Science Technology Studies Displayed in Society

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Edited By
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This booklet was created by the Introduction to History, Philosophy and Sociology of Science class LB133-007 in Spring 2014. On the following page, please see the excerpted page from the class syllabus which discusses the objectives of the project and how they were assessed.

The students did a great job of connecting what they have learned about social construction to "real-life" empirical examples that they selected independently.

Enjoy!

Assistant Professor Logan D. A. Williams
Lyman Briggs College, Michigan State University
2014-04-09

Excerpted Page from the Class Syllabus,

Capstone Assignment/ Creating an STS Booklet

OBJECTIVE: Develop your ability to communicate verbally in small and large groups
Outcome 2. *Organize* your small group with different roles for each person. *Tell* the class what you
have worked on in your small group. *Assess* the relative contribution of each small group
member. *Discuss* class readings in the large group (classroom of 30 students or less)
Task: Participate in Class, demonstrate collegiality.
Assessment Tool: Collegiality Grade, Capstone Assignment

OBJECTIVE: Develop your ability to work effectively in teams
Outcome 3. *Select* a complex contemporary example of science, technology and society where STS
concepts can be *applied*. *Assemble* a resource that can be used by yourself and your
classmates in the future.
Task: create a booklet together as a class, where each person is responsible for one
example and uses that example to explain one STS concept/theory. Bind the booklet
using the MSU Main Library Espresso Machine. Alternatively, post the booklet online as
an open-source document
Assessment Tool: Capstone Assignment

The purpose of this capstone assignment is to employ STS concepts to interpret an empirical
example of science technology and society. We will do this by designing a booklet together as a class.
Each group will have a maximum of 5 people and will be responsible for writing one section of the
booklet and presenting it in class. Your group's section will have one umbrella empirical area (e.g. as
broad as Environment, Health, Information, or Engineering/Design, or as narrow as "Vaccines and
Autism"). Each individual in the group is responsible for writing one empirical example + STS
concept/theory. The empirical example might be drawn from a currently disruptive event in science,
technology and society (or an important historical event in science, technology and society). One
person in the group should be elected the section editor. The section editors will be responsible for
writing the umbrella empirical examples + umbrella STS concepts/theories and arranging the class
booklet.

Grade Criteria

No.	Percentage of Grade	Task
CA 0.	10% Group Organizing Work Memo	Write a memo proposing the division of labor and communication responsibilities of group members.
CA 1.	10% Group Written Booklet Section Proposal	Write a memo proposing the umbrella empirical area and umbrella STS concept that your group's section will cover.
CA 2.	10% Individual Written Example + Concept Draft 1	Use an STS concept/theory that you have learned in class to explain an example of science, technology and society that has not been used in the course.
CA 3.	5% Individual Group Work Midterm Peer Evaluation	CATME peer evaluation.
CA 4.	20% Group Booklet Section Draft PPT	On Time Delivery; Audible and Understandable Delivery; Uses Images, Figures and Tables Well; Consistently uses white space (not too much text).
CA 5.	10% Group Written Examples + Concept Final Drafts	Revise & resubmit the drafts.
CA 6.	10% Arrange Class Written Booklet	Within each section of the booklet, arrange the concepts so that they build conceptually upon each other.
CA 7.	5% Individual Group Work Final Peer Evaluation	CATME peer evaluation.
CA 8.	20% Arrange Class Final PPT	Same criteria as previous presentation.

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Section One:

The Social Construction of Technology reflected in Cyberbullying and its relation to Interpretive Flexibility and Closure

Introduction to The Social Construction of Technology reflected in Cyberbullying and its relation to Interpretive Flexibility and Closure

By: Jacqueline Zuke, *Section Editor*

The concept of the Social Construction of Technology was developed by Pinch and Bijker (1987) and was applied as a framework in other's work. They have developed the idea of social construction of technology (SCOT) into four main elements. The four main elements of SCOT are relevant groups, interpretive flexibility, closure of the design, and technological frame. SCOT has been developed as a framework to studying new artifacts in technology (Sismondo 2010). The strength of the artifact is important when analyzing it with the four concepts. We will focus on the interpretive flexibility and closure of the design relating to specific cyberbullying examples, as well as new preventative technology to stop cyberbullying. As defined by Pinch and Bijker (1984), interpretive flexibility is the understanding of a certain technology and how it is designed and used in different social groups. Closure of the design is the finalization of a technological artifact after solving any problems between relevant social groups and reaching stabilization in the end.

The umbrella concept of social construction of technology develops into different narrow STS concepts that will be reflected throughout our group. SCOT can relate to black boxes as well. Interpretive flexibility and black box correlate in means of different social groups interpreting black boxes in different ways based on how they run, but not how they actually work. This booklet will demonstrate course objectives by reading critically to summarize and differentiate different STS concepts. This booklet will also show its ability to work effectively in our small groups and as an overall team to build a final booklet. Our class has demonstrated the ability to communicate effectively and efficiently to solve problems throughout the production of the booklet, as well as making a pristine final booklet.

The reader will learn about interpretive flexibility first and then closure. Our section will demonstrate interpretive flexibility through specific examples of cyberbullying online and how it

affects each person differently, leading some to commit suicide. Cases will include Amanda Todd, Megan Meier, Ryan Halligan, and the movie "Cyberbully." Our group will discuss how each person interprets and uses social media sites differently causing many different reactions. We will discuss closure in means of software developed to trace cyberbullying and prevent it, while under the permission of parents. Software discussed will be BullyTracer created by Bayzick, Kontostathis and Edwars. It is a computer database designed to flag insults on the Internet that parents can use to protect their children. Our authors will demonstrate the concept of SCOT through these specific examples of cyberbullying cases and preventative software.

The social construction of technology is well demonstrated when discussing the example of cyberbullying. Our section's core focus was interpretive flexibility and closure, which captures half of SCOT.

- Interpretive flexibility is demonstrated by how different users of the Internet are affected different ways and choose to use it in their own way.
- Closure is demonstrated through the design of databases that parents can use to detect insults online.

The use of technological devices is a huge contributor to cyberbullying. In the next section, the use of every day technological devices will be discussed.

Interpretive Flexibility and How it Relates to Cyberbullying

By: Huei Sears

The narrow STS concept that will be discussed in this essay is "interpretive flexibility" (Bijker and Pinch, 1984), and the empirical example will be the story of Amanda Todd, Megan Meier, Ryan Halligan, and "Cyberbully." The overall umbrella example is cyberbullying, and Amanda's story, along with three other stories are first-hand accounts of cyberbullying. The umbrella STS concept is the Social Construction of Technology (SCOT) (Bijker and Pinch 1984), and interpretive flexibility is a subconcept of SCOT.

According to Merriam-Webster, cyberbullying is "the electronic posting of mean-spirited messages about a person (as a student) often done anonymously (Merriam-Webster, 2014)." Merriam-Webster claims that the first known usage of the term cyberbullying occurred in 2000, but since cyberbullying is defined as mean-spirited electronic messages, cyberbullying began whenever that became possible, which is when the Internet was invented. Since cyberbullying is active through social media sites, one can reasonably assume that reports of cyberbullying increased as more social networks (such as Facebook and Twitter) emerged. I'll be investigating how interpretive flexibility of the social media sites have allowed for cyberbullying to prosper.

When topics like cyberbullying come up, it is always important to think about who is affected by it. It is quite obvious that if a person has access to technology, they may be a victim of cyberbullying, but surprisingly a person may also be a victim if they don't have access. According to the above-mentioned definition of cyberbullying, a person could be a victim of cyberbullying if a mean spirited message was posted about him or her. The definition does not require that the victim be a member of the electronic community. Because of that reason, I believe that marginalized peoples of society, as well as the elite peoples, are affecting cyberbullying through interpretive flexibility. Everyone comes from a different background and environment and will therefore interpret things differently. Also, the marginalized peoples of society are often looked down upon

by the elite peoples of society and sometimes other marginalized peoples. Since bullying is a form of power dominance, it is reasonable to assume that marginalized peoples may be cyberbullied more often than the elite peoples of society.

There are many reports of cyberbullying, but I shall only talk about four here. My first story is that of Amanda Todd. Amanda Todd was in 7th grade when her unfortunate tale began. In 7th grade, she would go online and use the camera feature on the computer to talk to strangers with her friends. On one fateful day, one such stranger requested that Amanda "flash" him. Amanda acquiesced to the request. One year later, a stranger attempted to blackmail her into "putting on a show" for him with the threat of distributing the picture of her breasts. Amanda declined the blackmail, but the stranger was true to his word. After the police came to her house with the news that the picture was distributed, Amanda became severely sick. She got "anxiety, major depression, panic disorder…" Changing schools did not help her situation, as her bully followed her online. Time after time, her situation became more and more grave. Eventually, the bullying came from her peers as well. She attempted suicide at least twice, both times receiving encouragement for success from her peers (Todd, 2012). She posted a video to YouTube about her story, and about a month later succeeded in her last suicide attempt (Dean, 2012).

