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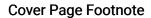
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Cover Page Footnote

To my parents, Tio and Tia Yesenia and Jeremy, and Eric Hahn, thank you for supporting and helping me. With much gratitude.

(STEM)ming on What Children Need to Learn: *Mister Rogers' Neighborhood* to *Cyberchase*

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Abstract

Although television is a cultural artifact, it is also a mode of intellectual inquiry that not only shape social values, attitudes, and beliefs of those who watch it, but is driven by these attributes by those who create the content of it. This paper illustrates and reflects the cultural and political implications of a shift in American educational television programming towards STEM (Science, Technology, Engineering, and Mathematics) related content through PBS KIDS around the early 2000's. PBS aims to enhance children's understanding of mathematical and science applications. By creating technologically-apted individuals through the use of television and future digital endeavors as sponsored by PBS, I argue that the audience of PBS KIDS will obtain skills to participate in a labor market geared towards STEM. *Mister Rogers' Neighborhood* (PBS, 1968-2001) and *Cyberchase* (PBS, 2000 – present) are the two sample shows that depict the shift that was originally orientated towards social-behavioral themes. By re-examining the purpose and history of public broadcasting, giving a biographical account of both shows, and analysis of each show's educational methodology through three episodes per show, I demonstrate PBS's interests are geared towards STEM literacy being more accessible to children. I conclude with a discussion of the STEM crisis being mediated by the possibility of STEAM as a better suited

educational methodology through Fred Rogers who promoted an interdisciplinary environment and by not belittling one discipline over another.

Keywords: Mister Rogers' Neighborhood, Cyberchase, PBS Kids, Public Broadcasting, STEM, STEAM

Every weekday, PBS has a programming block called PBS Kids. This segment runs educational television (TV) shows for children as early as six in the morning to four in the evening. Children, as young as preschoolers to as old as middle schoolers,[1] gather by their TV sets to enjoy themselves before leaving for school, or after returning home from school. I would consider myself a PBS kid too, for that matter. The captivating and creative narratives and characters convey lessons ranging from kindness, love, friendship, to reading comprehension. Many years later, I still feel the positive impression left on me by this accessible public broadcasting channel.

Historically, PBS has been "a symbol of both service and value", a loyal educational network providing quality as a public service (Hoynes 124). PBS Kids is no exception. To demonstrate this, I will focus on the type of skills that are being taught through PBS Kids shows. As a commercial medium and a cultural artifact, television shows, like PBS Kids' programming, reflect a specific socio-political agenda. I will discuss the cultural and political implications of a shift towards STEM related content in PBS Kids programming around the early 2000's. The two shows that perfectly capture this are *Mister Rogers' Neighborhood* (PBS, 1968-2001) and *Cyberchase* (PBS, 2000 – present).

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[1] According to PBS Kids "F.A.Q." webpage, PBS Kids includes PBS Kids' Sprouts (show segments that are aimed for ages 3-5) and PBS KIDS GO (show segments that are aimed for ages 10-12).

At first glance, one could argue that these two shows are unalike. On the one hand, *Mister Rogers' Neighborhood* epitomized and trail blazed children's television as its host, Fred Rogers, explored various topics of life and environmental spaces through presentations, music, and the Neighborhood of Make-Believe. On the other, *Cyberchase*, being one of PBS' STEM-related children shows,[2] deals with a group of children who are transported into a digital universe in order to protect it from an evil infiltrator. With further analysis, I will argue that by comparing *Mister Roger's Neighborhood* and *Cyberchase*, we can detect a marked shift in American educational goals from instructing and aiding in the social psychological development of a young audience to a new focus on the application of STEM related lessons driven to create socially well-rounded individuals. The significance of this emphasis is to enhance the general population of children's understanding in mathematical and science applications in order to prepare them for a competitive international labor market through the use of television and future digital endeavors as endorsed by PBS (McCarthy 128) (see Appendix A).

