Dear Reader,

The Gold Star Journal is presented to you as a collection of papers, essays, and reports that represent work done by the students at The Citadel. The pieces included represent various departments to highlight the non-fiction scholarly work of Citadel day and night students. The selection process from the eighteen papers was difficult.

The editors want to provide a glimpse of what students on our campus are writing across the curriculum and even outside the departments. Each paper explores ideas in a number of fields, whether it be biochemistry and finding a cure for Alzheimer’s Disease or integrating computers into the classroom. There is a paper from an Honors class about Senator McCarthy’s Red Scare and a brief look into a piece of literature that daunts most readers, Democracy in America. Mathematics is represented in a paper that explains the analysis of competition. Continuing education after The Citadel is acknowledged with a scholarship-winning essay.

This showcase is just a taste of great academic work that takes place at The Citadel. We hope this second edition of the Gold Star Journal will elevate the importance of good writing and encourage the pursuit of academic excellence.

We would like to thank Dr. Suzanne Mabrouk, the contributors, and Angela Williams and the Writing Center Staff.

Sincerely,

Joshua Jenkins, Editor
Brad Moorer and Chris McFarland, Assistant Editors
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GAME THEORY

Randall Finn

Randy, from Mauldin, SC, is majoring in Applied Mathematics. Upon graduation he will serve his country in the Air National Guard. On the civilian side, he will be an Actuarial Analyst for a benefits consulting firm in Manhattan. The following paper was written for Dr. David Trautman’s Mathematical Modeling class. He gave an hour presentation of the material to both cadets and faculty. Game theory simply studies how decision makers of opposing interests should make rational decisions. A game in our context means, more or less, a conflict of interests in which there are different strategies, or decisions, that can be chosen depending on the potential benefit returned.

Any situation where two or more decision makers have conflicting interests can be described as a game. Naturally, when these situations occur, each decision maker will try to develop the strategy that will bring about the most rewarding results. The branch of mathematics that deals with the development and analysis of these strategies is game theory. Game theory is more broadly defined as the study of conflicting and cooperative situations. It is the study of how decision makers of opposing interests should make rational decisions.

We begin by determining the requirements of a game. In every game there must be at least two players. It is important to understand that players may be individuals, companies, nations, or even biological species. Each player has a number of planned directions, called strategies, in which he or she may choose to follow. These strategies determine the outcome of the game. Lastly, there must be a distribution of payoffs to each player based on each outcome of the game. Thus, games can be divided into four components: players, strategies, outcomes, and payoffs. Furthermore, game theory is based on the assumption that all players make rational decisions and have opposing interests.

The following example illustrates the basic concepts of a game and how game theory works. Rick and Carl are playing a game in which Rick can choose one of four strategies (rows A, B, C, or D) and Carl must choose strategy E, F, G, or H. Rick is trying to get a large positive number, while Carl wants an outcome with a large negative number. This is because if the number is positive Rick receives that number of points from Carl, while if the number is negative, Rick gives up that number of points to Carl. Hence, each player is rewarded by payment from the other. The game can be represented by the 4 x 4 matrix shown below, where the values in the matrix represent Rick’s payoffs.

<table>
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<th>E</th>
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<th>G</th>
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<td>A</td>
<td>12</td>
<td>-1</td>
<td>1</td>
<td>0</td>
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<tr>
<td>B</td>
<td>-5</td>
<td>5</td>
<td>7</td>
<td>-20</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>-16</td>
<td>0</td>
<td>0</td>
<td>16</td>
</tr>
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</table>

The game is played by both players writing their strategy down on paper, and simultaneously turning them over to see the outcome, which is based on each player’s chosen strategy. Thus, both players choose their
strategy without knowing their opponents choice of strategy. For example, Rick is thinking about strategy D because he wants to get the largest payoff of 16. But then Carl might choose strategy E and Rick will lose 16. Well, if Carl chooses strategy E, Rick wants to choose strategy A. Thus, we enter a sort of circular cycle in which each player is going after a large payoff. As it turns out there is a strategy that each player can pick with certainty. However, before identifying that strategy we will develop a few elementary concepts of game theory in order to gain a better understanding of why one strategy is better than the other.

The Two-Person Zero-Sum Game consists of two players, referred to as the row and column players. The row player chooses 1 of $m$ strategies, and the column player chooses 1 of $n$ strategies. Thus, there are a total of $m \times n$ possible outcomes. If the row player chooses row one and the column player chooses column two, the outcome is taken from the matrix value at row 1, column 2.

<table>
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<th>E</th>
<th>F</th>
<th>G</th>
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<tbody>
<tr>
<td><strong>Rick</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>12</td>
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<td>B</td>
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<td>C</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>-16</td>
<td>0</td>
<td>0</td>
<td>16</td>
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</tbody>
</table>

In this game, the outcomes for each player add to zero (i.e. however much one player gains, the other player loses); therefore, it can be classified as a Two-Person Zero-Sum game. By taking a closer look at the game above, we discover that Carl should never choose to play strategy G, because strategy F will give Carl a better payoff than strategy G, regardless of how Rick decides to play. When one strategy has a better payoff than another for every outcome, we say that strategy dominates the other. Thus, strategy F dominates strategy G. It therefore makes sense that a rational player should never choose a dominated strategy.

One basic strategy in our game is for each player to try to minimize his worst possible outcome. Rick would determine the smallest number in each row and from this group choose the largest number and pick the corresponding row for his strategy. Carl would take on the same strategy; however, since he wants the largest negative number he would determine the largest number in each column, and from this group he would pick the column with the smallest number as his strategy. Thus, each player ends up choosing the strategy that is his best at-worst scenario. In our previous example, shown again below, Rick would determine, from the group of numbers -1, -20, 2, -16, that 2 is his best at worst scenario, and would choose the corresponding strategy C. Likewise, Carl would look at the group of numbers 12, 2, 7, 16, and choose strategy F because it is his best atworst scenario. After both players discover which strategies each other want to choose according to this worst case scenario theory, they determine whether the outcome at that point is less than or equal to any outcome in its row and greater than or equal to any entry in its column. If it is, then it can be classified as a saddle point and each player should choose a strategy that brings about that outcome. Therefore, this game would result in the strategy Rick C-Carl F, which gives a payoff of 2 to Rick.
To further understand why Rick should choose strategy C, and Carl should choose strategy F, we can put ourselves in each player’s position. Since it is rational for Carl to assume Rick will most likely choose strategy C, he isn’t going to want to change his position because if he does he will end up giving an extra point to Rick. Through similar reasoning, Rick can conclude that he is satisfied with his position, because, by changing, he will most likely lose points that he is guaranteed to win if he chooses his most rational strategy C.

Another basic principle in game theory says that if there is a saddle point, both players should choose the strategy that contains it. Furthermore, the value of the game can be determined if there is a saddle point. The value of the game is equal to \( v \), if the row player has a strategy that guarantees at least a payoff of \( v \) points, and the column player has a strategy that keeps the row player from winning more than \( v \) points (Straffin 9). Therefore, if the game has a saddle point, the saddle point entry is the value of the game. Thus, the value of the game below is 2, and occurs at the outcome of strategies Rick C-Carl F.

Since most games do not contain saddle points, we must develop a method for choosing the best strategies. Consider the following different example, with Rick and Carl playing the same game but with different strategies and payoffs are changed.

<table>
<thead>
<tr>
<th></th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>-3</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

In the above example, there is no saddle point. Furthermore, if both players pick the strategy that is their best at-worst strategy, Rick will pick strategy B, and Carl will choose strategy E. The resulting outcome is 0. However, if Rick thinks that Carl will choose strategy E, he will want to choose strategy A to get a payoff of 2. But Carl might foresee Rick changing his strategy and decide to choose F to get a payoff of 3; this thinking process goes on forever. There is no equilibrium point. Since it is reasonable for each player to determine that there isn’t a saddle point, they should decide to play a mixture of strategies by picking each strategy according to certain fixed probabilities. This type of plan is referred to as a mixed strategy.