My second story is that of Megan Meier. Megan Meier was 13 years old; she had been struggling with her self-esteem and being overweight, but things had been improving. She lost twenty pounds, and she started a new school. She was on MySpace one day, and she met this boy named "Josh" who claimed to be 16, attractive, musically talented, and from a broken home. Megan and Josh sparked up a friendship for about 6 weeks. Josh helped Megan boost her self-esteem, but then one day, Josh sent her a message saying that he wasn't sure if he wanted to be friends anymore. That's when things took a down turn. Megan's mom, Tina, always tried to keep a watchful eye on Megan, most especially when Megan was on MySpace. One day, Tina had to take her other daughter to the orthodontist, but Megan was on the computer, and she had been receiving and still

was receiving hateful messages from Josh. Tina told Megan to sign-off, and Tina called to make sure as soon as she got to the office, but Megan was still online. Megan was online until her mother got home. Megan ran upstairs, and Tina and Megan's father talked to each other about what happened. Twenty minutes later, Tina ran upstairs to check on Megan and found that she hung herself in her closet. Eventually, Megan's parents found out that Josh was a fake profile created by the parents of a girl whom Megan had a falling out with (Pokin, 2007).

Another story is a fictional one from the movie "Cyberbully." The main character of the movie, Taylor, receives a computer for her 17th birthday. When Taylor joins a social networking site, she begins to be cyberbullied. The bullying gets so bad that Taylor posts a video online saying that she wants to commit suicide. Taylor's friend sees the video and quickly rushes to save Taylor's life. As soon as Taylor's mom finds out about what happened, she tries to convince the school to make new rules and the state to make new legislation to prevent other children from experiencing what Taylor experienced. In the end, a law is passed that tries to fight bullying (Binamé, 2011).

My last story is that of Ryan Halligan. Ryan Halligan was a young boy who was bullied throughout school. As he grew older, he learned kickboxing so that he could defend himself if the situation ever arose. There was a specific boy bullying him, but he and that boy became friends. In 2003, Ryan began to spend more and more time online specifically on Instant Messaging. Ryan's parents didn't keep an eye on what Ryan was messaging, but they did have his password. Days after Ryan's funeral, Ryan's mother discovered that Ryan was being held victim to cyberbullying through Instant Message. Ryan had an online relationship with a pretty girl from school over the summer. When he went to see her in person, she ridiculed him and said that it was all fake. Although Ryan's mother does not blame a specific single person for her son's suicide, she does think that the bullying and cyberbullying were significant factors (Halligan, 2010).

These examples show how the interpretive flexibility of social media and technology has given bullying the avenue to progress. Social media websites were not created with the intent for

bullying. They were created with the idea that people far apart should be able to communicate with each other easily and quickly. Kids in these stories saw MySpace and Facebook as avenues for hatred, when the original intent of them was for positive communication. Although the mapping site that Amanda Todd's harasser used was likely created for the intent of navigational use, Amanda Todd's harasser used it as a way to stalk. Because these social medias and technologies have flexible interpretation, it allows for the consequences of those flexible interpretations to occur.

As said before, interpretive flexibility is one of the main reasons cyberbullying is prospering. Although there are steps being taken in an effort to halt cyberbullying, it still occurs. Twitter has the option to "block" someone or to report an account. Facebook has the option to block other Facebook members or it can have photos or statuses, which go against their rules of conduct removed. Twitter and Facebook are just two examples of the steps being taken to improve the safety of online communication. They have not closed on a final product yet, but one can assume that the final product will be one that allows for the maximum amount of freedom of communication while still keeping an accepted amount of safety and courtesy.

- Interpretive flexibility has allowed cyberbullying to prosper. As shown by the multiple interpretations of the social media sites mentioned above, cyberbullying has found a way to continue onward.

Sticks and Stones may **BREAK** my Bones

But words Will ~~NEVER~~ hurt Me

ALWAYS

This image shows a change on a common phrase emphasizing that words have a harsher affect than physical damage. (Lukan-the-Oracle, 2012)

Closure and Software to Prevent Cyberbullying

By: Matheus Faiete

It can be considered that cyberbullying is one of the most new society problem, growing together with Internet expansion and reaching discussions and attention of parents and schoolteachers about what can be done to prevent this problem. The purpose of this essay is to associate the narrow STS concept "closure" and the umbrella STS concept "SCOT (Social Construction of Technology)" (Pinch and Bijker, 1984) with a software that helps to prevent the practice of cyberbullying and the umbrella concept will help to identify users of the software and to explain the importance of the software to prevent cyberbullying.

As technology developed to help society, the bullying unfortunately expanded to a new form of practice. The new ways are via e-mail, tablets, cell phones and social media. (Li, 2006). As Internet is able to connect people everywhere in the world, Li also states that cyberbullying happens worldwide. The use of a tool from the technology environment would be useful to useful to identify the practice of cyberbullying and prevent any other transgression that users could commit, so software's have been created to do this work. (Liebermann, Dinakar, and Jones, 2011). The reader is expected to understand how the software can be used to avoid this kind of violence that happens in the society, mainly in schools and between underage people (Li, 2006).

Cyberbullying is an evolution from bullying, practiced by kids in the school among their classmates (Li, 2006). Parents will have the possibility to install the software in computers, tablets and cell phones to be aware of their children's relationships. It is necessary to remind that the conversations between parents and children are the foundation for a good education.

After some cases of suicide, violence and depression were detected, a plenty of software's willing too strike cyberbullying were created in response to concerned parents, teachers and government (Li, 2006). Lieberman, Dinakar, and Jones (2011) argue that to find out if the user typed a wicked sentence is not simple, their software divides the types of message in five different

categories: "race and ethnicity, sexuality and sexual identity, physical appearance, intelligence, and social acceptance and rejection". The software contains a huge number of phrases related to cyberbullying, combined with statistics data; it can search messages that can be considered discriminatory. Bayzick, Kontostathis and Edwards created a software similiar to the first called BullyTracer. It has a database that is divided in groups, and uses a "rule-based Algorithm". BullyTracer can indicate the insults that were said in social medias, and they also pointed out that it is common to insult using capital letters. This type of software is important to allow parents to limit the websites that their children can access and allow them to check if their children are receiving or typing insulting messages as well as have a chance to easily set a conversation with them about the topic (MySecureCyberspace).

When society started to care about how they would prevent the increase of cyberbullying inside schools, one of the methods created was the software. To develop this technology the software has to be tested and reformulated many times to be accepted by the users (Oudshoorn, Rommes, and Stienstra, 2004). The software became acceptable and an important tool to parents and schools to avoid the violence that the students could suffer. This period is called "closure" and it is defined by Pinch and Bijker (1984) as the moment that the "artifact", in this case the software, is running as a necessary technology and for the purpose that it was projected for. But it does not necessarily mean that the software will be the main technology to prevent cyberbullying, Pinch and Bijker (1984) highlight that groups can contest the technology and it may need to be reformulated again.

The parental control software must be used as a main support for parents to keep an eye on their children's behavior, but it cannot be substituted by conversation. To prevent kids who use social media in an interpretive flexible way, differently from what it is projected for, and suffers from cyberbullying, the software is going to protect the kids.

Additional Materials

Main Argument:

- Software's were created to prevent the practice of cyberbullying.

- Closure is the moment that this artifact started to be considered necessary and have already been designed to alert the parents about their children's behavior.

Image:

Figure 01. Girl suffering of cyberbullying, detection of a insulting message using capital letters. (J_O_I_D, 2008).

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Section Two:

How Appropriation affects the use of Household Technologies

Introduction to Appropriation of Household Technology

By: Rachel Quinn, *Section Editor*

Technology is important in many people's lives. When new technology is created, it is usually intended for one purpose. For example, the Internet was created to share and receive information quicker. However, as technology increased, many people used the Internet for their own purposes, such as sharing movies, or cyberbullying. Many people will record movies illegally in theaters and then sell them on the Internet or they will use social media to bully other people, even though social media was created to catch up with acquaintances.

This idea of appropriation is our main STS concept. It is the idea of taking someone else's idea or design and using it for one's own use. Another example of this is in the Kline and Pinch article (1996), the farmers were taking automobile engines and hooking them up to agricultural machines to make the agricultural work faster and easier. Our most important mini STS concepts are reinterpretation and social impact. The idea of the reinterpretation is that a technological device is used in a way than it was differently intended for, but they did not change the technology within the device (Eglash, 2004). The idea of social impact describes the ways that social media has changed the way we interact with others. Many people are now avoiding face-to-face interaction because their technology makes the interaction easier.

The previous section talked about the Social Construction of Technology as it related to cyber bullying. Appropriation relates to this section because the Internet was created so common citizens could access information more easily, rather than only the military being able to use it in its creation. However, some people have used the Internet to bully others through social networking sites. The Internet is a household technology that is being shaped by how society uses it. Unfortunately, some members of society use it in a way that it was not intended for.