What is Public Broadcasting: A Small Introduction to PBS

Before examining the implications of this shift toward STEM heavy content, the discussion of what is public broadcasting and how it came to be needs to be articulated. The Public Broadcast Service (PBS) is a "noncommercial system founded on public service principles" (Hoynes 117). This implies that whatever is aired will be of use and of access to provide "'informative', 'educational'… [and] 'respect[able] intelligence'" for its audiences; not only based on the creation of their "name brand",[3] but aiming to be independent from any outside influences (mainly, funders and sponsors) that may distort its original intent to be a

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[2] To name a small handful of other STEM related shows prior to *Cyberchase* were *Bill Nye the Science Guy* (PBS/Disney, 1993-1998), *Zoom* (PBS, 1972-1978 and 1999-2005), and *Zoboomafoo* (PBS, 1999-2001).
[3] See Hoynes, Chan-Olmsted, and Kim. All mention that PBS's name brand contributes to its success and failures.

network serving for their audiences' benefit (Chan-Olmsted and Kim 301). This original intent is based on a goal of providing a type of public service through content regarding the arts, sciences, public affairs, independent films, documentaries, interviews, and/or any type of genre as an engaging and freeform platform to enhance public knowledge.[4] On the contrary, the majority of public service principles have been established through the litigation of governmental organizations/affiliates, private producers, and contributed funding from both groups long before the formation of PBS. Hence, the question of who, how, and why these public service principles were created is a huge component when considering the shaping of children's programming. With that being said, we must look back to television's predecessor, the radio.

The radio was in its prime, functioning as an informative product to its listeners in World War I. It was not until the 1920's, under the Hoover administration that the U.S. government argued for a profit-based radio industry, a notion that was believed to best serve the general American interest. The alternative was having a nonprofit usage for communal groups like educational institutions, but, was initially rejected: it was perceived as a route for "special interest" (Hoynes 118). As a result, the Radio Act of 1927 was implemented, giving federal licensing to radio broadcasters that are for-profit stations (see Appendix B and C). This act was challenged; it excluded nonprofit groups and non-commercial uses from the industry. By 1935, however, a legislative bill was introduced in the U.S. Senate requesting to nullify all radio licenses and to set aside one-fourth of all AM radio channels for these non-profit groups, it was prevented by lobbyists from the National Association of Broadcasters, the representative of for-profit groups (Morrison).

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[4] A quick observation of the type of content shown from PBS's website. Last checked and used March 8, 2019.

The commercialization of radio continued and likewise, was transferred when television was introduced (Haggins).[5] Recognizing the significance of retaining some noncommercial stations (*FCC* 314) (see Appendix D), in 1952, the Federal Communications Commission (FCC) reserved 252 stations for noncommercial educational use (Hoynes 119). In response, The National Education Television network (NET, 1954 – 1982), funded by the Ford Foundation, participated in this opportunity. Its main function was to produce and distribute educational shows among public stations. In doing so, it paved the way for and ultimately dominated public television (Paradise 23). This allowed a change in 1967. Blueprinted by the Carnegie Commission to have public television "highlight…debate[s]; giv[e] voice to diverse expression, and serv[e] as a substantive alternative to commercial television", the Public Broadcasting Act of 1967 allowed federal government funding for public broadcasting (Hoynes 119). As a result, it established the Corporation for Public Broadcasting (CPB): the nonprofit institute for public media and its funds. It does not produce or broadcast programs, but gives awards to the producers to create programs for these public media stations.[6] NET agreed to be part of CPB as the Ford Foundation supported the Public Broadcasting Act. It was not until 1972 that PBS replaced NET, making it the media enterprise to distribute among its public television stations along with its transference of funding by both CPB and the Ford Foundation (Chan-Olmsted and Kim 382).[7]

Already, from this context, there is a paradoxical push for democratic uses of media for public education. What readers need to understand from the radio was that it was seen as an

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[5] On slide 23, Professor Haggins inserts a statistic that 90% of Americans owned a television set by 1959. Within the same lecture, she explains that *The Milton Berle Show* (NBC, 1948-1956) demonstrated commercial segmentations and sponsorship as this introduced audiences on how television worked.

[6] See "CPB FAQ" webpage under the header titled *Who creates the programs?*

[7] See "CPB FAQ" webpage under the header titled *What is the difference between CPB, PBS, and NPR?*

industrial product, a type of good used by a company for business consumption. The radio was a tool to avoid business exchange from war opponents not only because of the U.S. and corporate isolationist policy at the time, but because the U.S. wanted to protect its manufactures and businesses from foreign business domination (Cregan 9). That decision alone allowed American businesses to control and market the interests of these companies, not the public. Although the same thing could be said about television, the idea of having public education programs be non-commercialized is an ironic and radical decision to be both democratic and educational. The radio and its successor television's transition as a commodity suggests a blurred boundary between democracy, education, and commercialization. The effects of this commercialization necessitate critical examination, especially considering that the target audience of much of this content was children.