The effect of one or both of the players using mixed strategies can be analyzed using the concept of expected value. The expected value of a set of payoffs, \( a_1, a_2, a_3, a_4, \ldots \) with respective probabilities \( p_1, p_2, p_3, p_4, \ldots \) is \( p_1 a_1 + p_2 a_2 + p_3 a_3 + p_4 a_4 + \ldots + p_k a_k \) (Straffin 9). A player using a mixed strategy assigns probabilities to each strategy. It is possible for each player to determine the probabilities to their best advantage. Furthermore, if a player knows his opponent is playing a certain mixed strategy, and will continue to play it regardless of what he does, he can calculate the expected value for each of his strategies and should play the strategy which has the largest expected value. The example above requires that
each player should choose a mixed strategy, which means they should assign certain probabilities to each of their respective strategies to determine how often they will choose each. To find out how Carl can assign probabilities that Rick can not take advantage of, we calculate Rick’s expected value, by assuming Carl is playing strategy A, x of the time, and strategy B, (1 - x) of the time, where 0 < x < 1.

\[
\begin{align*}
\text{Rick A: } & \quad x(2) + (1 - x)(-3) = -3 + 5x \\
\text{Rick B: } & \quad x(0) + (1 - x)(3) = 3 - 3x
\end{align*}
\]

Rick will not be able to take advantage of Carl’s mixed strategy if these two expected values are the same (x=3/4). Thus, if Carl plays the mixed strategy (3/4)A (1/4)B he can guarantee that Rick will not be able to win more than (3/4) unit per game, regardless of how Rick plays. Using the same idea and method from Rick’s point of view, we see that if Rick plays the mixed strategy (3/8)A (5/8)B he is assured of winning, on average, at least (3/4) units per game, regardless of how Carl plays. We can further conclude that (3/4) is the value of the game, (3/8)A (5/8)B is Rick’s optimal strategy, and (3/4)A (1/4)B is Carl’s optimal strategy.

Let us now consider a missile penetration problem using an imaginary scenario created out of the events of the Desert Shield/Desert Storm war between the United States and Iraq. Suppose Iraq has four Scud missiles, which will be fired in sequence, and wishes to destroy a US military base in Saudi Arabia. Two of the missiles have real warheads, while two are dummies. Iraq must choose the order in which to send the live warheads and the dummies. We will represent the six different strategies, or orders, that Iraq can choose using the letters D and W to signify dummy and warhead, respectively. Thus, the strategy DWWD means Iraq chooses to send a dummy, warhead, warhead, dummy in that order.

For defense, the US has two Patriot missiles, which can intercept Iraq’s scud missiles. When launched, each Patriot missile can scan two Scud missiles and destroy the first one it sees which has a real warhead. The US must decide when to launch each Patriot missile. We represent the US’s strategic options using the numbers 1–4. For example, the notation “13” means they launch Patriot missiles when Iraq launches its first and third Scud missile.

The US wins (payoff +1) if they destroy both of Iraq’s Scud missiles. However, the US loses (payoff 0) if even one of Iraq’s warheads gets through and destroys a base. To further understand how the payoffs are calculated consider US 13 against Iraq DWWD. The first US Patriot missile will scan the first and second Iraqi Scud missiles and destroy the second, which has a live warhead. After scanning Iraq’s third and fourth Scud missiles, the second Patriot missile will destroy the third Scud missile because it is real.

The situation, or game, can be represented by this matrix:

<table>
<thead>
<tr>
<th>US</th>
<th>WWDD</th>
<th>WDWD</th>
<th>WDDW</th>
<th>DWWD</th>
<th>DWDW</th>
<th>DDWW</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13-</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>14-</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
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<tr>
<td>23</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>34</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
In our determination of each of the players’ optimal strategy, we begin by searching for any saddle points or dominance. There are no saddle points; however, there is dominance. US 14 is dominated by US 13, and US 24 and 34 are dominated by US 23. This makes sense, because the US would waste their second Patriot missile’s capability of scanning two Scud missiles if it isn’t launched until the final Scud missile is launched. Furthermore, Iraq’s strategies WDWD and DWWD are each dominated by the strategy WWDD, and strategy DWDW is dominated by the strategy WDDW. Hence, the game can be represented by the reduced matrix of size 3 x 3 below:

<table>
<thead>
<tr>
<th></th>
<th>WWDD</th>
<th>WDDW</th>
<th>DDWW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iraq</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>US</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>12</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>0</td>
<td>1</td>
<td>0</td>
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<tr>
<td>23</td>
<td>0</td>
<td>0</td>
<td>1</td>
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From here we can calculate the optimal solution from the US and Iraq’s expected values. We find the US’s expected value, by assuming Iraq plays a mixed strategy with probabilities x for WWDD, y for WDDW, and 1 – (x + y) for DDWW, where x > 0, y > 0, and x + y < 1:

\[
\begin{align*}
\text{US 12: } & x(1) + y(0) + [1 - (x + y)](0) = x \\
\text{US 13: } & x(0) + y(1) + [1 - (x + y)](0) = y \\
\text{US 23: } & x(0) + y(0) + [1 - (x + y)](1) = [1 - (x + y)]
\end{align*}
\]

The US will not be able to take advantage of Iraq’s mixed strategy if these two expected values are the same (x=1/3). Thus, if Iraq plays the mixed strategy (1/3) WWDD, (1/3) WDDW, (1/3) DDWW they can guarantee that the US will not be able to win more than (1/3) unit per game. We can further conclude that (1/3) is the value of the game, (1/3)US 12, (1/3) US 13, (1/3) US 23 is the US’s optimal strategy, and (1/3) WWDD, (1/3) WDDW, (1/3) DDWW is Iraq’s optimal strategy. From our analysis of the situation we see that the US has only a 1/3 chance of saving its base and that Iraq should always fire its dummies together in a string giving the US the opportunity to waste a Patriot missile.

Game theory may seem fascinating; however, it only can attempt to provide the best course of action in any situation of conflict and cooperation. In actuality, there is much involved in even the simplest real world situations. First of all, the complexity of real world situations may make it difficult to determine the identity of the actual players and the possible strategies, outcomes, and payoffs. Second, game theory works if both players are making rational decisions. And lastly, the situation becomes more complicated if the players’ interests are not completely opposed to each other.

**Works Cited**

AMERICAN INTELLECT

Joshua Scott Jenkins

Josh lives in Spartanburg, South Carolina. Josh, a member of the class of 1999, is pursuing majors in Political Science and Spanish. This submission was written for and suggested for publication by Dr. Gardel Feurtado, in his Comparative Politics class. The following book report is a look into Alexis De Tocqueville’s Democracy in America, Part Two, Book One focusing on De Tocqueville’s views on democracy’s influence on intellect.

Democracy In America, was first published in 1835 and 1840, but it is still a relevant look into America’s democracy and how democratic freedom has affected American society. Alexis de Tocqueville was born in Paris to the educated aristocracy, and he lived through the French Revolution under the shadow of “Equality, Liberty, Fraternity.” De Tocqueville realized that France was moving towards a political system based on democracy and equality, and he came to the United States to study the phenomena first hand. In 1831 he came to the US under the pretense of studying the prison system, and he left nine months later. After this tour of American society and politics he began the critical novel that revealed to the French characteristics of democratic thought that are still very important to this date. De Tocqueville was not a political scientist or democratic genius, but his ideas have survived the test of time and are essential in understanding the democratic system’s society.

I chose this book because it is relevant to the areas of study in a class that is focused on studying and comparing democracies. This may be the first important work that studies democracy in comparison to the old regime of aristocratic society. The novel, in its entirety, is long and would be difficult to review in a four to five page paper. The abridged version is more concise, and for the purpose of this review I selected one book from the novel to read. The novel is divide into two parts: the first discusses democratic origins and mechanisms in the United States, and the second part discusses the effects democracy and equality have on aspects of society. I chose the first book of the second part, Influence of Democracy on the Action of Intellect in the United States. The book is also divided into separate sections of focus. This book has ten sections and forty-one pages. Forty-one pages may not appear to be many, but the script is small and the style is precise and teeming with information.

De Tocqueville wrote this book to inform the French about the effects and consequences of democracy and equality. He concerns himself with uncovering both the positive and negative aspects of this political system in order to assist in France’s political development. He approaches the work as though he were a casual observer, but his insight is extremely sincere and to the point. It is still important today because the democracy is still being developed around the globe. This book can give insight into some of the things leaders should consider about the culture the represent. The text is being referred to be both modern political parties of the US, and it has made endnotes in over sixty books. The lack of assigned social status, equality, is the one continuous thread that dictates American society. In the section I read he talks about the effects of equality on the American intellect. In the Book I he writes about the American intellect in relation to philosophy, religion, the indefinite perfectibility of man, and our tastes for science, literature, and art.

When De Tocqueville writes about democratic philosophy he concentrates on man’s new found individualism through equality. He says that equality has set each man to believe that his own judgement
and understanding is valid (144). Therefore, each man only answers to himself and only trusts what he
knows to be true. In a democratic society where everyone’s vote is equal the people will find it harder to
follow or readily accept the philosophy of one man. The people will devise their own philosophies or
accept the majority views when they cannot find their own (149). This individualism and unwillingness
to be lead greater intellect or forms will also have a diminishing affect on religion.

De Tocqueville says that the democratic society is possessed by the attainment of material gratification
(152). The focus of democratic society will not be only on the church or salvation, but men will also look
for peace and happiness in earthly possessions. He says that priests will be confined to the sphere of
religion and the confines of the church, and that his work in the remainder of society will be diminished
(154). Equality and democratic thought will lead society to totter between “liberty and obedience,” and
this dispute will have an over all weakening of organized religion (156). Religion may suffer, but he does
say that man must be persuaded to pursue his riches in an honest manner. While God’s influence is being
ignored men will most often look to themselves for the answers, so the theory of the perfectibility of
mankind was born.