Throughout this section, we focus on the re-interpretation of technology and the social impact technology has on society. Each of these topics focuses on a different aspect of appropriation.

Re-interpretation is the change in semantic meaning of an object. The social impact of technology is relating how technology is changing to its changing impact on society. These narrow STS concepts will be used to explain controversies video camcorders, cell phones, and the Internet, respectively.

This section is aiming to help readers understand the positives and negatives of appropriating technology. We are using three examples of the most common technology used in society today. The next section will talk about Genetic Engineering and its relation to the Public Understanding of Science. The public understanding of science can explain the idea behind the black box – people don't understand how technology works, but they should. Genetic engineering can be seen as a good thing to some, but others have found many problems with it. Possibly some time in the future when genetic engineering becomes more popular, it could be appropriated into a problem. Appropriation can be a good thing or a bad thing, but it is important that the laypeople of the public understand certain aspects of science.

The appropriation of household technologies is becoming increasingly common. Our group focused on appropriation as it related to re-interpretation and social impact.

- Social impact ties into the example of appropriation of cell phones because it changes society's personal life and cultural attitudes

- The idea of using a camcorder for a different idea than what it was intended for, without changing the technology, is reinterpretation

Technology has become an increasingly large part of our lives. Many people can find multiple uses for it aside from what the technology was created for. It is important to recognize these uses so that the negative ones can be prevented.

Impact of Household Technology Items on Society

By: Mehar Brar

Social impact is the narrow STS concept that will be discussed in this essay about this group project, through the specific empirical example of cell phone use in everyday life. The author of this narrow STS concept is Ron Eglash. Our section project is looking at everyday household technology and appropriation, and the specific example being discussed in this essay is the use of cell phones in everyday life and how they are used is changing. There are many articles on how cell phones nowadays are being used for many other purposes than what they were originally designed to do. This technology change is affecting our personal lives, cultural attitudes, and environment, which is the definition of social impact.

Cell phones were originally designed to be used for calling and messaging other people, but recently, cell phones have been used for much more, such as for games, a camera or a GPS. The people who are responsible for this change in technology are the companies who make the cell phones. They make it possible for the cell phones to function this way. Looking at this topic is very important for society because the way people use cell phones nowadays is really affecting people's everyday social life and interaction with others, and in a way this is a new technological creation, and this started in the last ten years. The reason that this STS analysis is important is because looking at this issue can open up people's eyes to the fact that we should be communicating and interacting more face-to-face and not just staring at a screen.

For example, a woman who lost her vision about three years ago, now uses a basic flip phone that speaks aloud to her (Mobile Phones and Society-- How Being Constantly Connected Impacts Our Lives, 2013). She said, "I have a mobile phone that is a basic flip phone, where it talks aloud to tell me who is calling and reads all the screens and text aloud…I really love the fact that I am not always looking at a phone," (Mobile Phones and Society-- How Being Constantly Connected Impacts Our Lives, 2013). This story shows just how much impact these cell phones have on the

social interaction in our society now. Another resource that I found while researching was a blog about the negative effects of cell phones on society. This blog validated the main point that the cell phones are used for so many different things nowadays, that people don't even need to look up from their phones. The blog states, "In the past before cell phones became so popular, when at a restaurant a family would be sitting, eating, and talking together about a lot of different topics. Today, when people go out to eat, everyone is on their cell phones, and the table is silent," (Roden, 2013). The blog then goes on to talk about how people are less likely to make conversations with strangers and make friends because society is becoming afraid of face-to-face communication. People are so used to hiding behind of screen, they are no longer used to making friends and meeting people the old fashioned way. After reading this blog, I can now see how people are more "connected electronically and disconnected emotionally", (Roden, 2013).

In the last article that I found on this topic, it talks about the social impact of mobile phone device. The author talks about traveling and how he sees the effects on cell phones over the decade that he has been without one. He states, "Several people are overusing, misusing or even abusing their use of mobile phones. Such persons tend to ignore those around them; they become emotionally attached to their phones," (Bemah, 2012). He then goes on to talk about how people can even sleep with their phones now. This shows how attached people are now that they can do everything on their phones. This ties back to appropriation and how since people have found new uses for their cell phones, there's no real need for them to interact with other people face to face anymore.

Social impact is a sub concept of appropriation and the specific narrow STS concept that will be used for this empirical example. This is examining how science and technology change our personal lives, cultural attitudes or environment. Social impact ties directly into this example of appropriation and cell phones because the change in the use of cell phones is changing how people interact with each other.

The main argument for this specific empirical example is that since cell phones are being used for so many other purposes than just calling people like they were designed for, they are affecting society and how people interact with each other and it is taking a toll on our personal lives. It makes people become more distant from people in their everyday lives, and makes it harder to meet new people, and interact with each other. Appropriation, the main STS concept, and social impact, the narrow STS concept, play a huge part in this. They both accurately describe how society is being affected by this change in technology use.

Main Argument:

Appropriation is being used to describe what is happening with cell phones and how they are being used for purposes other than what they were designed for. The sub concept of appropriation, social impact, ties directly into this example because this is changing society's personal life and cultural attitudes.
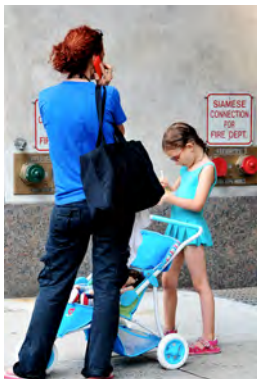
Image:

Figure 1. Shows the negative affects of cell phones- child being ignored by mother on cell phone

The Reinterpretation of the Camcorder

By: Austin Piwinski

The camcorder can be considered a significant object when considering appropriation because it can be used to record other peoples recording. The MPAA (Motion Pictures Association of America) insists, "recording copyright material is considered highly illegal and is a crime that is on the rise" (MPAA). These actions have started ever since the release of the camcorder in the 1980's, and also starting in more urbanized areas of the United States. It seems that marginalized people, or the lower class, are involved in these criminal activities; since those with money have no need to acquire others information illegally. A good example of this idea is the recording of movies in theaters.

"The recording of major motion pictures is costing companies millions of dollars in revenue" (Ernesto, 2013). Criminals are known for sneaking into theaters with their recording devices and recording the movie. Once the movie is on their camera, they can share the movie online for money or they can share it for free. Since the release of camcorders, theaters have started to crack down and search for people using the devices. However, criminals soon became smart enough to hide the cameras in their jackets or to even put them in cups to carry. Theaters on the other hand are taking matters into their own hands. Hansen describes how the movies are being projected with special lenses and at specific angles to where cameras are not able to record them (Hansen, 2002). "Certain theaters are also giving their attendants night vision goggles to spot the cameras as well" (Ernesto, 2013). These recorded movies, according to the MPAA, are the largest source of fake DVD's sold in the world. Being caught results in huge fines and is considered a felony in the United States (MPAA). Even with these problems in mind, moviegoers are still eager to record their

favorite movies with camcorders. Once they have the recordings in their possession, it is very easy for the criminals to make money off of the illegal content. The idea of using camcorders to record someone else's work falls under the STS concept of reinterpretation.

The STS concept reinterpretation, developed by Eglash, is defined as using an object or piece of technology for something else then it was desired for without modifying the piece of technology. Reinterpretation (a sub-concept of appropriation) is defined as using a device for an action other than what it was designed for, without changing the technological makeup (Eglash, 2004). This can be connected to camcorders because these machines are not changed in any technological way; however, they are used for a purpose that the creators were not prepared for. The creators obviously can not be blamed for the dilemma. One must look at the people to see where the problem is coming from.

Overall, the use of camcorders to record copyright material is a problem that worries many people. This process falls under the STS concept of appropriation, which is defined as using a piece of technology in a different way than the creator planned. It also connects to the sub-concept of reinterpretation, which uses the idea of appropriation, without changing. As one further explores household objects and appropriation, he or she can see how other actions like Internet piracy and cell phones social problems are involved.