Who was Fred Rogers?: The Idea of Children's Education Television

Fred Rogers defined and established children's educational television when there was no genuine interest or direction from TV corporates to follow that initiative. In 1951, before entering the television industry, Rogers was ready to become a minister in his senior year of college. Coming back home from a vacation, he was introduced to a television set as this new commodity. Through watching it, Rogers explains that he saw people "'throwing pies in each other's faces'" and thinking, "'This could be a wonderful tool. Why is it being used this way?'" (*Won't You Be* 5:00 – 05:15). The "throwing of pies" is a typical gag from vaudevillian television that aimed for adults and children to laugh at. At this point in history, most of television programming was a remediation of Vaudeville Theater and radio shows (vaudeos) adapting them to television as a medium (Haggins, slides 18-22). With that being said, the content was for spectacle, toying with the audiences' expectations while they adjusted to the new

medium. More or less, the idea of entertainment (a form of distraction and leisure) was the norm in television's early uses. The creation of this device and what he saw in it inspired Rogers to go into the television industry.

A television station named WQED (a station that was part of NET for the Pittsburgh, Pennsylvania area) was introduced to the area. As their initiative to be part of educational programing, Rogers took the opportunity to produce and compose music for a show titled *The Children's Corner* (1955-1961) which nobody wanted to do (*Won't You Be*). Just as the film stock used to make the show was cheap and brittle, so too was the slapstick – redundant - and the simple content it captured lead to Rogers' dissatisfaction. He took a break from the show to become ordained as a minister (*Won't You Be*).

The Children's Corner illustrated the issues in early children's programming. As iterated, the lack of funding was evident because initially it was not thought of as marketable. Meanwhile there was no format or model to follow in creating content for young children because of the process of adjusting to a new medium and figuring what exactly is effective for children's learning. At the same time, I would argue that because of how television was perceived as just an entertainment entity for commercial expense, the simplicity of the show (as an example for other children's educational programming at the time) was ineffective. Children were not learning anything new. The repetition of the same lessons, rhymes, and spectacle was a distraction and mindless. Its creators (with the exception of Rogers) were not treating its audience with dignity, maturity, and respect. It was assumed that young children were not capable of learning complex and abstract thoughts and feelings. This concept that children are as emotionally and psychologically complex as adults is what Rogers held fundamental to his beliefs. Already, this sentiment was radical thinking for its time.

Wanting to understand child development, Rogers went to the University of Pittsburgh as a student of Margaret McFarland, one of the leading child psychologists at the time, at the Arsenal Family and Children's Center (Curry 51-52). Through training, McFarland emphasized to be empathetic and told her students to apply their own experiences as children in order to understand them as they respond with clinical insights (Ibid). Upon conversation, Rogers shared with McFarland that he should not have to feel the need to create a spectacle in order to develop a legitimate relationship with a child. One could read this as a criticism towards the programming at the time. Agreeing with his comment and knowing that Rogers was a part of the television industry, McFarland explained "'…to the child, the television program between you and the child is a real relationship'" (*Won't You Be* 09:18 – 09:28).

Her statement not only motivated Rogers to create his show, but confirms the issue of children's programming at the time: children's programming should not treat the child like a consumer and likewise, it should be as meaningful to a child's development as is their relationship with their parents.

How Mister Rogers' Neighborhood Worked

Although I will not go fully in-depth about the entire run of *Mister Rogers' Neighborhood*, I will instead elaborate how Rogers established a relationship between his viewers and the lessons that he wanted to address. With McFarland's statement in mind, Rogers created his children's television show to explore different themes dealing with the difficulties and joys of life and to offer suggestions as to how to navigate them (Neville). Through his own childhood experiences and what was happening in the late 1960's, Rogers felt that there were many children with anxieties and fears that were not being addressed nor being allowed a space to explore those emotions, thoughts, and curiosities as part of development (Bianculli 38-39).

Audiences could recognize an establishment of a model for the future of children's programming.