Man is capable of improving his situation. When class structure confines man to a certain profession
he must continue on with the work his father has taught him. In a system where men are equals one can
chose which field he will pursue, and competition and continuous improvement is key in success. In the
democratic society success is answered with a call for more success and when one tastes a better lifestyle
they strive for one more level of improvement (157). This train of thought can be followed indefinitely,
and that is how democratic society has developed the theory of perfectibility. He expands this idea of
continuous improvement and capitalistic drive in his discussion of the American tastes for the humanities.

De Tocqueville says that the “spirit of gain” focuses our attention on the acquisition of wealth and
leaves no time for consideration of the imaginary or intellectual (159). He continues by saying that we do
not study science for its own sake, but we advance our knowledge of practical science in an effort to
increase our fortunes (166). The American Dream is the idea that any man, because he is equal with all
others has an opportunity to secure happiness for himself through his own hard work and dedication. It is
this constant striving by most Americans to be successful that we forget the importance of leisure and
cultivated arts. Thankfully, Europe has been close enough to prevent our fall into barbarianism (160). De
Tocqueville predicted that our literature on the whole would be printed as quickly as possible in order to
increase sales at the expense of quality (177). He says that the concentration of our poetry will be the
human plight rather than nature and heroes. He concludes by writing about our focus of history as the
theory and interests that shape events and-not the individuals that make the decisions. His insight comes
very close to the way things have developed in our democratic society.

It is amazing to see how relevant De Tocqueville’s writings still are today. I have learned a lot about
American culture from this reading of *Democracy in America*. I think it is amazing how much our culture
is derived from one basic principle, equality of all men. I would recommend this novel to anyone who
would like to read a solid and very respected view of the essence of American culture and reason. This
novel is a timeless tool in understanding the democratic development of society.

**Works Cited**

THE BIOCHEMISTRY OF ALZHEIMER’S DISEASE

Dean Sproles

Dean is from Rock Hill, SC, and is graduating this year with a major in Biology. He spent a week in Nicaragua setting up a medical facility and distributing health aid. This paper on Alzheimer’s Disease was written for Dr. Lisa Zuraw’s Biochemistry class and was suggested for publication by Dr. Susan Mabrouk. The study of the events that cause or are caused by Alzheimer’s will help future genetic engineers cure the ailment.

Introduction:

Alzheimer’s disease is a condition affecting over two million people in the United States. The characteristic symptoms of this disease involve a gradual loss of abilities in memory, thinking, reasoning, judgment, orientation, and concentration (Gruetzner 5,7). Patients usually die within twelve years from the onset of the disease, but an accurate diagnosis can only be made through eliminating other factors that can contribute to mental dementia (Sherwood 138). The exact cause of Alzheimer’s disease is still unknown. Over the past century, many researchers have been working arduously in efforts to identify the many biochemical interactions causing this disease (Gruetzner 205). Much has been accomplished as a result of these efforts, but the progress towards producing an effective cure for this condition has been minimal. As more knowledge is obtained about the specific biochemical events occurring with this disease, several medications have been produced which inhibit or enhance the agents implicated in the symptoms of the disease.

The main problems that arise in Alzheimer’s patients are the manifestation of neurofibrillary tangles and neuritic plaques in the cerebral cortex, which is the region of the brain controlling such functions as reasoning, thinking and memory. These physical abnormalities occur in the body of neurons in this region of the brain, potentially leading to the destruction of these nerve cells. Research is currently attempting to determine if these abnormalities directly cause the disease, or if they are only side effects resulting from the diseased condition (206-7).

Research Discoveries:

Alzheimer’s disease was first discovered by Alois Alzheimer in 1907, as a pathological change occurring in the cerebral cortex of the brain. In the late 1960s, Blessed, Tomlinson, and their colleagues discovered a correlation between elderly persons demonstrating dementia in clinical experiments, and those having excessive neuritic plaques after death. These researchers also found that the patients showing signs of mental dementia consistently had a reduction in the production of the enzyme choline acetyltransferase (Dubler and Melnick 2-4).

Reisburg (1983) convincingly showed that Alzheimer’s disease disables the brain’s neurotransmitter cholinergic system (Figure 1). The transmission of a nerve impulse in this manner involves the secretion of a chemical called acetyl-CoA in the presynaptic portion of a neuron. The acetyl-CoA transfers an acetyl group to choline by binding with the enzyme choline acetyltransferase, resulting in the production of acetylcholine (Figure 2). Molecules of acetylcholine are packaged into synaptic vesicles, which are
released into the synapse between the neurons upon stimulation by the presence of calcium. These vesicles are recognized by acetylcholine receptors on the recipient neuron. The message is transmitted until an acetylcholinesterase enzyme can be activated to disrupt the bond. Acetylcholinesterase is a serine protease that catalyzes the hydrolysis of acetylcholine to produce choline and acetate (Figure 3). These molecules are transported back into the presynaptic membrane for future use (Voet and Voet 390, 1296-9). This mechanism allows the brain to process hundreds of impulses through the nerves each minute. In Alzheimer’s disease, there is a loss of acetylcholinesterase in cholinergic and non-cholinergic neurons in the brain. There is, however, an increase in this enzyme in the areas around amyloid plaques (Sberna September 97). The damage in these nervous pathways causes severe damage to the memory functions and emotional health of Alzheimer’s patients.

There are other neurotransmitter deficiencies in Alzheimer’s patients. Volicer (1985) discovered that there is a serotonin and serotonin metabolite 5-HIAA deficiency involved with this disease. The flow chart in Figure 4 shows the necessity for serotonin in the effective response to a strong stimulus. The HIAA deficiency can be related to changes in metabolic products from reduced levels of serotonin. These deficiencies have been associated with the patients’ changing sleeping patterns, mood changes, and aggressive behavior. Studies by Gottfries (1985) and Davies and Wolozin (1987) proved that there are also deficits of noradrenaline in Alzheimer’s patients contributing to depression and excessive sleeping. Various neuropeptides, such as somatostatin, substance P, neurotensin, and cholecystokinin, have also been shown to play a role in this disease. Tammenga (1987) has linked the deficiency of somatostatin neurons with the early stages of brain deterioration (Greutzner 230-32).

In 1987, Davies and Wolozin discovered a genetic defect on chromosome 21, which could be the cause of familial Alzheimer’s disease. This was the first indication that some forms of this disease are under genetic control. The same chromosome has also been shown to have a gene for producing a primary protein component for amyloid (Gruetzner 217). Other genetic links were discovered with early-onset familial Alzheimer’s disease on chromosome 1’s mutation in presenilin-1, and on chromosome 14’s mutation in presenilin-2. Through amino-acid sequencing data, the carboxy fragment of presenilin-1 with neuritic plaques, has been shown to start at residue 300 (Wisniewski Aug 97).

The neuritic plaque is seen as a tangled mass of neurons. The tangle consists of arrays of thousands of fibrils, which are seen as pairs of abnormal filaments wrapped around each other in a helical pattern, called a bihelical filament. Each filament in the bihelical pair is 100 Angstroms in width. A normal filament is the same width, but it is linear and has many branching side arms that are not present in the bihelical filament.

The neuritic plaques have degenerating nerve endings; however, most of the membranes involved in the transmission of nerve impulses are intact. The center of the plaque contains another group of proteins called amyloids. These proteins are found in other regions of the body which have undergone a chronic infection. The amyloid proteins inside the plaque result from the breakdown of proteins in the tissue of the brain (Dubler and Melnick 2-4). Wisniewski (1983) discovered that there were three different types of plaques: classical, amyloid, and primitive. In classical plaques, the amyloid is contained inside the core. Amyloid plaques consist entirely of amyloid; and primitive plaques have no amyloid. Alzheimer’s patients have all three types of plaques (Gruetzner 214).

Recent researchers have investigated two A beta species, which are found in amyloid plaques. They obtained the brains of patients known to have early-onset familial Alzheimer’s disease. It has been determined that a region of the presenilin-1 gene has a point mutation of known specifications, and has a
deletion of exon 9. Carboxyl-end specific antibodies were incubated with the two beta subunits of the amyloid plaques in these brains. It was determined that there was only an increase in the A beta 42-plaque in brains who had the presenilin-1 gene. This could mean that early-onset familial Alzheimer’s disease promotes an increase in this particular region of the amyloid plaque (Ishii May 97).

Oxidative stress has also been associated with the damaging effects of this disease. The membrane action of amyloid A beta 42-plaque results in an accumulation of beta-associated free radicals. These free radicals cause lipid peroxidation, which yields the major product 4-hydroxy-2-trans-nonenal (HNE). Synaptic membranes showed changes in protein conformation and bilayer fluidity when incubated with low concentrations of HNE. As the concentration of HNE was increased, the fluidity of the synaptic membrane increased. The changes brought about by HNE may be the primary cause of neurotoxicity in the brain (Subramaniam September 1997).