- The camcorder is a machine that was designed to take personal videos; however, it can be used for many ways that it was not designed for. This idea of using a camcorder for an idea that it was not designed for without changing the make up of the machine is reinterpretation.
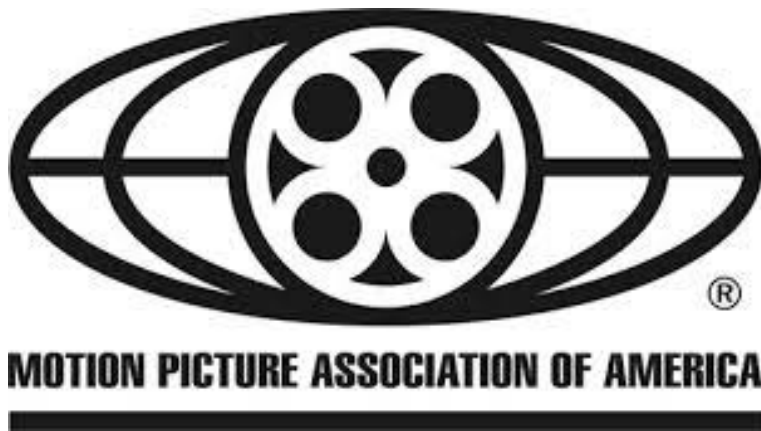
This is the symbol commonly seen in movies that protects films and warns violators of the potential risks of recording in theaters (MPAA)

- The STS concept reinterpretation is a sub-concept of appropriation. Appropriation is defined as using a piece of technology for other purposes then what it was designed for (Kline, Ronald, and Trevor Pinch). Reinterpretation, defined by Eglash, is similar to appropriation; however, it makes sure to mention that the device is not tampered with in any way to preform this undersigned use (Eglash 2004)

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Section Three:

The Controversy Behind Genetic Engineering

and The Public's Understanding of Science

Introductions to The Controversy Behind Genetic Engineering and The Public's

Understanding of Science

By: Danielle Weiss, *Section Editor*

Genetic engineering has been a highly controversial and debatable topic for many years, most likely attributed to the mixed perceptions of its capabilities by the general public that have had access to information about this technology. It is possible to analyze the advances of this technology with respect to the public's understanding of science, which states that the understanding of science by the public is limited based on the knowledge that is presented to them via the scientists whom published it and often doesn't facilitate the public's understanding based on their presentation of only the findings and not the mechanisms (Sismondo 2009 citing Wynne 1992). Therefore, this STS concept is adequate and broad enough to be applicable to all subcategories and capabilities of genetic engineering. In relation to the section prior to this, which discussed the STS concept of black box with the focus of technological devices that are involved in everyday life, genetic engineering can also be analyzed with this concept as well. Amid a technology as developed as manipulating the genetic sequence of an organism (being an animal, human, or food) the mechanisms of this technology are not commonly understood by the public. This also conveys the public's understanding of science, or as we will describe, genetic engineering, because when scientific knowledge is published, the findings are emphasized instead of the processes. When exposed to society, those that utilized the technology depend completely context. For example, those that use cloning are typically active in a laboratory, whereas those who consume genetically modified foods often shop at a large chain grocery store. Therefore, marginalized groups shift in response to the situation, but normally do not have

the best access to the technology. This is an important societal issue to discuss because the tension between the groups within society ultimately effect the advance, or failure, of a technology and its capabilities.

Within this section, the broad empirical example of genetic engineering is broken into three different subcategories: cloning, eugenics, and genetically modified foods. All three areas will discuss the comprehensive STS concept of the public understanding of science, however each will independently discuss an additional narrow STS concept. Cloning will cover the deficit model (Sismondo, 2010), eugenics will discuss the ethics of science (Merton, 1973[1942]), and genetically modified foods will examine technological momentum (Hughes, 1994). All of the discussed concepts will accurately describe the underlying controversy surrounding genetic engineering because each subcategory will go into greater detail, with respect to societal beliefs, about members that are not active in the scientific community respond to the technology. In relation to the next section of the booklet, genetic engineering is further discussed, but in a more narrow light; there is a main focus on GMO's and how the STS concept of co-construction is also applicable to this technology.

This section of the booklet will give one further insight of the controversies associated with genetic engineering and some of its possible subcategories in relation to an umbrella STS concept, as well as more narrow focuses. This information should also allow one to form their own opinion on the use of genetic engineering technology and its aptitudes.

Additional Material: Main Argument

This list is able to accurately capture and list the main arguments and information of the following pieces in this section:

- The general public normally is hostile about scientific findings due to their lack of education; however, if they were to become educated, the hostility could decrease.

- The controversy associated with genetic engineering can be greatly attributed to the presence of a knowledge gap.

- Although scientific knowledge is something that has a significant amount of capabilities, there tends to be a lot of ethical controversies, which accompany the procedures.

- Genetically modified crops have a promising future for agriculture, and although the controversy is sever, if overcame, it is possibly to exploit their full potential.

The controversy that accompanies genetic engineering can meet multiple STS concepts, including those that will not be directly discussed in this section. However, one example that isn't discussed in this section, but a later one, is social determinism. This is applicable because society ultimately decides what this technological advance can be used for, in addition to how successful and acceptable it will be (Zenzen and Restivo, 1982).

Cloning and the Controversy Surrounding

By: Henry J. Spies

The controversy surrounding the cloning debate will be discussed using the narrow STS concept of the deficit model from Sismondo 2010.

- The deficit model states that the general population is uneducated about a specific topic and this lack of knowledge leads them to become extremely skeptical and hostile towards those educated in the topic. However, if the general public was educated about the topic then they would forgo their hostility and accept the idea. (Sismondo 2010)

- The controversy about cloning rages mainly because there is a knowledge gap between the general population and the educated few scientists in the cloning field. Also if the general people were educated then the hostilities would diminish and the debate about cloning would become less of a battle ground and more of a civil function of figuring out problems and fixing them.

The deficit model is the best way to understand why there is so much controversy surrounding cloning in the realm of genetic engineering. Cloning is perhaps one of the most widely known areas of genetic engineering due to its use in movies and television shows, however cloning in real life is looked at with a fearful eye and an air of hostility. The deficit model, as part of the STS concept public understanding of science, fits the cloning debate almost perfectly. The public understanding of science is the way nonscientist look at a certain topic, and if there is mistrust and hostility due to a lack of understanding then the deficit model is the concept that envelops the idea, like we have with the controversy over cloning. (Sismondo 2010)

The controversy surrounding cloning began with the first cloned sheep that was named Dolly. She was cloned at the Roslin Institute and PPL Therapeutics in Roslin, Scotland by Ian Wilmut, Keith Campbell, and their colleagues using nuclear transfer (Pennisi 1998). After Dolly was cloned there was a thought about what cloning would be used for, or how it could help advance

Figure 1. Figure 1 is photo of Dolly the sheep.

society and science. There are many who think that cloning can be used to help solve out endangered species problems, or even in extreme cases bring back extinct species. There is even some success in the area of bringing back extinct species. For example in 2000 the last bucardo, a species of mountain goat, died. This bucardo had skin samples taken and the

genetic material was extracted from these samples. This genetic material was transplanted into egg cells of a domesticated goat and a living bucardo was actually born (Connor 2012). The opponents to cloning immediately sited cloning as unethical however after Dolly was born it took a few years for them to substantiate their opposition. Opponents not only claim that cloning is unethical, but also horribly impractical. For example in the attempt to clone endangered species, the sum of the success is an afghan cat, a banteng cow and a couple of grey wolves (Shanks 2012). Furthermore in order for each of these animals to be cloned there were countless trials that were unsuccessful. These failures include animals being born with horrible health defects such as misshapen spines, lungs that are not fully formed, and other countless problems that cause the scientist to need to put the animal down or it will live in horrible agony (Shanks 2012). However the majority of current cloning research is going towards creating more accurate and re-creatable processes for cloning so that cloning becomes much more efficient. Ian Wilmut, the main person behind Dolly, has not cloned anything since Dolly and is instead focusing his research on how genes are reprogrammed to make cloning more efficient. Wilmut has said that he is not giving up on cloning but that it is so inefficient that the efficiency must be addressed before cloning can be a viable solution for anything (Pennisi & Vogel 2014).

The deficit model can be used to understand why cloning is such a controversial topic. For example in 2002 a study showed that 12 to 29 % of people approved of cloning and 64 to 84% of people disapproved of cloning with roughly 6% of people saying they didn't care depending on the situation cloning was in (Animal 2012). Many people also have a lot of miss conceptions about cloning. Examples of this are clones are artificial beings and not born of natural processes, clones are exact copies of what they cloned from, and clones

will appear with all of the memories and at the same age as the animal cloned (Genetic

2014). Also the opponents who are at least moderately educated about cloning say that it is

cruel to the animals being used as surrogates and that cloning is far too inefficient to be used

(Stanks 2012). However these people are unaware that the majority of scientific research is

in the cloning itself but rather the ways in which cloning can become more efficient and safer

for the animals involved (Pennisi & Vogel 2014). Based on the deficit model if the general

public and the moderately educated knew exactly what the current cloning research was and

what the eventually cloning possibilities are then the hostility and disapproval would

diminish and public opinion would shift in favor of cloning (Sismondo 2010).

      The deficit model when used in the context of the cloning controversy shows why

there is hostility between the general public and those with knowledge about cloning, and

how if the general public became more educated about cloning then the controversy would be

less about whether or not cloning was good or bad but rather how we can make cloning better

to solve problems. The debate about cloning is also one of an ethical nature. In this way the

cloning controversy is similar to the eugenics controversy in that both can have the STS

concept of the ethos and ethics of science applied to them (Sismondo 2010).

Eugenics And its Ethics

By: Devon Fields

Today, plants and animals are commonly genetically modified (Darnovsky 2010). This is done so humans can get more out of that plant or animal. Hypothetically, this process can be done with humans as well; we could be modified to have more desirable traits. This is called eugenics and falls under the category of genetic engineering. However, just because we can do this, should we? Would it be ethical? Does society fully understand the process of eugenics and its implications?