The format of *Mister Rogers Neighborhood* is to fuse reality, creativity, and the make-believe. Since the show was aired during the weekdays, his team followed a "theme week" schedule where a single topic would be devoted for the whole week and allow it to be fully interwoven and fleshed out per episode. These themes reflected many topics like divorce, sharing, death, learning, etc. Although many critics felt that these topics were not appropriate for children (Curry 56), Rogers believed that like adults, children desired truth and, as such, he decided to present his real self rather than playing a character (Bianculli 39). In doing so, Rogers received the appeal and attention of his audience, establishing intimacy, trust, and consistency by looking at the camera and utilizing language that spoke to the audience (Roger's second person use of the word "you" directed towards his audience for example) (Zelevanksy 197). How he conveyed the lessons is through conversing with either the audience or other cast members, utilizing presentations, musical performances of calm melodies, and the most important segment, The Neighborhood of Make-Believe (a kingdom where whatever lesson was discussed by Mister Rogers would be acted out with puppets and more supporting cast in this imaginary social space). Particularly, with the Neighborhood, Rogers established a place to draw upon all the anxieties and misunderstandings of children and demonstrate them through an investigative process called a "'system of correspondence'". This "system" associates space, people, symbols and ideas while encouraging his audience to ask questions, speculate, interpret, and recognize the relations between them (Ibid). All of this was to encourage self-discovery and allow the child to develop a personal interest in the world around them (Curry 56). Its aim was to have children be reflexive thinkers in the ability to learn and contemplate what was taught (*Won't You Be*).

To give perspective as to how this was done, here are some examples of particular moments of *Mister Rogers' Neighborhood* that illustrate this.

"Episode 195"

On a hot day in the Neighborhood, Mr. Rogers decides to cool off in an inflatable pool. Upon relaxing, a regular character on the show, Officer Clemmons (played by Francois Clemmons), passes by to greet our friendly host. As one of the show's most iconic moments, Mr. Rogers invites Officer Clemmons to cool off in the pool with him (*Won't You Be*).

During this time, segregation of pools and violent actions were taken upon African Americans and were widely publicized throughout the nation. Seeing the injustice of these actions, Rogers intended this episode to be a direct reference to this. As a positive reinforcement for young African American children, Rogers asked Clemmons to portray himself as a police officer even though he, like the rest of the community, were fearful of the police for their brutality (*Won't You Be*). Recognizing the ever-present racism of this era, Rogers' actions model the idea of equality, respect, and kindness in order to combat racism, a behavioral conditioning that is passed along from parent to child. Overall, this moment was to teach children the importance of tolerance: the acknowledgement that whatever they may be told to do simply because adults may be doing it or saying that it needs to be done does not make it right, but knowing that we are no different from others to feel as respected as part of the human race.

"Special Episode"

Set in the Neighborhood of Make-Believe, Daniel the Tiger (voiced by Rogers) is with Lady Aberlin (played by Betty Aberlin) as he holds a balloon. He asks her to blow into it to see how much it can expand. Upon blowing, Daniel interrupts Lady Aberlin by asking what assassination means. Heartbroken, Lady Aberlin stops and explains to Daniel what it means and

how people are upset about it too. Daniel does not want to talk about it, but for another day. Lady Aberlin agrees and promises to do so (*Won't You Be*).

This episode was aired the two days after Robert Kennedy's assassination. Although this was not the first time that something similar has happened, this was the first time that a children's television show addressed a national incident like this. This episode, although open ended, was left intentionally to allow children and parents to grieve as demonstrated through Daniel and Lady Aberlin. Rogers, knowing the publicity of this event, would come to the attention of children filling in a likely gap of parents not knowing or failing to address this sensitive issue with their child. Rogers' address of assassination is a discussion regarding fragility and resilience. Igniting the discussion around this topic allows a given space to their audience a better understanding and response to their somber feelings in both children and adults.

"Episode 1534: Food"

On the topic of food, Mr. Rogers asks his audience how other beings receive food. In a presentational segment, a montage is shown of different types of animals' breastfeeding their babies as Mr. Rogers narrates through it. This montage includes human breastfeeding ("Episode 1536: Food").

By the presentation of this segment, this montage is to serve as a sequence of association for its young audience. This allows children to see the similarities of how breastfeeding functions from different animals to humans. Especially seeing the function of life in a tender and motherly way. Meanwhile, during a time of conservative idealism in America, this presentation normalizes breastfeeding and is aimed at what would have been a non-appropriate age. Nonetheless, it

serves for children to understand that this is a normal process and there is no shame in realizing the similarities.

The Legacy

For many years, Mister Rogers Neighborhood taught children many social behavioral lessons. The show was one of kind: its aim was not to "[program children] into model shoppers" (Zelevansky 208). Its aim was to give children their own agency and knowledge of everyday life. The model created by Rogers was simple in establishing an engaging relationship with children, but complex in the way that allowed the audience to grow even after its airing time. The show itself created a legacy for PBS to follow and experiment with.