Some researchers have suggested that there is a relation between an intronic polymorphism at the 3' position of the presenilin gene’s exon 8 and late-onset Alzheimer’s disease. The results of a controlled experiment, involving persons with and without late-onset Alzheimer’s, have led some intellectuals to believe that this effect is merely a symptomatic culmination of vascular dementia. They feel that this polymorphism is not caused by Alzheimer’s disease (Matsushita August 1997).

In the early 1980s a series of experiments showed that the bihelical filaments and neuritic plaques are primarily located in the hippocampus amygdala regions of the brain. These regions of the brain are the control centers for the experience and expression of emotion, and for the storage of short and long term memory. In 1986 Bondareff discovered that the tangles are also present in areas of the brain responsible for secreting norepinephrine, serotonin, and dopamine (Gruetzner 212).

Studies have shown that the loss of cognitive ability can be attributed to reduced synaptic capacity in areas of the brain. The synaptic proteins synaptobrevin, synaptophysin, synaptotagmin, synaptosomal-associated protein 25 (SNAP-25), and syntaxin 1/HPC-1 were tested by Western blotting methods to see if there was a decrease in the amount of each protein expressed in normal and Alzheimer’s brains. The amounts of synaptobrevin and synaptophysin, which are found in the transmitting synaptic vesicles, decreased by 30% in Alzheimer’s brains. Synaptotagmin, synaptosomal-associated protein 25 (SNAP-25), and syntaxin 1/HPC-1, which are located in the presynaptic vesicles, decreased by 10% in Alzheimer’s brains (Shimohama July 97). This suggests that the proteins of the neuron that are associated with packaging the neurotransmitter into vesicles are decreased to a greater extent than proteins involved in formulating the neurotransmitters.

Mace and Rabins (1991) found an accumulation of two abnormal proteins in the brain of Alzheimer’s patients. The tau protein and the microtubule-associated protein (MAP) were found in regions of neurofibrillary tangles in the brain (Gruetzner 218). Tau is a specific type of MAP which is only activated upon phosphorylation. In Alzheimer’s disease, tau is found to be hyperphosphorylated. Research has discovered one specific enzyme, GSK-3 beta, which may be the agent causing this hyperphosphorylation (Wagner July 97). In normal axons, the tau protein associates with tubulin to form the microtubule along which the neural message proceeds (Figure 5). If tau becomes hyperphosphorylated, it intertwines to form an aggregation of bihelical filaments (Sherwood 139).

Neural levels of the apolipoprotein E epsilon 4 allele have also been associated with the varying degrees of dementia in Alzheimer’s patients. Those homozygous for the A allele of the alpha 1-antichymotrypsin gene have also been linked to those having late onset Alzheimer’s disease (Nacmias July 97). The gene for apolipoprotein E is located on chromosome 19, which is in close vicinity to one of the three genes coding for calmodulin. Calmodulin is a calcium binding protein, that is suspected to be linked
to the diminished calcium buffering capacity in the lymphocytes in Alzheimer’s patients. All results obtained to this date have not linked this particular calmodulin coding region to any alteration in the calcium buffering capacity of Alzheimer’s patients (Ibarreta July 97). Some studies have suggested that apolipoprotein E epsilon 4 keeps the extra phosphate attached to tau proteins. This could be the cause of the increased neurofibrillary tangles in patients with this gene (Sherwood 139).

**Possible Treatments:**

One of the main problems associated with Alzheimer’s disease is that it is difficult to diagnose during its early stages. One promising method for identification involves fibroblasts located in the skin. The fibroblasts in Alzheimer’s patients have defective potassium channels in their cellular membranes. This could allow physicians to identify a characteristic of the disease besides mental dementia (Sherwood 138)

Although Alzheimer’s disease cannot be cured, many measures have been taken to prevent its numerous side-effects. Most of the drugs are being used because of their effects on the cholinergic system. Lecithin and choline increase the availability of acetylcholine in the brain. Choline treatment has been shown to have very little effect in Alzheimer’s patients. Some patients have experienced an increased awareness and a reduction in confusion, but it has only been shown to help patients in the early stages of Alzheimer’s. Lecithin has been shown to elicit similar effects, as well as possibly slowing the deterioration process.

Physostigmine and THA reduce the effects of acetycholinesterase on acetylcholine hydrolysis, allowing the acetylcholine to remain attached long enough to transmit the signal. The improvements shown in patients taking physostigmine are greater than in choline or lecithin treatment. Patients taking physostigmine have shown improved visual recognition memory and an increased ability on psychological tests. This drug has been effective in patients that have only suffered from decreased cholinergic neurotransmitters. THA treatment has shown similar results, but there are fewer side effects than with physostigmine, and it lasts longer in the brain. This drug selectively blocks potassium channels in the nervous system, allowing the action potential to be maintained for longer periods of time. The combination of lecithin and THA have resulted in the greatest extent of demential improvement in Alzheimer’s patients.

**Discussion and Conclusions:**

Much has been discovered about the biochemical occurrences in the brain and their relationships with the physical characteristics of patients with Alzheimer’s disease. The connections between the various mechanical interactions involved with the progression of this disease are slowly being determined. The decreased numbers of neurotransmitters and alterations in other important proteins involved in the transmission of nerve impulses are altered in patients with Alzheimer’s disease. This disrupted communication throughout the brain is responsible for the victim’s altered personality. Medications focusing on these specific regions have yielded promising results.

Recent research has been able to identify two different types of this disease. Late-onset familial Alzheimer’s begins in old age and progresses slowly, and early-onset familial Alzheimer’s begins in middle age and continues with a rapid course of development. The possible genetic relationships with these types has been intensively studied to completely identify specific agents promoting the transcription of these genes. In the distant future, as more information is obtained about the roles of genes in Alzheimer’s, there is the potential for direct application of genetic engineering to cure patients with this disease.
Figures

Figure 1: Neurotransmitter cholinergic system (the neurotransmitter is acetylcholine)

Figure 2: Effects of choline acetyltransferase

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\text{Acetyl-CoA} + \text{Choline} \xrightarrow{\text{choline acetyltransferase}} \text{Acetylcholine}
\]

Figure 3: Effects of acetylcholinesterase

\[
\text{Acetylcholine} \xrightarrow{\text{acetylcholinesterase}} \text{Acetate} + \text{Choline}
\]
Figure 4: Flow chart for effects of serotonin secretion

- Release of serotonin from facilitating interneuron
- Cyclic AMP in presynaptic neuron
- Blockage of K⁺ channels in presynaptic neuron
- Prolongation of action potential in presynaptic neuron
- Ca²⁺ channels in presynaptic neuron kept open longer
- Ca²⁺ influx
- Output of transmitter from presynaptic neuron
- Postsynaptic potential in efferent neuron
- Enhanced behavioral response to mild stimuli

Figure 5: Tau protein forms microtubular "highway"

Endoplasmic reticulum
Golgi complex
Microtubular "highway"
Secretory vesicle
Axon
Debris
Lysosome
Cell body
References


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CHILD CARE FOR WELFARE RECIPIENTS

David Rawlinson

David, from Rock Hill, SC, is a member of the Class of 1998. He is a member of the White House Committee for Youth, Drugs, and Violence, and winner of the prestigious Truman Scholarship. He plans to study law and concentrate on public policy after graduation. The essay below was written for his Truman Scholar application. The essay was written as a letter to a Senator to propose a policy change regarding child care assistance for mothers on welfare.

In our nation’s effort to move welfare mothers from “welfare to work,” the most crucial, but sometimes overlooked factor may be child care. The average welfare recipient is a single mother with two children. In addition, 89% of all children who receive or are under the care of someone receiving Aid to Families with Dependent children (AFDC) live with a single parent home. Child care is often the deciding factor in whether welfare recipients have income below or above the poverty line. In my home state of South Carolina the total value of all welfare benefits for a mother with two children is about $5800. If this same mother is working a full-time job at minimum wage, then earnings jump to $13,450 or $1130 over the Federal Poverty Income Guidelines. However, once taxes, which are minimal, and child care are taken into account she earns $10,300 or $2120 under the Federal Poverty Income Guidelines. This is certainly not a problem contained in South Carolina. In 37 states the consideration of child care puts a mother working full-time at minimum wage under the poverty line.

I propose that we provide free and reduced-price child care for all welfare recipients who have been hired for a job. There are 9.6 million children on AFDC. Of these the Department of Social Services estimates that 57.8% are in need of child care that can’t be provided at home, at a parent’s work, or in a friend’s home. This leaves 5,548,800 children who are in need of organized child care. The Department of Social Services makes allowances of $175 for children under the age of 2 and $200 for children 2 to 10 for the purposes of eligibility benefits. Since this is the figure agreed upon by our government I will use this as the estimated cost for child care (this figure is actually higher than the national average). By this measure it would cost about $13,197,000,120 a year to pay for child care for the 5,548,000 children in need of organized care.