Eugenics is hand picking traits and controlling reproduction to improve the human gene pool, create better people, and give humans a head start in life (Darnovsky 2010). In fact, the term eugenics translates to "good in birth" in Greek (Health 2014). Between the late nineteenth century and World War II, eugenics was in its prime. For example, there is an extremely well known example of eugenics where Nazis in World War II took methods to an extreme level with mass sterilization and genocide (Heath 2014). The Nazis killed many different groups of people including the marginalized, disabled people. Both the physically and mentally handicapped were viewed by the Nazis, the elite, as useless, a threat to clean genetics, and were therefore deemed unworthy of life (The Murder of the Handicapped). Nazis killed the disabled throughout the whole war and killed approximately 200,000 handicapped people between the years 1940-1945 (The Murder of the Handicapped). However, the first historical reference of eugenics dates back to 368 B.C. in which Plato and Aristotle wanted their society to be full of healthy individuals to create an elite ruling class and an army. Eugenics takes different forms throughout history and across the globe as well.

Currently China is experiencing a form of eugenics. The Chinese are very strict about their reproduction; they have a one child policy.

There are both pros and cons to eugenics. Some positive aspects are that babies have an increased resistance to disease, an optimized weight and height, and are more intelligent. Additionally, personalities can be adjusted, new body forms can be designed, and life expectancy extended. However, there are also negative aspects to eugenics. Opponents believe that eugenics is too unpredictable and malfunctions too often. Also, it goes against the "Genetic Bill of Rights" which claims an individual has "the right to have been conceived, gestated, and born without genetic manipulation" (Darnovsky 2010). Anti-eugenicists say that the process "can alter humanity itself". Eugenics gives humans the ability to "play God" which creates ethical problems. Many countries have already banned genetically modifying babies (Darnovsky 2010).

Many opponents to genetic manipulation cite it as being unethical. According to Sismondo 2009, violations of norms are ethical lapses. He says that deviance is to be expected which results in conflicts among norms (Sismondo 2010). If there are conflicts for what are societal norms, that would then affect what is an ethical lapse; different people would see different things as ethical lapses. For something to be ethical, informed consent has to be given; however, an embryo cannot give consent. This means his or her life would be controlled by doctors and the parents. Additionally, regardless of how much animal testing has been done, the first human trial will still be an experiment and genetic manipulation has slim justification to start with (Darnovsky 2010).

The public understanding of science is also a part of eugenics. Sismondo says that science is often difficult to understand and accuracy is very important (Sismondo 2010). The

process of eugenics is a scientific one. Does the public understand the science behind eugenics? Harry H. Laughin from the International Congress of Eugenics said the following in 1932: "Applied eugenics works essentially through long-time education, in which young people build up an appreciation of the importance of 'blood' and 'breed' -- that is, of the hereditary foundations of individual and family success." (Vermont Eugenics). Therefore, society does not understand the actual science behind eugenics. They don't know the process behind what they want, or a good 'breed'.

Although we have the technology to modify children before they are born to obtain desired traits, the process of eugenics has been questioned ethically and is not fully understood by members of society. Eugenics provides some benefits to the individual, but there are also cons. Opponents to genetic manipulation claim it is unethical. Additionally, eugenics is a scientific process so it would be argued by Sismondo that it is not fully understood by the average person in society. Should eugenics be allowed to create a better human race or should we let nature run its course?

Additional Material Main Argument:

- The process of eugenics has been questioned ethically and is not fully understood by the public.
- Even though we have the certain scientific knowledge to undergo scientific procedures, there are other things that must be considered such as the ethics of those procedures.
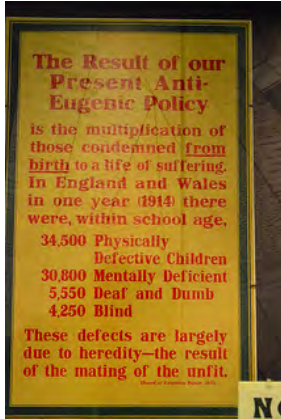
Creative Commons Image:

Figure 1
This is a 'pro-eugenics' poster. It shows that birth defects are a result of mating of the unfit.

Sutherland, Ben. Pro-eugenics Poster. 2012. Flickr, Web. 18 Mar. 2014.

Genetically Modified Crops and the Public Understanding of Science

By: Connor Park

As biotechnology advances, the importance of the STS concept of technological momentum (Hughes 1994) becomes more and more apparent. The idea of technological momentum is very well demonstrated with the up-and-coming technology of genetically modified crops, which also show the darker side of a more overlying idea: the public understanding of science.

Genetically modified crops can be examined through the lens of technological momentum to provide a valuable insights about the implications that they have for society in the future. However, these crops have been seeped in controversy since their introduction in the year 1982 (Tanaka 2013). This acts as a barrier to the development of the technology, and yet these crops offer a huge potential to combat global agriculture problems.

Genetically modified crops are crops and produce products that have had their DNA altered by genetic engineering techniques. The purpose of these modifications is to emphasize desirable traits or introduce new traits entirely. These traits can vary from resistance to pests and disease to a desirable color, shape, or flavor. The end goal of these techniques is a safer, larger, healthier, and more appealing harvest. Traits can even be introduced from entirely separate species, a practice that is common in efforts to confer resistances to various crops. A good example is a rather recent development in this field: a modified form of Asian rice called golden rice. Golden rice is modified to be able to produce beta carotene, which is a precursor to Vitamin A (Ye, et al. 2000). This enables a major staple food to combat Vitamin A deficiency, which is a problem on a global scale.

It indeed seems that, ostensibly, the technology appears to offer only benefits such as these. However, the idea of changing an organism's DNA for our own ends is unappealing to many, and for this reason, genetically modified crops are a hot-button issue as they become more and more prominent in agriculture. There is a general perception among the public that scientists are recklessly 'playing God' and that this technology could have dangerous, unintended side-effects (Singh, Ghai, Paul & Jain 2006). It is also introducing a rather drastic change to global agriculture, and this is met with resistance by both politicians and people involved in agriculture. Some farmers, such as a group in Sweden, are worried that the introduction of genetically modified crops could prove detrimental to their non-modified harvest, or have qualms with unforeseen biosafety implications that the crops may have (Lehrman & Johnson, 2008). These controversies give the public a poor view of the practice in general, which greatly impedes the progress of their development.

That is where the idea of technological momentum comes into play. The controversy surrounding this technology obviously serves as the society influences that are molding it in its infancy. However, looking forward, it is apparent that genetically modified crops could become a core aspect of the global food system. As populations continue to grow worldwide, agriculture struggles to keep up. By refining the process of genetically modifying crops for beneficial traits, we can begin to combat the inevitable starvation that would otherwise strike an overpopulated world. While not necessarily becoming something that we are dependent on, it's obvious that as the technology ages and improves, it will greatly influence the way society operates – and indeed, survives.

So it is apparent that the controversy surrounding this technology should be addressed and dispelled. By using the framework of technological momentum, we can alter the public

perception of science in regards to genetically modified crops. Doing so will prove

beneficial to society in the long run.

These tobacco plants used to be at great risk for damage from pests. Tobacco was the first crop to be genetically modified, offering resistance to pesticides. *Photo by Ashwan Lewis. Creative Commons.*

Main argument summary (bullet point): Genetically modified crops offer a promising future for agriculture, and

to buffer our efforts against starvation. However, they are currently seeped in controversy, especially members

of the public who are not in scientific circles. By overcoming this controversy, we can fully exploit their

potential.

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Section Four:

The Co-construction of Genetically Modified

Organisms

Introduction to the Co-Construction of Genetically Modified Organisms

By: Christian Przeslawski, *Section Editior*

  The umbrella STS concept discussed in this section is co-construction. Taylor (1995) explains co-construction as the act of objects influencing each other in either some positive or negative aspect. Co-construction is how science/technology are related to society; however the public understanding of science is society's idea of how science should be organized. In the terms of STS, co-construction refers to society shaping technology and science or vice versa. Genetically Modified Organisms (GMOs) are our umbrella empirical example. GMOs are a specific type of genetic engineering, and genetic engineering was the example provided in the section prior to this one, which discussed public understanding of science. GMOs were picked because these organisms are great examples of co-construction occurring in STS. GMOs are organism's whose genomes are altered to create desired traits. For instance some fish were genetically modified to have a gene that causes them to glow in the dark. GMOs were also chosen as an example because the technological creation of GMOs are relatively new and these ethics are currently in huge debate within society. Furthermore, GMOs are now widespread in many different parts of our lives, such as medicine, food, and pets. The focus on GMOs in this article explores the technological aspect. This technology both influences and is influenced by society. The technology introduces some new product to society, which then changes how society operates. Society then in turn decides if these GMOs are ethically correct. Thus we can use the term that the technology of GMOs and society are co-constructed in the fact that they build off each other.