Funding, Branding, and the Crisis of Education: The New PBS

However, this experimentation is created based on the needs of funding. Since the 1970s, PBS struggled financially as government funding decreased. Slowly, they turned to the private sector through the Reagan administration (Hoynes 120-122). Meanwhile, within the same decade going into the 90s, decreasing funding in education throughout schools nationwide had an impact for low income and in-poverty students. This hindered many children to succeed economically (Collins 215-226). By 1992, Conservative activists and allies of Congress campaigned to privatize public broadcasting once more (Hoynes 120-122).

During this campaign, PBS was in the transition, with its new sponsors, to take public broadcasting into the digital world as it reestablished itself as a multichannel enterprise. Converting PBS to a digital network allowed for more funding opportunities to broaden access to children's education in the new medium. However, to secure public broadcasting temporarily, PBS launched the "Ready to Learn" initiative in 1994: a project to help early childhood educational programming reach underprivileged children. This constituted the re-introduction of

former PBS children shows (like *Mister Rogers*) by creating a television block (Bedford). Because of PBS's name brand being loyal to serve children's education (Chan-Olmsted and Kim 302), by 1996 and 1998, the House Telecommunication Subcommittee raised (while endorsed by the Public Interest Obligations of Digital Television Broadcasters) a fund for more financial stability for public broadcasting by commercial broadcasters (Hoynes 122-123). By 1999, PBS launched PBS Kids: a unified branding of children's education including daytime broadcasting, online resources, and a separate channel dedicated to this purpose (Bedford). Securing roughly 150 corporate sponsor partnerships with PBS at an approximated worth of $80 million (Paradise 23), Congress was met with hostility from private sector and public broadcasting supporters alike. In response, Congress approved a $300 million funding increase in 2000 (Hoynes 122).

The ironic twist of PBS's reputation as nonprofit was the thing that ultimately saved it. Nonetheless, the question of commercialization and its influence on PBS' initiatives remains. This new era of PBS is more "market savvy", yet it tries to stay true to its initial reputation (Chan-Olmsted and Kim 302). With that said, sponsorship is taken with strict regards if one were to support PBS, especially PBS Kids. "PBS defines a sponsor, or underwriter, as a third party that has voluntarily contributed cash to finance, in whole or in part, the production or acquisition of PBS program" (Paradise 24). This means that PBS must identify the sponsor sometime in the program with strict consideration of a neutral mention (non-flashy or extensive focus that overly distracts the program away from their audience) (Paradise 24). This comes into play when PBS starts accepting sponsorships in order to reflect the current needs of children's education in the beginning of the 21st century.

Cyberchase: The Answer to an Educational Crisis

The creation of *Cyberchase* is vague and limited, but it is through an assumption of events that has developed to reconfigure the nation's educational standards that influenced PBS's own agenda to reflect those needs through this show. In the 1990's, the National Science Education Standards and the National Council of Teachers of Mathematics (NCTM) assisted U.S. educators with a curriculum to help prepare students in the STEM field based on the below average performances of students (see Appendix E). However, there were academic reports in the early 2000's that concluded that there was a desperate need for U.S. students to improve on their proficiency in STEM disciplines (Marick). Essentially identifying this issue as a STEM crisis, the National Science Foundation funded WNET (a PBS station located in Newmark, New Jersey) to "engage [with] a lead mathematics consultant [Cary Bolster], an advisory committee, and producers to develop…a multi-component project designed to excite, inspire, and involve 9-11 year olds in mathematics" (*NSF*).

Chasing Cyber-Technical Skills

Cyberchase was finally aired in 2002. It involves a group of multi-ethnic children named Matt Danklin (voiced by Jacqueline Pillion), Jackie Pappi (voiced by Novie Edwards), and Inez Garcia (voiced by Annick Obonsawin) being transported into a digital universe to protect it from a villain named Hacker (voiced by Christopher Lloyd). In every episode, the Cyber Squad (as they call themselves) are confronted with Hacker's mischievous plans that involves mathematical application and reasoning - a reflection of the current educational curriculum as drawn by the NCTM (*PBS*, "About Cyberchase"). The group discusses and explains their reasoning as they try to solve these problems. Through this process, they make common mistakes (like most students would), reiterate a concept if there is a misunderstanding, retrace steps, and sometimes with a mixture of all the listed items, they succeed on stopping Hacker's plan on a

temporary basis. This step-by-step and conceptual analysis is to demonstrate to its audience the common mistakes made and to prevent from repeating them. To conclude the show, the last five minutes of it is dedicated to a segment called "Cyberchase For Real". One of the two protagonists named Harry Wilson (played by Matthew A. Wilson) and Bianca DeGroat (playing herself) reapply the same math lesson to real world scenarios in exaggerated fashion or through humor (PBS). This last segment is to provide the relevancy of learning math and how often we, as people, encounter similar situations that involve it. From a long list of episodes, there are a few that specifically and effectively illustrate these concepts.

