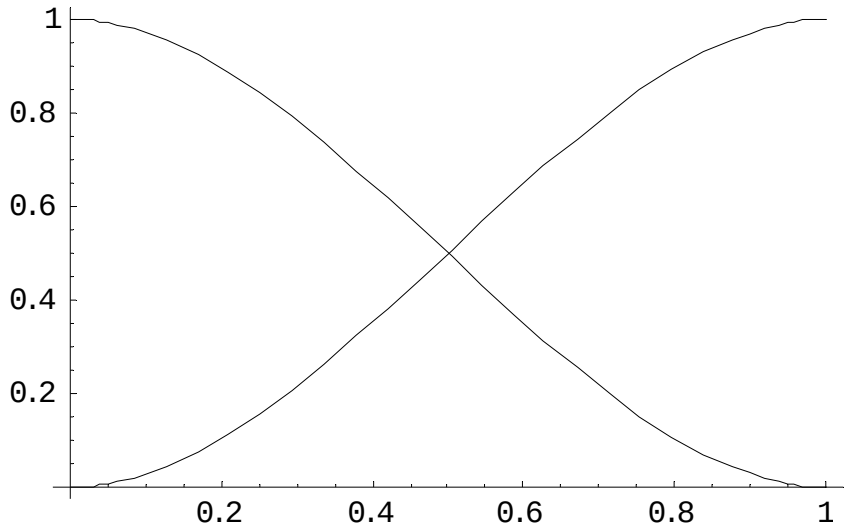


Table 2



2. The lower the initial percentage of followers, the slower the trend spreads. Our model showed that as the percentage of followers increased, the trend spread faster at every tested level. For example, with only 10 percent followers, it took more than 40 seconds for the trend to begin spreading, and more than 80 for the trend to encompass all students. However, with 90 percent followers, the trend began to spread after only 8 seconds, and had spread completely after only 22 seconds. In the real world, each individual student is influenced by other factors and the trend may never spread to all students.

3. A tipping point may exist in the initial percentage of followers, above which the trend spreads much more quickly. In fact, we found two general tipping points. Below 20 percent followers, the trend took more than 40 seconds to begin, and more than 60 seconds to spread completely. The first tipping point exists between 20 and 30 percent followers. Above 30 percent followers, the trend now starts to spread at about 35 seconds, and spreads completely by 50 seconds. A second tipping point occurs between 70 and 80 percent followers. Above 80 percent, the trend begins at 12 seconds, and spreads completely by 25 seconds.

Recommendations

Our students can modify the model to apply it to other social issues affecting teens today, such as tobacco use, sexuality issues, or the effect of advertising on the spread of trends and to study the susceptibility to trends of differing age groups. They can also research whether there is a correlation between shyness and susceptibility, and incorporate these

findings into a more sophisticated model. Students could also try to prove these results by conducting an experiment in the real world school environment.

Teacher team members will use this model to teach students about StarLogo, Mathematica, and programming in general. We also hope to create a StarLogo TNG model, to help entice students to participate in the Supercomputer Challenge.

Appendix 1

StarLogo Code

OBSERVER PROCEDURES: (*Comments in bold italic,* commands in regular font**)**
Globals procedure creates a counter for data output

```
globals [counter]
```

Setup procedure clears all turtles from previous tests, clears and resets the line graph, and clears the output window. Then, it creates 1 trendsetter (turtle 0), and 99 followers and freethinkers based on the percentages set by the slider.

```
to setup
        clear-turtles
        clearplots
        clear-output
        create-trendsetter 1
        create-follower number
        create-freethinker 99 - number
```

Ask procedures put turtles randomly on the screen, and create the original shape, color, and energy of each breed of turtle.

```
ask-turtles
        [setxy random screen-width random screen-height]
  ask-trendsetter
        [setc 125
        setshape square-shape
        setenergy 80]
ask-follower
        [setenergy 60
        setc 65
        setshape person-shape]
ask-freethinker
        [setenergy 20
        setc 96
        setshape turtle-shape]
end
to startall
  startbutton2
  startbutton3
end
```

Data procedures set up counters and create data output on each breed of turtles

```
to data
```

```
type counter
type ", "
type count-trendsetter
type ", "
type count-follower
type ", "
print count-freethinker
end
```

TURTLE PROCEDURES:

Breeds procedures creates the breeds of turtles, turtles-own allows window to show energy of each turtle

```
breeds [trendsetter follower freethinker]
turtles-own [energy]
```

Go procedure makes counter advance, causes turtles to move and to meet, and prevents any turtle's energy to rise above 100, so program does not crash. Go also stops the program when all turtles are trendsetters

```
to go
        friends-meet
        move
        if energy > 100 [setenergy 100]
        set counter counter + 1
        if count-trendsetter = 100
                [stopall]
end
```

Move procedures allows all turtles to move one step with a random heading, and creates a class of "shy" turtles who move in a right-turn circle and so have fewer exposures to the fashion trend

```
to move
ifelse who > 0
  [
        ifelse (random 100) < 30
        [rt random 90
        fd 1]
        [rt random 10
        lt random 10
        fd 1]
  ]
  [     rt random 10
        lt random 10
        fd 1
  ]
```

```
end
```
Friends meet procedures cause freethinkers and followers turtles to change energy based on meeting any other turtle (trendsetter does not change). Each breed loses a very slight degree of energy based on meeting another follower or freethinker, but to gain a large degree of energy based on meeting a trendsetter. Freethinkers and followers change color (become paler) as their energy level increases, and become trendsetters when their energy rises to 90 (after two exposures for followers, four for freethinkers)

```
to friends-meet
   if breed = follower
          [
          if count-trendsetter-here = 1
                    [setenergy (energy + 20)]
           if count-follower-here > 1
                    [setenergy energy - .05]
          if count-freethinker-here = 1
                    [setenergy energy - .05]
          if energy > 80
                    [setc 69]
           if energy > 90
                    [setbreed trendsetter
                    setc 125
                    setshape square-shape
                    setenergy 80]
            ]
 if breed = freethinker
          [
          if count-trendsetter-here = 1
                    [setenergy (energy + 20)]
          if count-follower-here = 1
                    [setenergy (energy - .05)]
          if count-freethinker-here > 1
                    [setenergy (energy - .05)]
          if energy > 40
                    [setc 99]
          if energy > 60
                    [setc 85]
          if energy > 80
                    [setc 89]
          if energy > 90
                    [setbreed trendsetter
                    setc 125
                    setshape square-shape
                    setenergy 80]
```

]
end

Works Cited

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