  This section will use the examples of GMOs in medicine as well as the food industry to help explain the STS concept of co-construction. These topics will be investigated upon to

show the positive and negative aspects they may cause on society as well as society's effects on this technology. Furthermore with the topic of medicine, the STS concept of relativism will be explored. The different views of GMOs within medicine will be observed. Similarly, the food industry will then be explored to show how GMOs have been incorporated into the global food market. This topic will help explain the STS concept of technological determinism.

Overview

Knowledge will be gained on the following topics:

- There are multiple views in society of how GMOs should be used. GMOs are thus an example of relativism.

- The idea of relativism is that all the views on a subject are correct and all the views help develop the subject.

- How society is influenced via technological determinism through the controversy of GMOs in the food industry.

The overarching idea is co-construction in STS explaining that society and science/technology build off each another. Within the next section, the influence between society and technology is examined using time as a factor to explain the STS concept of technological momentum as applied to the food sciences..

Relativistic Perspectives on Genetically Modified Organisms

By: Austen Cox

The narrow STS concept that will be used to describe the main empirical example is relativism (Zenzen & Restivo, 1982). The empirical example(s) used are focusing on medical GMOs (Lemey & Gulotta). Lastly, the main STS concept that relates the empirical example and narrow STS concept is Co-construction (Taylor, 1995).

Relativism is the concept that describes different opinions and points of view that have no definite validity (Zenzen & Restivo, 1982). The term holds specific value depending on an individual's direct perception(s). Each and every human being looks, acts, and thinks differently, which is the root cause for relativistic viewpoints. Relativism plays closely with the term co-constriction, which relates how specific ideas/objects feed off one another (Taylor, 1995). As ideas feed off each other and progress, many different viewpoints are appointed to the specific cases that arise from these ideas. Genetically modified organisms (GMOS) are great examples that incorporate relativistic viewpoints, especially those within medicine.

HIV is a life-threatening virus that is extremely difficult to cure, and dates back to the 19th century (Lemey et al., 2003). Nearly all treatment options have little success rates, along with being highly dangerous. Recently, (2012) a new scientific discovery created a genetically modified T-cell that is safe and remains healthy for up to 11 years (Anonymous, 2012). Gene transfer to cells is high risk as it can cause leukemia in patients. The new genetically modified T-cell does not present this risk and is ultimately a truly safe treatment method for HIV patients. This particular GMO has a great deal of positive aspects associated

with it. Although there are many favorable viewpoints, not all are considered good. The genetically modified T-cell treatment is rather expensive, which brings negative opinions towards it from the medically marginalized groups, specifically the poor. The new T-cell has been proven to do wonders, but individuals are required to first pay for the treatment, which ultimately denies many. As you can see, scientists view the new discovery as something that could change the healthcare world forever, while others present negative viewpoints due to means of access.

Another case study discusses the results of genetically modified stem cells and their attempts to regenerate tendon and bone connection (Gulotta et all., 2010). After 4 weeks of being introduced to the new stem cells, tendon-bone attachment sites were clearly more developed. This gave insight on how to successfully use genetically modified stem cells, however the tendon-bone interaction never displayed a complete attachment. Many scientists argued that it was good reliable data and could be used in further experimentation. On the other hand, arguments were made that it was not reliable data due to the simple fact that there was no resulting attachment of tendons and bones. No matter what side one may take, there will never be a determining factor that separates right from wrong.

The above case studies display relativistic/different viewpoints stemming from specific research and discoveries. As science, technology, and society feed of one other through co-construction, they create many differentiating perceptions within particular instances like the case studies. Genetically modified organisms are one of the most popular topics being discussed in today's society, which makes them extremely prone for relativistic discussions. The next time you find yourself in a heated argument, try stepping back and look through the eyes of the other individual.

- The main argument of this essay is that genetically modified organisms create relativistic viewpoints. GMOS are created using science, technology, and society and their co-constrictive nature. The creation of GMOS is then critiqued by society and this is where the differentiating perceptions arise.

- Relativism is defined as a family of views on the same topic. There are no incorrect views, as they are correct in the perceptions on the beholder.

Figure 1: This image displays how relativism is a term that refers to how each specific individual views something. The picture can be thought of as the bike being upright or upside down. It all depends on how you look at it and your own perspectives on it.
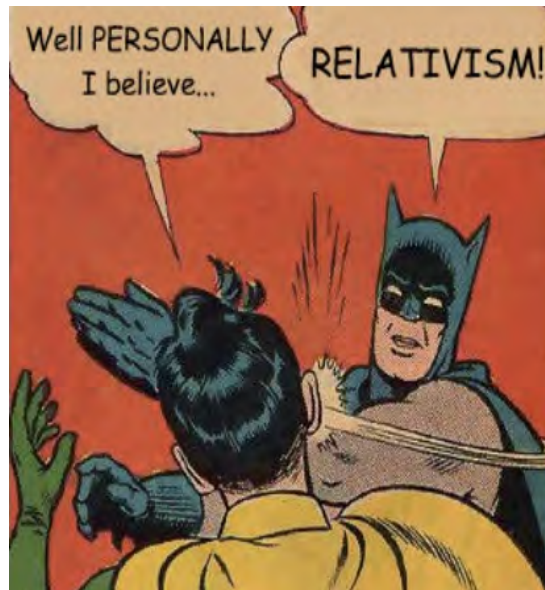
Figure 2: This image displays how Robin is getting slapped by Batman for attempting to inform him of his thoughts. Batman says "relativism" which indicates the terms outlook on multiple viewpoints by multiple people and how no one individual is correct over another.

Technological Determinism of GMFs

By: Mark Cieslik

Technological determinism will be the narrow STS concept used to analyze genetically modified foods (GMFs). This concept explores the idea that technology is the driving force behind the advancement of science and society. GMFs will be analyzed with this concept as GMFs fall under the umbrella of genetically modified organisms (GMOs), and technological determinism contributes to the umbrella STS concept of co-construction.

The controversy behind GMFs began relatively recently due to the advancement of the methods attributed to genetic modification. Technological breakthroughs created the possibility of DNA modification in a relatively short time frame. GMFs are altered to gain characteristics that would not have been natural for that particular plant to have. Controversy arises from this "unnatural" aspect of GMFs as some people feel that these methods are unsafe and could be dangerous for the environment; however, there are many benefits.

A study done at the University of California demonstrated one of the benefits of GMFs. The study detailed the effect of genetically modified rice on mice. Mice were fed rice that was genetically modified to produce human lactoferrin or lysozyme, both of which have effects similar to antibiotics when present in the intestinal track (Rice Expressing Lactoferrin and Lysozyme Has Antibiotic-Like Properties When Fed to Chicks, 2002). GMFs in this case provided a viable alternative to antibiotics. Changing the DNA of a crop changes the very nature of the plant itself. Theoretically, DNA altercation could enable the crop to acquire virtually any characteristic, including resistance to pests and producing larger yields.

Not all are convinced on the benefits of GMFs. Many are concerned about the risks to the consumer. GM foods are a relatively new technology with the public fearing that GMFs

are not safe for consumption. Peter Timmer states in his essay, "Much of the political opposition to GM foods in Europe arises from widespread consumer doubts over their safety because of the perception that GM foods are unnatural or unhealthy" (Biotechnology and Food Systems in Developing Countries, 2013). Often times, the public is slow to accept new technologies even when the benefits are easily apparent. These fears are not always based on fact but nonetheless contribute to the success of a technology.

One other controversy plaguing GMFs are concerns for the environmental impact. GMFs created to resist pests and disease could render natural occurring plants obsolete and reduce biodiversity. Unmodified plants do pose much of a competition to GMFs that, "…led to significant increases in net yield, and a significant decrease in the application of insecticide." (Food Biotechnology: Benefits and Concerns, 2002). Farmers would have no reason to use unmodified plants if GMFs have such obvious benefits. This would contribute to the domination of GMFs in the ecosystem.

Technological determinism can be used to analyze the relationship GMFs have with society. Before DNA modification, GMFs were never an issue in society. Only after the methods for DNA modification were developed did GMFs begin to be controversial. The technology of DNA modification determined the course of society in this example. Had the technology of DNA modification not been developed, then GMFs would not have existed. DNA modification and GMFs opens the door for more organisms to be modified in the pursuit to better the already existing organism.

GMFs have been the source of much controversy. There are obvious benefits to be had but not without risks. Environmental impact and safety concerns are some of the focal

points of this controversy. Such controversies are not limited to solely GMFs. Genetically

modified organisms used in medicine face similar concerns.

Main Argument

- Controversies surrounding genetically modified foods are centered on the

    issues of risk to the consumer and reduction of biodiversity. The development

    of GMFs can be analyzed through the concept of technological determinism.

Figure 1: Shows the negativity and fear towards GMFs/GMOs in general.