The next question is how do we pay for this? The first place for consideration is from the parents themselves. On the average a mother working 40 hours a week realizes a net income gain of $118 per week, $5,664 a year after benefits have been reduced for increased income. Nearly $3800 of this increase would be taken up in child care expenses. With free child care and benefits reduced by $1200, the mother would still realize a net gain of $2600. This would give the recipient a net gain of $8,264 for working and would push her income up and out of the poverty level in all 37 states mentioned previously. Approximately $5,998,000,000 would be gained by this reduction in benefits, leaving about $7,209,120,000 to pay for.

If mothers after one year were required to pay for a portion of the child care expenses at the same rate as is used for dispersal of the Earned Income Tax Credit which they receive, to reach 50% after five years, this would pay for another $865,094,400. This leaves $6,344,025,600 to be paid for by the states, or $126,688,050 per state. For a number of reasons this burden is not as heavy as it may seem. The first is that states already have a mandate under federal law to guarantee child care to AFDC families “to the
extent that such care is necessary for an individual in the family to accept employment, or remain employed in the AFDC Job Opportunity and Basic Skills (JOBS) program." In addition, states are required to pay for Transitional Child Care (TCC) for 12 months after a family leaves AFDC, although they are allowed to set up a sliding fee scale. Programs intended to comply with this unfunded federal mandate could be eliminated, freeing up money to go towards the Federal program. States would also realize decreased welfare roles, increased buying potential for welfare recipients, and a decrease in the welfare eligibility since the $150 and $200 allowances for child care used in determining AFDC eligibility could be eliminated. Since each state has tried to comply with the Federal mandate differently, it is impossible to know what the net loss or gain for this program would be for the individual states; however, it seems safe to assume the majority of the cost would be offset.

Central to the preservation of the American Dream, which has its foundation in opportunity for advancement, is the need for government to, in the words of our President, “help people help themselves.” By not having child care options our government has fallen short of this goal and consequently has prevented the realization of the American Dream by many. Just as our nation’s economic productivity is judged by the Gross National product, so is its basic level of humanity judged by the treatment of those citizens who seem to matter least. America’s humanity, ideals, and traditions demand that we give welfare mothers additional options other than either seeing that their children are cared for or living in undignified poverty.

**Notes**

*All figures and statistics are from 1994 since this is the last year that all necessary information was available.

4. Keith, 8.
5. Keith, 11.
15. Davis, 13.
17. Davis, 13.
COMPUTER’S IN THE CLASSROOM: ITS PART IN EDUCATION REFORM, BENEFITS, CHALLENGES, USES, AND THE ROAD TO THE FUTURE

Walter Eric Zink, Jr.

In the face of growing demands on education by the various facets of society in a changing world, the words “technology” and “reform” have been increasingly used in reference to education. The increasing manifestation of technology in science, business, government, and every other aspect of society requires a like manifestation in education.

The most prevalent issue dealing with technology in education is the use of computers in the classroom. In conjunction with the increasing adoption of technology into our lives and society is the influence of computers. The reality of this is all too apparent when one finds him or herself face-to-face with a display console and a keyboard (the whole apparatus talks as well), not when analyzing complex data but at the local gas station. It is therefore a very current and real issue with which society is faced in dealing with technology and education.

The ushering in of this new era, ostensibly lauded as the “Information Age,” brings with it many concerns about its effects on education issues pertaining to the Internet in an educational environment. With the Internet networking thousands of computers in every corner of the world it has without any doubt the potential to be the greatest information resource ever known: “the broadest array, and the largest amount of information ever assembled on Earth” (Warschauer 1995, p.70). However, many issues including the availability and potential use are stalling education’s adoption of this technology.

It is remarkable that in such a fast-paced and information-wealthy society education lags so far behind the rest of society in embracing this movement. Strikingly, one is required to deal with a computer at the filling station or the supermarket, but only a mere 15% of classrooms have a telephone connection, let alone a computer (Loveless, 1996). According to such data it would seem to be of paramount concern to bring our classroom environments up to speed with the technological leaps in society. There are many who resist the addition of technology to the classroom. This is one of the biggest debates in education today. Can technology really help students learn? Will connections to the Internet help or hinder students learning? In what ways can technology and computers, especially ones that are connected to the Internet, be used in schools to facilitate learning, and are there any real benefits over traditional styles of learning? These are some of the questions that are being raised in this debate.

Studies in several different educational disciplines have proved with varying results that computer
technology and the Internet do have affects on students in educational applications. In subjects ranging from physical education, to English, to mathematics, use of the Internet has been demonstrated to be a positive influence in the classroom. There are concerns about certain problems that could be introduced by the Internet with content being perhaps the most prevalent, but most agree that it is a vast resource waiting to be tapped. Additionally, as a result of long-overdue educational research, it is being shown that technology based education reform fits very well into what are currently being purported to be the best teaching and learning methods and are very strong in areas where traditional learning styles have shown to be lacking.

Having its roots in the Cold War, the Internet grew out of the 1957 founding of ARPA, or Advanced Research Projects Agency, within the Department of Defense, in response to the launching of Sputnik. Its purpose was to lead the US in science and technology as applicable to the military. With this agency came ARPANET in 1969, the first computer network, which connected computers at four US universities. As leading computer specialists world-wide agreed on communication protocols so that the various computers would understand each other, the number grew to over 100 in 1979, over a thousand in 1984, and now is growing exponentially to over ten thousand in 1989, a million in late 1992, and almost 20 million in 1997. Now world-wide and connecting countless millions of computers, and thereby the ideas and cultures of the users, the Internet and its offspring, the World-Wide-Web, which includes audio-visual capabilities is an educational tool of unimaginable power (Zakon, 1997).

In general, the computer technology and the Internet have many potential uses in education. Computer-Aided-Instruction (CAI), Internet-based research, E-mail, and discussion/news-groups, are just some of the more useful features of computer/Internet technology (Rothenberg, 1995; McCarthy, 1994; Means and others, 1993). The intrinsically different qualities of information presentation in this medium have proved to be beneficial in educational applications: “Used well, technology applications can support higher order thinking by engaging students in authentic complex tasks within collaborative learning contexts” (Means and others, 1993, p.28).

As an agent of education reform, technology is viewed by many as a potential method for breaking the cycle inherent in the current education system. The efforts at present in reforming education along the lines of traditional methods have been described by critics as “quantitative, not qualitative in nature (i.e., ‘more of the same’),” offering more courses of advanced degree but with insufficient content and the same instructional techniques previously employed, and thereby not accomplishing the goals of reform (Means and others, 1993, p.1). Based on the transformation of other aspects of society, such as the workplace, communication, and commerce by technology, it is believed that it can bring the similar changes to education, and that it can “support superior forms of learning.” Current education research states that “advanced skills of comprehension, reasoning, composition, and experimentation are not acquired through the transmission of facts, but rather through the learner’s interaction with the content”(1-2). Computers being inherently interactive provide a rich environment for this “constructivist view” of learning (Means and others, 1993). Promising a positive outlook, the usefulness of these technologies in the classroom has already been proven in many disciplines.

Work with special-needs students, specifically the hearing impaired, has shown the effectiveness of using computers and the Internet to implement these new forms of instruction. Such students, for whom traditional modes of learning are not applicable have been shown to benefit from computer-based learning: “The Internet has many capabilities that make it especially useful with dead and hard-of-hearing students, who benefit from a highly visual presentation of information.” Furthermore, “the combined textual with
visual presentation of information enhances conceptual understanding and can lead to increased academic achievement” (Luft, 1997, p. 85). The ability for students to tailor their studies according to their own needs is another benefit that has been demonstrated by this type of learning. Of this, Pamela Luft wrote that using the Internet “allowed [students] to select web-sites and resources that portray information in a manner that is most effective to them as individuals” (82). Examples of using the Internet effectively include enhanced conceptual development by using

1. topical sources to expand students’ knowledge base,
2. to create or expand information presented as graphical organizers (e.g. semantic webs and conceptual maps) and
3. access to video encyclopedias or resources that provide footage of real-world events and their impact on our lives. (Luft, 1997, p.85)

These kinds of benefits are not limited to special-needs students. The same reasons that make the Internet such a useful teaching tool for these students would have similar benefits for students without special needs.

The foreign language classroom is one place where students would be able to make use of the audio resources that the web provides. In this application, CAI, here called CALL for “Computer Assisted Language Learning,” has shown to be immensely useful in the repetitive instruction of grammar drills. “Grammar Drills: What CALL Can and Cannot Do,” by Brian McCarthy goes so far as to say, “computer format has added a new dimension to the genre of grammar drills” (McCarthy, 1994, p.6). Also discussed in this article are the many advantages of these computer exercises over comparable exercises in books. Drawbacks described included the inability to freely flip back and forth between pages in a book and limited screen space in which to display information, but the ability to randomize information and the hugely increased amount of information that could be presented in computer-based instruction were shown to be benefits. Other benefits included the graphical presentation of data and the ability to use other audio-visual devices such as animation to accompany the instruction. In this comparison between books and computers, McCarthy writes that computers allow “fresh combinations of information and new dimensions of interactivity between the learner and the subject matter” (p.3). In the transition from books to computer-based instruction, rather than being concerned with the loss of certain qualities of the former, it is necessary to deal with the information according to intrinsic qualities of electronic media and the according conventions (McCarthy, 1994). Computer based instruction is not limited to grammar drills. The teaching of any repetitive exercise can utilize this sort of technology.