"Find Those Gleamers"

As a way to boost his self-confidence by toying with the Cyber Squad, Hacker steals the Encryptor Chip (a device that helps Mother Board, the ruler of this digital universe, to prevent herself from glitching). In order to retrieve the device back, the squad must capture electrical butterflies called Gleamers that have been scattered on an abandoned island. Once finding them, they must bring them to Hacker's spaceship and place them into the generator before sunset ("Find Those Gleamers").

This episode focuses on Algebraic application. When finding a relative number of Gleamers, the squad must figure out how many power-glows each Gleamer gives off. By using variables to represent each space available per Gleamer container and the total number of power glows they have, it confuses the squad's "cybird" sidekick, Digit. However, with the guide of the squad, they are able to articulate the function of variables and draw out how the application works as they continue figuring out the minimum number of power glows Hacker's ship needs. This demonstration is a visual display depicting a step-by-step simulation of how algebraic functions work while illustrating and affirming many students' confusions about algebra.

"The Eye of Rom"

Continuing the chase for the Encryptor Chip, the squad must retrieve the Eye of Rom that was stolen by Hacker. They must return it back to Binky (voiced by Bebe Neuwirth), a cybercat who controls a pyramid in the Tomb of Rom before it all shatters to the ground ("The Eye of Rom").

Inverse operations are the main lesson in this episode. Inverse operations are the mathematical operations that undo each other (e.g. adding to subtracting, multiplying to dividing). This episode is unique in that the lesson is more conceptual and metaphorical rather than literal demonstrations. Assuming that these basic functions are what every student knows how to do, the show instead demonstrates it in a puzzle solving setting in reversing the steps taken. An example, when the Cyber Squad finds the Eye of Rom and is accidentally broken in puzzle pieces, the Squad must see what order it broke in therefore they can reverse the order to put it back together again.

"A Crinkle in Time"

In the process of chasing the Cyber Squad, Hacker's ship gets destroyed. Using a beaten-up ship as his is being fixed, Hacker kidnaps the Cyber Squad's friend, Slider (voiced by Tim Hamaguchi), a skater-boy that lives in the Cyber World. Hacker takes him to Tick-Tockia, a world with clock beings and environments ("A Crinkle in Time").

As part of their journey, the squad must figure out how to run a train to the other side of the city by cranking it through gears. They learn that by placing a gear with more teeth on top of the one with fewer teeth makes the train go faster. The lesson is focusing on the function of gears, a concept more in-line with engineering. However, this ties into the concept of polynomials, an expression consisting of variables and coefficients. Although they do not show

any mathematical application of this in the episode, the attention should be brought upon a visualization of the gear's function and how to solve their problem.

Conclusion: The Future of PBS and STEAM?

As this paper explains, viewers can see that the shift in children's education is reflected in *Mister Rogers' Neighborhood* and *Cyberchase* moving from a focus on social behavioral development to STEM topics. This shift continues to this day as a proactive effort to promote STEM fields and increase STEM literacy. Currently, there are many critics that have skepticism towards this STEM crisis: is this even true? To some, it is believed that it never existed: the crisis was developed to reestablish and push the U.S. as a hegemonic state to compete against other nations (see Appendix F, G, and H). Interestingly enough, the argument of *Mister Rogers Neighborhood* being a potential (and perhaps) a better influencer than shows oriented to STEM has directed towards the idea called STEAM (Science, Technology, Engineering, Arts, and Mathematics).[8]

STEAM is rooted on the pressure towards educators to start implementing STEM education in young children due to "the concern that the United States is falling behind in scientific innovation" (Sharapan 36). Educators, especially those working with young children, are unfamiliar and uncomfortable with teaching young children science-related fields. Since the arts is introduced in early childhood as a natural and common activity among children, STEAM invites the arts to be the core focus, not only allowing children to explore their interests and creativity, but as a way to help educators apply and simplify STEM concepts through them. In recognizing how Fred Rogers' naturally fused arts and sciences through his show, Hedda

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[8] Georgette Yakman is the creator for STEAM education. Sharapan advocates for this discipline.