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Section Five:

Technological Momentum of Food Sciences

Introduction to Technological Momentum of Food Sciences

By Melanie Mermiges, *Section Editor*

The "umbrella" STS concept and empirical example that our group has decided on is how technological momentum affects nutrition and food items (*Hughes*, 1994). This concept is defined to be a large technological system that begins small and is shaped by society at first, then shapes society as it grows larger overtime (Hughes, 1994). The concept of technological momentum provides "a more complex, flexible, time-dependent and persuasive explanation of technological change" (Hughes, 1994), which is why we decided to use technological momentum as our "umbrella" concept instead of social determinism and technological determinism. Specifically, we will be looking at how economies of scale, social determinism, and technological somnambulism attribute to our sub-concepts within food and nutrition (*Sismondo*, 2009). Our sub-concepts include the mass production of corn as an economy of scale, and technological somnambulism and the social determinism of vegetarian diets, and the choices for feeding babies.

In previous sections, we started off with cyber bullying which lead to the next section of common household technologies, to genetic engineering, then to genetically modified organisms. Section four ending with GMOs in the food industry leads directly into the technological momentum of food. Throughout the semester, our group has been working together and communicating with each other and each of the four other groups to produce the best booklet possible. This capstone assignment has taught us how to work well in small and large groups. Relaying everyone's thoughts and ideas inside and outside of class enhanced the progress and quality of each section. Roles were established in each team to assign different parts to each member and to make sure no one and no important part was left out of

the booklet. This assignment has forced each group member to critic other sections and revise when seen to be beneficial for the quality and completion of the booklet. Constantly revising and giving feed to back to our fellow group members assured that nothing was left out and the product would be successful. Contributions, communication, and criticism were the ultimate keys to the success of this booklet.

Corn is found in an extensive amount of food items that people consume everyday. Corn, being a large technological system, is used to produce an extremely large amount of product. Corn is product based on an economy of scale.

Being a group that does not consume any meat at all, and therefore does not get all the vitamins they need, vegetarians and vegans were in need of new vitamins to sustain their nutrition. Vegetarians and vegans socially determined what technology was needed to assure they were getting the required nutrients daily.

Technological somnambulism is the idea that people are "unconscious" as they make personal choices in technology (Winner, 1983). There are certain factors in technology that people are not aware of so they base their decision of these products unknowingly. This is the concept used to describe the decision of whether to breast-feed or formula feed a baby. Certain factors in society unknowingly direct women to what method they think best suits them in choosing a type of feeding for their child.

What To Take Away From This Essay:

This section of the booklet should give some insight of how certain factors can affect the choices a person has on their nutrition or the effect nutrition has on a person's choices. The goal of each section is to relate the sub-concepts to the overall STS concept: technological momentum.

- The abundance of corn in everyday food items that some people may not even be aware of and how this small food can affect so many daily items.

- Because of the vegetarians and vegans need for vitamins, new technology developed new vitamins to satisfy these needs. This then made it possible for technology of these new vitamins to advance and gain popularity as the diets of vegetarians and vegans got better.

- People make decisions based on factors they are not even conscious about while choosing between baby formula and breast-feeding.

The goal of each section is to relate the sub-concepts to the overall STS concept: technological momentum. It will be proven that each section is once socially determined, and then eventually becomes technologically determined as popularity grows.

The Cornucopia of Corn: Its Takeover as an Economy of Scale and Scope

By: Alana O'Mara

The corn industry has grown extremely influential on society. This is due to its development as an economy of scale defined by Hughes (1994) as an industry that mass-produces products and makes them available at a cheaper cost. Due to its mass-production, corn has been used and engineered for a gamut of food products also making it an economy of scale defined by Hughes (1994) as a technological system that has large infrastructure capable of infiltrating much of society. Due to the corn industry's scale and scope, it has changed society's nutrition. The dynamics that brought the corn industry to this point will be analyzed with technological momentum (Hughes, 1994) in order to understand how the social roles of politics and the role of advancing technology has affected corn production over time.

The corn industry has grown exponentially over the last century. In fact, the United States has an overabundance of corn (US Dept. of Agric, 2014). This has left society with two questions: how did this large influx of corn arise and how should society use the corn? The mass production has been shaped by politics and technology over time, while corn has emerged as an economy of scale and scope. The wide scale use has influenced corns' use in animal feed and as derivatives in a large scope of packaged foods. Although corn is now a cheap commodity, there are many negative nutritional repercussions.

These repercussions have affected a large portion of society because the corn industry is a vast economy. However, more of corn's impact rests with marginalized members of society. In this case, the marginalized members of society are the un-wealthy because they are more apt to buy the inexpensive corn derived products. This places the poor at a

disadvantage because they have less nutritionally beneficial options when shopping at a supermarket. While often, the wealthy shop at organic stores, they are not concerned with synthetically derived corn products because these products would not be present in their selection of whole foods. This has created a division amongst supermarket shoppers: the wealthy and the poor. Therefore, a movement away from corn in food is and will continue to be difficult because movements often come from those with time, energy, and money, in other words, the wealthy.

Corn, however, was not always used in this fashion. The momentum of the extensive corn industry came about in large part due to technology. There was an extreme calling for hardier corn at the time of the Dust Bowl during the 1930's. Around this time, the hybrid corn seed was developed and it quickly spread throughout the Midwest for its valuable characteristics: more resistant to drought, sturdier, and capable of growing in close proximity (Crow, J.F., 1998). More technology erupted during the time of WWII when scientists were experimenting with ammonia and nitrates for explosives. Scientists discovered that these ammonia and nitrate containing compounds were powerful fertilizers (Crow, J.F., 1998). The new technologies allowed farmers to grow more corn without exhausting the soil an appreciable amount. This allowed for corn industry to erupt as an economy of scale defined by its low unit costs from mass production.

Reports by the United States Department of Agriculture, display this mass-production. In 1964, the average number of corn bushels per acre was 62.9; in 2013 this number has more than doubled and is now 160 bushels per acre (US Dept. of Agric, 2014). Not only are farmers capable of growing more corn per acre, but there are also more farms

growing corn than any other grain crop in the United States. The Department of Agriculture also recorded that 95.3% of grain produced is corn.

Scientists have found ways to incorporate this plethora of corn into our everyday food. In the documentary, Food Inc., Dr. Larry Johnson, a professor at Iowa State University in Center for Crops Utilization Research, stated "We are now engineering our food. We know where to turn to for certain traits…and engineer new foods that don't stale in the refrigerator, don't develop rancidity." Corn is a common component in engineered food because it does not go bad. That has allowed corn to be in all of the following products: catsup, cereals, Motrin, jelly, McDonald's burgers, and more (Kenner, 2009). Being applied in a multitude of ways is what makes the corn industry an economy of scope.

Clearly the corn industry has and can shape society's nutrition. This is evident because the way corn is grown in the United States, how often it is used in obscure products, and due to the fact that it is now extremely cheap and easy to produce and store.   Typically, economies of scale and scope are viewed as beneficial because they make products more accessible and feasible to purchase. However, society has not necessarily benefited from corn as an economy of scale and scope as it has made nutritionally poor packaged food cheaper and a part of everyday nutrition for many.

Due to its growth, the corn industry has become more complex. Making changes to a large technological system is difficult, however, by analyzing how the corn industry reached this point I believe that society can change its course. Technological momentum has swung it in the wrong direction, but with societal pressures to make the corn industry more nutritionally beneficial, change can occur.

Main Point:

- Define that the corn industry's growth, from hybrid seed and fertilizer technology, has created a need to use the corn in a processed and 'unnatural' fashion. This has negatively impacted the nutrition of society by limiting choices, especially for marginalized people, by making packaged 'unhealthy' options cheaper. However, people are capable of eliciting change in food nutrition, because society is a factor of technological momentum

"Figure 1. Corn Field (2010)" demonstrates the mass production of corn across the United States

Social Determinism and the use of Vitamins by Vegans and Vegetarians

By Kristen Nash

Vegans and vegetarians use vitamins to receive much needed nutrients in order to not be Anemic. This creation of vitamins falls under Social Determinism because they would not be created without the need from those with deficiencies to survive. This falls under the umbrella concept of Technological Momentum due to the progression of vitamins being made over time by the growing need of more vitamins to be created. Vitamins are now becoming an integral part of everyday lives for people. The intake of vitamins increases a person's health and can bring about a healthier diet (Willett, 2001)

Vitamins were discovered as part of a healthy nutrition since the early 1900s. Since then vitamins had been discovered for certain purposes. There are many vitamins that helps vegetarians and vegans; one is vitamin B12. The vitamin helps to stop Anemia which is the inability for oxygen to travel through the blood stream. Vitamin B12 allows for the absorption of Iron which helps the oxygen travel. After many initial ideas of the Liver and its extracts healing Anemia, Mary Shorb discovered the vitamin in 1947. (Shorb, 1948). Iron supplements are also necessary as a partner to the B12 so there is an aspect of absorbance and also source of Iron. Vitamin D also discovered and helps vegetarians and vegans to help strengthen bones.