Work is being done with Intelligent Computer-Assisted Instruction (ICAI) which is also known as ITS or Intelligent Tutoring Systems. CAI, which started out as simple tasks such as grammar drills, simple arithmetic operations, and vocabulary learning, is entering more complex areas. These systems, dubbed “adaptive systems” because they adjust themselves to the learning competency of individual learner, do so according to analysis of a student’s previous performance. Increasingly complex systems now are “able to present problems based on models of the student’s knowledge, to solve problems themselves, and to diagnose and explain student capabilities” (Means and others, 1993, p.15). ICAI systems have traditionally been developed in what can be called “mathematically oriented domains,” such as arithmetic, algebra, and programming, and while their use has not been extensive in schools to this point, they demonstrate the potential and abilities of such systems for future use (Means and others, 1993).

The English classroom is another likely target for computer supplementation. With the Internet being
lauded as the biggest communication breakthrough thus far in the history of man, it is easy to see the potential advantages of using the most popular function thereof -- E-mail -- in the classroom. A major frustration of English teachers has been a "lack [of] sufficient opportunities for communication." In the teaching of English, "E-mail provides students with an excellent opportunity for real, natural, communication," as well as "authentic contexts and motivation for communicat[ing]" (Guthrie and Richardson, 1995, 2). Perhaps as important as the advancement of students thought this technology is the enrichment of teachers. Through E-mail and discussion groups, teachers can communicate with thousands of colleagues, share new ideas, resources and materials, information, and contacts. In addition, such communication can "provide information, contacts, and stimulation that can make teaching more effective and enjoyable" (Warschauer, 1995, p.3). Especially true among younger students, the interactive and hi-tech tools of computers also have a certain appeal which encourages learning. Used in composition classes for young students, computers were found to be the most popular choice of classroom activity, which resulted in increased productivity. It has further been shown that "kids are drawn to technology and are intrinsically motivated to use computers" (Guthrie and Richardson, 1995, p.16). The composition class further reinforced the concept of individualized learning of which it was stated that "computer technology allows for a more individualized approach to learning," and that "much of the software lets students progress at their own pace, and teachers become more like facilitators and coaches who tailor their assistance to the needs of the child" (Guthrie and Richardson 1995, p.16).

The communicative qualities of the Internet have proven useful to both scientists and science classrooms. Using the Internet and the World Wide Web as connections between the two, teachers can gain access to work being done by scientists and use it in their classrooms. The article entitled "Science-On-Line: Partnership Approach for the Creation of Internet-based Classroom Resources," by Isabel Hawkins and Robyn Battle, describes a case study done in California in which fourth-graders were taught a fairly complex technical subject by a teacher using an Internet tool created by scientists in the field in their classrooms. In this study, scientists at NASA in partnership with a teacher in Oakland, collaborated to create a teaching device using the web which taught the movement of light photons in a satellite data flow. Through this operation, it was established that the World Wide Web can be employed to distribute scientific research to the classroom. It furthermore demonstrated that the web provided an excellent medium through which complicated, highly scientific and technical information could be presented. The article also discussed further current education research which states that the primary focus of educational design, in keeping with the philosophy of materially and socially-oriented learning, should be on "activities" or "coherent human actions." The success of this study illustrates the full capacity for which this technology could be used in the classroom to bridge the gap between students of science (or any other subject for that matter) and the scientists who are discovering it, as well as further showing the advantages of using the stimulating audio-visual environment of the Web to teach concepts (Hawkins and Battle, 1996).

The social studies classroom is yet another avenue for computer involvement in education. For all the same reasons that it benefits other disciplines, social studies, too, can make use of this technology. Of this, Michael Berson, in his article, writes, "The emerging use of computers in the social studies has been explored as a means for educators to integrate higher order thinking activities into the classroom while confronting the veer growing array of data in the field" (p. 487). Among the features that could be useful are "simulations drill and practice, educational games, tutorials, database management, word processing and writing, and graphing" (p. 487). In discussing how a drill and practice instructional program affected
the classroom, it was found that, while the effects were not the same for all students, students tended to be more motivated to participate in class and prepare for exams. Additionally, with the Internet being such a vast supply of current information, it provides an up-to-date source for countless social issues.

The wide-ranging capabilities of use of computer technology and the Internet in the classroom are even more prevalent in their application to the Health, Physical Education, Recreation, and Dance classroom. As a classroom tool, traditional topics of instruction can be delivered non-traditionally, improving the classroom experience, reducing the necessary class-time, and allowing students to learn at their own pace. For teachers, software exists for the tracking of student performance, grading fitness, conducting assessments, and providing simulations. For health topics, CD-ROM packages and CAI systems are available to educators to assist in their teaching. Additionally, the “explosion of communications” that has been created by the government-sponsored expansion of the Internet, have not left out health and physical education from the plethora of topics available. Many sources, including medical universities, provide related material, including audio-visual material through the WWW to the public over the Internet (McLean, 1996). For computers to assist in disciplines as seemingly unlikely as these, it is clear that they are a powerful resource for classrooms of any sort.

There are, however, many problems faced by education in its slow and hesitant transition into the information age. As far back as 1984 the observation was made “that the technological revolution appeared ‘to be sweeping around schools, leaving them virtually untouched’ “(Proctor, 1996, p.1). With all of the advances in technology present today, the basic chalkboards, lectures, and textbooks remain the most universally popular classroom media, and with this country’s decentralized education system comprised of over 14,000 independent school systems, each with its own autonomous governing board, a universal movement toward information technology is simply impossible (Proctor, 1996; Loveless, 1996). Too many people insist that change is not necessary and that teaching with technology is no more effective than before. Furthermore, teachers will not be willing to embrace computer-technology in the classroom until they themselves are comfortable with using it (Proctor, 1996). Even in schools where computers are being used, most teachers report using computers for enrichment and variety or for computer-related topics such as teaching about computers, or programming, rather than as a tool for teaching core curricula (Means and others, 1993). Many teachers, according to surveys of teacher opinion, resist using computers out of fear of role reversal. With the introduction of information technology, control over students’ learning would shift more towards the students themselves, with teachers assuming more of a facilitator role (Proctor, 1996). Indeed, teaching with such technology directly conflicts current and long-standing conventions regarding the roles of teachers and will remain an obstacle even after the technology is fully available to the classroom.

The logistics of computer integration is another hurdle. A report prepared for Saskatchewan Education, Training and Employment quotes prices from $200 per month for low-end dial-in service to the Internet, to $2,500 price-per-month for a high-end full connection (Proctor and Allen, 1994). Prices of computers vary as well, and in addition to the obvious hardware costs, comes other inherent expenditures, such as software, maintenance, supplies, and obsolescence of hardware (Loveless, 1996). There are varying statistics pertaining to the costs of bringing computers into the classroom, but regardless of who is giving the estimate, the cost is high. The real question is not whether large amounts of money will have to be spent on this technology; rather, whether the costs are worth while compared to using the money to continue supporting more traditional education media (Proctor, 1996).

The arrangement of computers in schools raises availability issues as well. Even as both the numbers
of computer-using schools, and the number of computers in those schools continue to rise, availability remains a problem for students and teachers. Between 1985, and 1995, the median number of computers in computer-using K-6 schools rose from 3 to 18 and in high schools from 16 to 39. The average number of computers per 30 students nearly tripled, going from 0.60 in 1984 to 1.53 in 1990 (Means and others, 1993). By 1995, there were 5.8 million computers in public schools, resulting in a ratio of one computer for every 9 students (Loveless, 1996). Even this increase, however, does not leave a healthy ratio, and the most common arrangement for computers in schools remains the lab of 20-30 machines for which entire classes are allotted small blocks of time (Means and others, 1993). While this arrangement provides better instruction and facility of use as a result of supply and maintenance requirements, this arrangement is unsatisfactory and does not permit successful classroom use. Until logistical problems can be overcome, this will have to be sufficient.

Now that obstacles regarding getting technology into the classroom have been discussed, it is important to look at one other important challenge. While incorporating technology into the classroom conflicts with conventions regarding the roles of teachers, it likewise conflicts with standards regarding the roles of students. As teachers would take on a more positive role as facilitators, students would inversely take on more active roles in their learning (Means and others, 1993). Even though, current educational research supports this mode of learning, it will require a large adjustment on the part of the students. Students will have to accept the more passive role of the teacher and yet be comfortable with getting the individual help that they need which will require a working relationship. No longer will it be sufficient for the student to simply go to class and impersonally absorb knowledge. Though these may seem at the moment to be obstacles to overcome, they can also be seen as positive and necessary change.