Sharapan, a close friend of Rogers and the director of early childhood initiatives for the Fred

Rogers Company, pitches STEAM as a way to have STEM literacy:

> "[We should] think of 'understanding the world around us' as [the way Rogers
>
> did]…To him, [the basic elements that comprise STEAM] were just part of our
>
> everyday language, not intimidating academic concepts. STEAM is much more
>
> about facilitating inquiry-based thinking and discovery than about teaching facts
>
> and giving answers…" (Ibid 36-37)

What Sharapan implies by her statement is that the conception of STEM is perceived as

complicated and less tangible to understand for both teachers and students through everyday

classroom activities because of how rigid and isolated the material is to everyday knowledge.

Sharapan believes that if the exposure and learning process for the child is governed by

humanistic principles and facilitates more social behavioral growth through these fields then

STEM literacy would become more comfortable and accessible to both the student and teacher.

This is demonstrated through her explanation of what the STEAM acronym means to her:

> "Science is about nurturing a sense of wonder and curiosity. It's about
>
> experimenting, encouraging investigation, and asking 'Why do you think…?'
>
> questions…Technology is just a fancy word for tools…[C]rayons and pencils are
>
> tools. So are rulers, magnifying glasses, scissors, zippers, and even dump trucks.
>
> Engineering starts with identifying a problem, then moves ahead to thinking about
>
> solutions and trying them out. All of us have seen children go through these
>
> processes when…they can build their blocks higher or when they're working on a
>
> toy boat…Adding the arts gives children the opportunity to illustrate STEM
>
> concepts…through music and dance, communicate with descriptive language,

illustrate ideas with crayons or markers, create graphs, and build
models…Mathematical thinking includes comparing, sorting, working with
patterns, and identifying shapes. Language, too, plays a big part in math, for
example, when we use comparison words like bigger, smaller, higher, lower,
farther, and closer" (Ibid 37).

As an overall proposal, I believe it is a wonderful idea in terms of giving a well-rounded education for young children. So far, STEAM shows promise in allowing children to recognize how similar and to some extent, reliant STEM is to the Arts (and vice-versa) as they maneuver through both disciplines simultaneously. The way STEM is taught is sometimes perceived as a separate discipline from Art as if to assume that they are not exchangeable or they should not mix. The same could be applied to Art, only involving the cliché like paints, crayons, Play-Doh, etc. STEAM gives opportunities for young students to explore their true interests and to appreciate both realms without being taught to isolate the other. This is beneficial in that children are going to be well-informed about both disciplines. Yet, at the same time, allows them to decide for themselves what would be their desire to continue learning in an open and integrated environment without any restrictions or divisions. In essence, it could be implied that Sharapan's proposal aims to change how the current education system is structured. Sharapan reconfiguring of the idea of STEM proves how having arts and humanities in a STEM discipline is crucial and how easily accessible it is to bridge the two without the costs or the complexity.

It is significant to see that what can be reflected through her proposal are the anxieties - that some critics worry about – of the STEM crisis removing arts as a relevant subject to be taught and specialized in (Strauss). This worry is reflected in present-day America where the number of funding for humanities and art degrees are decreasing as the number of STEM

degrees increases. It is believed that what contributed to this shift is the 2008 Recession where financial burden more heavily impacted arts and humanities graduates than those in STEM. Hence, the major concern based on this event is financial security and job opportunity among students. It "no longer feels as if [students] can afford to major in whatever strikes their fancy. Instead, they feel like they have to take the safe path and go for the money. And they can't help but notice that…the chances of finding a job generally tend to be higher for [STEM]…" (Smith).

However, this statement is not true for all STEM graduates because of the competitive environment (NPR). If anything, to blame STEM completely would be irresponsible to do so. STEM education is still lacking and does not adequately reach low income students (*PBS* "PBS Survey"). With that being said, because of PBS's change to digitalization, Cyberchase should be thought of as an accessible educational resource to enhance math literacy for children without any charge. As a plus, there have been studies that prove that Cyberchase is effective in delivering math literacy both in its show and on the accompanying PBS website (Yusop 398).[9] However, there is a legitimate concern that the PBS channel only reaches a certain number of people compared to Disney or Nickelodeon. Once again, a limitation to providing STEM education (Ibid).