The pill form of vitamin B12 was not made for vegans and vegetarians. It was made for those who could not naturally absorb Iron, not those who just didn't eat the appropriate foods to allow an adequate Iron intake. Vegans and vegetarians are a group that is pushed away from mainstream society. They are outsiders and peoples who believe that society is not moral enough (Spencer, 1996). This creates a drift between the main group of people and

those who disagree with the main way of thought. Vegetarians and vegans were typically unhealthy because they ate foods that were not rich in Iron or vitamin D from fish. This caused the majority of people to look down on the vegetarian diet because they still lacked key nutrients for a healthy lifestyle all in the name of being "moral" (Lyle Davis).

Vegans and vegetarians have a need to be healthy in order to survive, which falls under Local Knowledge. What is not common knowledge, however, is the impact of vitamins. Vitamins may have been created for people who were not marginalized, but they are still used by vegans and vegetarians. One vitamin that was previously mentioned was the pill, vitamin B12. Although, to fully use this vitamin their bodies must initially have Iron present in the body to begin with. There are two types of iron: Heme and Nonheme. Heme is found in most meats and is easily absorbed. Vegans and vegetarians don't eat meat so they are forced to get the raw nutrients from plants, which are Nonheme. This source is not easily absorbed and requires higher amounts (Dwyer, 1991). That is why Iron Supplements were created. Bone health also depends on the intake of vitamins which include Vitamin D pill (Craig, 2009). Even though it can be found in the sun's rays, vitamin D is found in fish and some dairy based products. This makes it hard for some vegans to receive this nutrient due to the intangible source for them. The key idea is that the vegan and vegetarian diets lack key nutrients and the vitamins allows them to be healthy. Becoming a Vegetarian has become more popular recently due to the push by society for Vitamin creation (Craig, 2009).

The creation of vitamins has brought on a healthier non-meat eater. This is slowly causing a Paradigm Shift from what scientists believe about Vegetarians and Vegans. A Paradigm Shift is when "one conceptual world view is replaced by another. (Kuhn, 1962). In recent years scientists have conducted research that achieves a great change from the past

experiments done before. A test conducted in 1966 and later in 1995 shows a change from

being more likely to have deficiencies to much less and then having an increase in

preventative measures against diseases such as prostate cancer. A proper diet is described as

preventing nutrient deficiencies (Sabaté, 2003). Taking vitamins and increasing the intake of

dairy based items helped to move the curve in the right direction toward the proper diet.

Another test conducted showed that meat actually increased the risk for chronic diseases as

stated by Sabaté. Along with the fact that meatless diets have less fatty acids has recently

been causing a change from thinking that Vegetarian diets were more harmful, to being more

helpful to the human body.

The Vegetarian and Vegan diets are healthier in terms of fat and preventative measures,

but they lack necessary nutrients to strengthen the body and maintain health. With the

growing need for vitamins to be created in the 19th century by society, Vegetarians and

Vegans now have access to these vitamins. Due to the desire from society, the technology of

vitamins was created to suit Vegetarians and Vegans; which follows Social Determinism.

This caused the group of Vegans and Vegetarians to grow over time by the creation of the

technology. As time progresses, following Hughes' fundamental idea, the vitamins will make

Veganism and Vegetarianism a more relevant diet and cause a large shift for more people to

join their ranks. This follows Technological Determinism due to the vitamins creating a new

way of living which society would want to evoke on themselves.

Main Point:

- Due to society's need for a cure to certain ailments, a new technology in the way of

    vitamins was created. This creation has allowed Vegans and Vegetarians to have a

more healthy diet. This caused more people to become Vegans and Vegetarians and propel that group forward into society.

The idea of Social Determinism can be defined by Zenzen and Restivo as "shaping of technology due to social influence" (Zenzen and Restivo, 1982)

Figure 2: Bradly Stemke. (2009). Vitamins are becoming a daily part of people's lives, in order to live a more healthy life

Technological Somnambulism Influencing the Feeding of Infants

By: Jessica Porter

It is commonly found that as technology progresses society seems to follow whatever path the technology takes it down without even realizing it. This is a concept known as technological somnambulism and was developed by Langdon Winner. Technological somnambulism is the idea that we are in a state of "sleep walking" in our "mediations with technology" (Technology as a Form of Life). This has even become relevant in the world of food. Looking at infant feeding in particular, historically the best and only option to feed a baby was breast milk. However, with recent advancements, the development of baby formula has evolved and become an alternate choice when deciding what to feed infants. This advancement in technology is a process known as technological momentum (Technological Momentum). Technological momentum is the theory about how technology influences society and it advances (Technological Momentum). Baby formula in particular has been persuading society ever since it was first invented.

Baby formula first hit the shelves at all local grocery and drug stores in 1951(A Brief History of Formula). Baby formula was composed of cow's milk, but was enriched with extra vitamins, minerals, and nutrients essential for proper development of infants. This idea of a quick feeding time appealed to a lot of mothers, especially those who had to go back to work. Most mothers often only receive six to eight weeks of maternity leave and believe that is not enough time to get situated with breast feeding, making formula feeding the ideal option (Breastfeeding).

Women in society at this time were also considered to be part of the marginalized population. Women were working just as often & hard as males, but only received a small

percent of what males were getting. Even though women were not receiving as much pay as

males they still were using baby formula because it was the quickest and simplest thing to do

after a long day of work. Just because formula

feeding was considered easiest though, doesn't mean

it was the best choice.

Figure 3: "Sleep like a Baby"

First and foremost, infant formulas when, first

developed, were not regulated by the FDA before

they hit the shelves (Baby food and infant formula).

Also important is that formula, early on and now, has

never included the infection-fighting antibodies that

are found in breast milk, making formula-fed babies

more susceptible to illness than breastfed babies.

Breast milk, although not the latest technology,

is known to be the perfect food for babies. Breast

milk is not only free, but is also frequently available on demand. It has been linked to a

reduced risk of obesity later in the child's life, along with a reduced risk of developing

asthma and allergies (Breastfeeding). Children who were breastfed longer as infants have

also been known to perform better on intelligence tests by four IQ points, due to an

enhancement in brain development (Kids).

Technology is changing everyday. Just because it continues to move, doesn't mean it

is always what society should follow. It is commonly seen that society unknowingly follows

technology, thinking it is the latest and best, a trend known as technological somnambulism.

When applying this STS concept to feeding infants, we are finding just the contrary--with

more and more women becoming educated, there has actually been an increase in the number of mothers choosing the age-old proven method to breast-feed their children. Even though breastfeeding is a little more time consuming and not as convenient, mothers are going against the before seen trend of technological somnambulism. In relation to infant feeding, this is a very good thing and means that more and more mothers are looking deeper into the nutrition of their children starting from their most vulnerable beginning.

As easy as it is to go with the flow of ever-changing technology, it is important that society stay alert and fully informed with the choices available. This is not only relevant in the nutrition of babies, but with everything that technology presents to our society. New and "up-to-date" is not always what's best for us.

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Glossary

Appropriation:

A designated use of a certain object; the action of taking something for one's own use (Kline and Pinch, 1996).

Closure:

Closure is the final design of a technological artifact after all problems between social groups have been resolved; also reaching stabilization. If a new discussion about the artifact appears and socials groups start to contest it, closure can turn back into interpretative flexibility (Pinch and Bijker 1987).

Deficit model:

The deficit model states that the general population is uneducated about a specific topic and this lack of knowledge leads them to become extremely skeptical and hostile towards those educated in the topic (Sismondo 2010).

Economy of Scale:

The use of the large technological system infrastructure to produce a high volume of product with a low cost unit (Hughes 1994).

Economy of Scope:

Technological organization where investment of a large infrastructure infiltrates much of society. (Hughes, 1994)

Ethics of Science:

According to Sismondo, violations of norms are ethical lapses. He says that deviance is to be expected which results in conflicts among norms (Sismondo 2010).

Public Understanding of Science:

The understanding of science by the public is limited based on the knowledge that is presented to them via the scientists whom published it. These published data then often doesn't facilitate the public's understanding based on their presentation of only the findings and not the mechanisms (Sismondo 2009 citing Wynne 1992).

Interpretive Flexibility:

It is a section of the Social Construction of Technology, which shows the different understanding of technological artifacts to different social groups (Pinch and Bijker 1987).

Social Construction of Technology:

The idea designed to analyze a technological artifact through relevant groups, interpretive flexibility, closure, and technological frames (Pinch and Bijker 1987).

Social determinism:

Society shapes technology (Sismondo 2009; Zenzen and Restivo 1982).

Social Impact:

A sub concept of appropriation. This is examining how science and technology change our personal lives, cultural attitudes, or environment (Eglash, 2004).

Technological Determinism:

Technology is the deciding factor in determining the course of society

Technological Momentum:

A large technological system begins small and is shaped by society at first, then shapes society as it grows larger overtime (Hughes 1994).

Technological Somnambulism:

The idea that we are simply in a state of "*sleepwalking*" in our mediations with technology (Winner1993).