In spite of these challenges, there are many benefits that can result from embracing this technology. For those who are not convinced, however, of the potential advantages over traditional methods, it is still necessary to consider technology as a supplement or alternative where traditional methods or resources are simply not sufficient. In many places, student bodies are increasing faster than new classrooms can be built and traditional resources acquired for them. In such situations, computers can assist where convention has failed or is insufficient. For example, “telecommuting” has been considered as a possible solution to the increasing problem of schools outgrowing their classroom resources. In the Webster school district in Ogden, Utah, a world civilizations course is offered on-line. The class does not meet in a classroom, yet the students can still interact, teacher can still monitor their progress through E-mail, and in order to maintain a certain level of human interaction, field trips are taken (West, 1996). There is another issue being addressed in Saskatchewan, where computer use is being debated. With their textbooks and other traditional materials becoming obsolete, the Internet, which remains current, and computer based instruction which is easily upgrade able, can be used to supplement and reinforce inadequacies in their education system. In this report, the authors close by saying: “Given that well developed information processing and problem-solving skills are essential to the development of independent learners, all schools in the province should be encouraged to integrate the use of the network and ... network resources into regular courses of instruction” (Proctor and Allen, 1994, p.28).

As with any issue, there will be countless arguments and counter-arguments, and countless statistics that can have exactly opposite meanings when viewed in opposite contexts. There is no single measure for educational effectiveness, and there never will be. Education, like so many facets of society, is nearly impossible to be quantified by a controlled experiment. What works for one might not work for all, and what works for the masses, will have varying results for the individual. Nevertheless, with all the obstacles
to incorporating information technology into the classroom, there are many potential advantages. Even for those who say that the status quo in education is sufficient, there is always room for improvement in anything. If information can be taught and learned better or more efficiently, then why not do it that way? Classroom effectiveness aside, however, there remains the advancement of society, and as computers are increasingly becoming assimilated into our lives, education will have to keep up. Hundreds of years into the future, when there are more display screens than walls in the average dwelling will education still resist technology? Surely not. Computer technology will soon supplement and eventually replace certain traditional classroom methods in the same manner that pen and paper gradually supplemented and eventually replaced the slate. Those who say that this is a worthless effort can be likened to those who said that pen and paper were a waste and would never be effective or efficient classroom devices. With change coming faster and faster with the ever quickening advancement of the human race, now is not the time to drag our heels. Those who resist now will be left behind.

References


JUSTICE AND POLITICS IN THE
McCArTHY ERA

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Brett is a native of Chicago, IL, but he calls Greenville, TX home. He is a Political Science major who plans to attend law school after graduation. Brett is Editor-in-Chief of The Fulcrum, an honors program publication, and president of the Round Table. The paper was written for and suggested for submission by Dr. Ted Tucker in his “Faces of Justice” honors seminar. The paper takes a look at the effects of public pressure on the United States system of justice during the McCarthy era.

In 1950, a junior United States Senator from the state of Wisconsin by the name of Joseph Raymond McCarthy stood on the corner of Market and Twelfth Streets in the city of Wheeling, West Virginia, and made a speech which ultimately served as the verbal foundation for a piece of history which is now referred to as the McCarthy Era. The era was marked by massive allegation and accusation concerning communist activity in the United States. The accused eventually included all levels of society, from high-level government officials to members of the Hollywood community, down to the common individual citizen. Although there may have been some justification for concern of the communist threat, what defined McCarthy’s series of accusations was a serious disregard for legitimate evidence of guilt and the subsequent prosecution of innocent people. Probably one of the most controversial of these cases was the trial and execution of Julius and Ethel Rosenberg, a young Jewish couple from New York with two small children. Based upon very questionable evidence and a determined, presumptive prosecution, they were tried for treasonous espionage in 1951, found guilty, and summarily executed in 1953. The question raised by the events of the McCarthy Era is this: How often does the pressure of public opinion foster injustice by demanding the attribution of blame? The backdrop of the McCarthy Era and more specifically the Rosenberg case will be used in an attempt to find an answer.

The political foundation for the McCarthy Era rested in the rise of anti-Communist sentiment among the American population. This came as a result of the growth of communist sympathy within the United States beginning in the 1930s. The Depression had caused many to question the ability of capitalism to successfully endure, and so a significant interest in communist ideology began to grow. As author Roy Cohn writes, “By the middle of the 1930s, Communist intrusion into American life was an established fact” (Cohn 3). Thousands of Americans either joined the actual Communist party or some “front” organization that it supported. In 1939, the party drew in over 103,000 votes, its highest amount ever. However, according to the Communists themselves, for every actual party member, there were at least ten others ready and willing to support the party’s work (4). Even more alarming, its influence was particularly strong “among the intellectuals and idealists who were in thought-molding positions” (4). The communist sentiment was most evident on the college and university campuses across the country. When World War II arrived, the United States suddenly found itself in the delicate situation of alliance with the Soviet Union. “The Soviet Union was our ally, but at the same time it was committed to an ideology no less alien to ours than that of Hitler’s Germany” (5). Then, in 1945, as the war came to an end, the threat of Communist infiltration was substantiated when a former Communist spy named Elizabeth Bentley told the FBI of two extensive Soviet intelligence networks that had established themselves within the American
government. One was headed by a top Treasury Department official, and the other was headed by a member of the United States War Production Board. In addition, the case of Alger Hiss was uncovered, a high-level State Department official who had once been an advisor to President Roosevelt. He was sent to the penitentiary after he was convicted on charges of perjury stemming from allegations that he had provided top secret documents to the Soviet government. Also in 1945, the FBI and the Office of Strategic Services (later the Central Intelligence Agency) infiltrated a communist organization known as Amerasia and found 1700 stolen United States documents, 540 of which were classified (6).

As this information became public, concern began to grow within the American population about the threat of communist infiltration. In addition to the internal communist activity, it was becoming readily apparent that the Soviet premise of expansion was very real. Americans “watched with mounting apprehension the solidification of Soviet control over the nations of Eastern Europe, culminating in the Czech coup of 1948 and the blockade of Berlin” (Fried 3). By 1949, China had fallen into the communist hands of Mao tse-Tung. The United States had heavily supported the Nationalist forces of Chiang Kai-shek up until that year. At that time the State Department advised President Truman that further aid would be useless and that, as then Secretary of State Dean Acheson declared, “The material aid, the military and technical assistance, and the good will of the United States, however abundant, could not of themselves put China on her feet” (4). Meanwhile, the American people’s fears were solidified as President Truman announced in late 1949 that the Soviet Union had detonated its first atomic weapon. The threat of communism had extended to the ultimate fear: nuclear war.

The China situation formed the touchstone with which the communist issue became a political battleground. Republicans decried the decision made by the White House, which by then had been under Democratic control for almost twenty years, to drop support for the Nationalist forces. Accusing the Democrats of being weak concerning the communist threat at home and abroad, the Republicans even attempted to portray the socialistic New Deal proposals of Roosevelt and Truman as friendly to communist ideology. It was this pattern of events that brought a junior senator from Wisconsin to the American political forefront and initiated an era that would bear his name.

Joseph Raymond McCarthy was born on a farm in a small town near Appleton, Wisconsin on November 14, 1908 (Griffith 2). He was naturally intelligent and did very well in school until he decided to drop out at the age of fourteen to work full time for his father. Soon he decided to branch out on his own and, renting an acre from his father and purchasing a flock of chickens, he began to show signs of a perseverance and ambition that would carry him into his political career. Within two years of his first venture, he owned two thousand hens, ten thousand broilers, a home made chicken house, and a truck to haul his poultry to the market. At sixteen years old, he was the talk of the county (Cohn 13). Not long after, however, a cold spell killed most of his flock and he was forced to sell everything and move to the local town of Manawa. Here he found a job as a store manager and first became interested in politics. He soon established himself as a political voice within the community and after returning to school at age twenty to get his diploma, he enrolled and graduated from Marquette University in Milwaukee. He then went to law school, graduated, and established a practice in nearby Waupaca. Although he was not very successful as an attorney, he quickly became involved in local politics. At the age of 31, he won his first elected position as a circuit judge. When World War II arrived, he joined the Marine Corps as an intelligence officer. A year after his time in the Marine Corps, McCarthy announced his intention to run against the strongest politician in the state of Wisconsin, Senator Robert La Follette. Although the incumbent was a heavy favorite, McCarthy’s political tenacity and La Follette’s underestimation of his threat combined to
form an incredible political upset. Joseph McCarthy, the unknown farm boy from the backwoods of Wisconsin, was a United States Senator.

McCarthy soon established a reputation as a troublemaker. In just his first year as Senator, he became embroiled in several political attacks on various agencies of the government including the Pentagon, the Senate Armed Services Committee, and the White House. However, none of the issues he involved himself in gave him the sustained political spotlight that he desired, and he was soon in search of an issue that would do this for him. Then, in January of 1950, McCarthy met with three men who "wished to make a more conscientious legislator of McCarthy" (Fried 40). They were Father Edmund Walsh, director of the School of Foreign Service at Georgetown University; Professor Charles Kraus of the Political Science Department at Georgetown; and William Roberts, a Washington attorney. As they spoke, "the Senator vented his anxiety over his failure to find an attractive political issue" (40). After several suggestions were discussed, Father Walsh commented on how important the issue of communism had become in the American mind. McCarthy was immediately attracted to the idea, and although all three men "tried to impress him with the need for a cautious, informed approach" to the issue, McCarthy attacked it with the unrestrained fervency that would become his political trademark. Although there evidence that McCarthy's focus on the communist issue was not entirely politically motivated, and that he had a personal concern with the subject before his meeting with the three men in Washington, it can be assumed that this incident marked the real beginnings of the McCarthy Era. Not long after his meeting, Senator McCarthy spoke to a Women's Republican Club in Wheeling, West Virginia, and began his campaign of unsubstantiated accusations and political chicanery. Speaking to the club, he declared that he had in his possession a list of 005 State Department employees that were known communist sympathizers. No one would ever see this supposed list, and most would later doubt that it ever existed, but the comment was quite effective for Senator McCarthy's immediate purposes. His comments touched off a media frenzy, and he fed the excitement with feigned seriousness and continued bluffing as to the where the document actually was. There were even occasions where McCarthy would claim to have left the list "in his bag on the airplane" when asked by reporters to see the list. McCarthy's antics were not so much convincing as timely. The Republicans had long hoped to be able to turn the "communists-in-government" issue against the Democrats, and in McCarthy they saw a man with the audacity to charge headstrong into the issue, regardless of the accuracy or significance of its substance. And so, "the rise of Joe McCarthy took only a few short months. In February he was an undistinguished and indistinguishable Midwestern senator. By July he had become a symbol of Republican extremism and a political force of major proportions" (Griffith 52). With his incredible ability to distort the truth, McCarthy managed to avoid ever producing the supposed "list of 205" while continuing to use it as the foundation for his attack on the State Department. What Washington soon realized, though, was that the accuracy of the allegations was no longer important; McCarthy had captured the American interest by merely suggesting what the public already feared was real. The truth was not what the American people wanted to believe. They wanted a visible, culpable target to blame and destroy for the communist activity in the United States. McCarthy would provide it.

On the evening of February 20, 1950, McCarthy brought with him to the Senate floor a briefcase full of over one hundred individual dossier files prepared from a State Department loyalty investigation three years earlier (Griffith 54). These included individuals who had been investigated for alleged Communist or left-wing activities. About forty of them still worked at the State Department (54). McCarthy used this old and outdated list as "proof" that Communists had heavily infiltrated the United States government, and that nothing was being done to stop them. What baffled most of his colleagues, however, was that this list was hardly a secret. In fact, "there were copies of the...list scattered around Capitol Hill and 'the list...was
hardly new, nor was it entirely accurate. The individual case summaries contained a goodly number of unconfirmed and the "unsubstantiated allegations" (55). But this fact did nothing to impede McCarthy from telling the Senate that with this information in his possession, he had broken through the "iron curtain" of State Department secrecy and with the aid of "some good, loyal Americans in the State Department had compiled an alarming picture of espionage and treason" (55). The preposterousness of this claim of secret knowledge was obvious to anyone in Washington who knew that the "list" was just an outdated investigation that was of no particular interest, but all knew that McCarthy had taken advantage of a major topic of concern with the American public. The Republicans were glad to assist McCarthy in his diatribe of suggestion and unsubstantiated allegation, and the Democrats knew that there was no way to explain the truth to the American people without it appearing as if they were, as McCarthy accused them of doing, covering up mistakes. Thus McCarthy's charade continued.

Senator McCarthy called for the first Senate quorum in over five years and gave a speech alleging the Communist "conspiracy" to the entire Chamber. Later examination of his speech showed it riddled with half truths and blatant inaccuracies. Using this supposedly exclusive list, he cited eighty-one cases of Communist activity both past and present within the State Department. Incredibly enough, even though many of his fellow Senators held in their hands copies of the very list he was using for his reference, he unashamedly distorted and misquoted the information. In one case, he read from the file of an individual who had applied to but was never hired by the State Department. McCarthy told the Senate that the individual had "top secret clearance" and was "still in the Department as of today" (56). He conveniently omitted or added to the actual content of the files, however it enhanced his allegation. The lies were often outrageous. Consider the following excerpt from the actual file that McCarthy possessed concerning one of the individuals and compare it to what the Senator actually said. Case no. 40:

This employee is with the Office of Information and Educational Exchange in New York City. His application is very sketchy. There has been no investigation. (C-8) is a reference. Though he is 43 years of age, his file reflects no history prior to June 1941.

And McCarthy's version:

This individual is 43 years of age. He is with the Office of Information and Education. According to the file, he is a known Communist. I might say that when I refer to someone as being a known Communist, I am not evaluating the information myself. I am merely giving what is in the file. This individual also found his way into the Voice of America broadcast. Apparently the easiest way to get in is to be a Communist. (57)

However inaccurate, McCarthy's speech was effective in that it initiated a full investigation of the allegations, a process in which the Republicans hoped they would happen upon some actual case of Communist infiltration that could be capitalized upon. In the meantime, a subcommittee of the Senate Foreign Relations Committee was organized to hear McCarthy's charges in their entirety. Here McCarthy could no longer shuffle around the facts with no substance. "His preposterous exaggerations would show up rather badly under close examination, and it would be especially embarrassing if he could not produce the names which he had 'held in his hand' (60-61). McCarthy immediately arranged a team of researchers and assistants to begin delving into every old congressional investigation that he could obtain, searching for anything that could be utilized.
Several investigations did ensue as a result. Most held little if any serious reason for concern, but McCarthy persisted in his distortion and political shaming. During closed executive sessions with the Senate subcommittee he would fumble for a lack of substance but would then proceed to give impromptu press conferences between each session, proclaiming the vast uncovering operation that was underway and the serious threats of Communism that were being discovered. It was during this series of hearings that the Rosenberg case arose.

The Los Alamos Atomic Laboratory was one of the two primary sites of research and construction for the United States’ atomic weapons capability. It was here that an engineer named David Greenglass was discovered to be stealing atomic weapon secrets and giving them to the Soviets. Upon interrogation, Greenglass admitted to his Communist sympathies and also to the espionage work for the Soviet Union. He also mentioned the names of his sister and her husband as fellow conspirators and the force behind his activities. Julius and Ethel Rosenberg lived on the Lower East Side of New York City. Julius worked as a civilian engineer at the Fort Monmouth, New Jersey, United States Army Signal Corps Laboratories. Based upon Greenglass’ testimony, an investigation ensued. Typical of the era the investigation was rushed, and the conclusions reached were hasty, but the Rosenburgs were summarily arrested and taken to trial. The prosecution team included one of McCarthy’s close assistants, Roy Cohn. The American public now had two faces with which to associate the threat of Communist activity. The evidence against the Rosenburgs was based almost entirely upon the testimony of David Greenglass and a series of documents that contained communications between American Communist organizations and the Kremlin in which Julius Rosenberg’s name was found twice, with no reference to any subversive activity, and Ethel’s name did not even appear. However, when the decision was handed down by the jury, the young Jewish couple from New York were convicted of espionage and sentenced to die in the electric chair. Appealing immediately and repeatedly, the Rosenburgs desperately clung to their claim of innocence. Each of their appeals were procedurally denied, the final appeal being to the Supreme Court. The Rosenburgs had been tried and found “guilty by association.” They were executed in the summer of 1953.

Whether the Rosenburgs were actually guilty or not may never be known but the fact is, it is highly likely that the court and jury that convicted them did not know for sure either. The climate of public hysteria and assumption that had been created by the McCarthy Era was as responsible for their deaths as any alleged evidence of their guilt. Throughout the few select years in which Joseph McCarthy held such magnanimous influence and power, justice often grew dim in the light of political maneuvering. The essence of McCarthyism was its timely capitalization on the sentiment of the American people. The public, through both circumstance and assumption, was afraid of what they viewed as an offensive Communist threat to their safety. McCarthy’s actions, as reprehensible and irresponsible as they were, alleviated America. By first enhancing their fears and then providing them with an easily destructible place to lay the blame for their fears? McCarthy was merely taking advantage of a political opportunity. As Robert Coover wrote in his parody of the Rosenberg case, The Public Burning, with the character of Uncle Sam speaking: “It ain’t easy holdin’ a community together, order ain’t what comes natural...a lotta people gotta get kills tryin’ to pretend it is, that’s how the game is played,’ (Coover 531).

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