As my final thoughts on this research, this debate between Humanities and STEM has been a fraught issue for many years and it has sadly become an argument between prestige, intellect, and competitiveness over finances among students, educational faculty, businesses, and companies. As a general conversation, I find this mentality a display of ego between an individual who receives a paper that dictates whether an individual studied something in art or

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[9] Refer to the conclusion of Yusop's study.

science. This is quite absurd, toxic, and disheartening. What the conversation hints at is this idea of which discipline is the truest display of human capacity and innovation and should be rewarded based off that deductive reasoning. How should one be rewarded on that logic? Well, you cannot. We are humans. Everything that we do has some form of art or science. Sometimes art influences science and science influences art. There should not be a competitive sport out of this. Yet, it is a cultural phenomenon that happens on a day-to-day basis and how unfortunate this has to happen because it toys with the accessibility of finances. As a student and a coming of age adult, it is a known fact that finances can solve many problems and open many doors as a means of survival. Yet, as an individual and from my own belief, sometimes too much accessibility of finances can ruin one's spirit and distort everything that made up that person.

This conservation is where I turn to Sharapan's STEAM and PBS Kids as a resource of hope as a mean of mediating the argument. I find humor and irony that *Mister Rogers' Neighborhood* and *Cyberchase* depict this argument. Based off of what PBS and Cyberchase have achieved, I am going to credit them for making efforts and taking initiative to providing STEM resources and literacy through accessible means (and I do hope they continue with this initiative). Nonetheless, I believe STEAM has potential to enhance PBS's future STEM initiatives and inspire classroom environments. From what Sharapan discusses, I am in agreement with her in that we, as a collective, should recognize all elements from all disciplines and there should not be biases over them. However, what makes her proposal convincing is that she wants to provide all resources and have children decide for themselves what interests them in a natural process without external pressures - like finances - as Fred Rogers intended it to be. Or better yet, to not belittle specific interests based on market relevancy. The human capacity is

unlimited and has varying expressions of that. That for me, is what I hold important and

ultimately proves Rogers' legacy.

Appendix A

The Key Point from Betsy McCarthy's Article

Betsy McCarthy's article, "PBS KIDS Mathematics Transmedia Suites in Preschool Homes", addresses that "[t]here is growing evidence that economically disadvantaged preschool children have less extensive mathematical knowledge than their middle-income peers. This study addresses a program to foster low-income parents' support for their preschool children's mathematical development." (McCarthy 128). Although this article is considerably recent, it speaks on the purpose of PBS Kids' establishment: an initiative to help maximize lower class children's academic performances at a national standard. As the study indicates, there is a lack of resource and knowledge from lower class families where the reluctance for children is upon teachers and their parents. There has been recent developments and affirmative actions by PBS to help further this initiative as this study indicates. However, the initiative should be reflective in what *Cyberchase* pioneered and experimented in its early beginnings. And more so followed by Rogers approach's in teaching this subject matter.

Reference Citation

McCarthy, Betsy, et al. "PBS KIDS Mathematics Transmedia Suites in Preschool Homes."

   Proceedings of the 12th International Conference on Interaction Design and Children -
   IDC '13, 24 June 2013, pp. 128–35., doi:10.1145/2485760.2485777.

Appendix B

A Wartime Stepping Stone for an American Radio Industry

In Elizabeth Cregan's article, "The Impact of WWI on the Course of American Radio History",

Cregan explains that on August 14, 1914, when Britain declared war on Germany, Germany

limit its communication with foreign owned cables while England controlled the transatlantic

network. Having no wireless communication network, the U.S. was reluctant on using England's

network in order to receive information regarding the war. Meanwhile, on the same day that

Britain declared war, President Wilson declared a state of neutrality: "no U.S. citizen or

company could trade articles of war with, provide armed aid to a belligerent party…" (Cregan 8).

With trouble identifying which messages belongs to who and losing information because of

trafficked lines, it left the radio as the only option for a communication device in the U.S. There

was no radio commission or network established here in the U.S. By August 13, 1912, Wilson

passed the Radio Act of 1912 which allowed the government to take control of the radio as a

wartime communication tool not only with participating countries but allowed Americans to be

informed as well. It is through the Radio Act of 1912 that authorized President Wilson to

jumpstart an American radio industry.

Reference Citation

Cregan, Elizabeth. "The Impact of WWI on the Course of American Radio History."

    Academia.edu, 2011,

    www.academia.edu/937415/The_Impact_of_WWI_on_the_Course_of_American_Radio

    _History. Accessed March 28, 2019.

Appendix C

The Special Interest in the Radio Act of 1927

Sharon Morrison's article, "Radio Act of 1927", expands upon defining what is considered special interest according to the American government. As the successor to the Radio Act of 1912, President Coolidge's passing of the Radio Act of 1927 not only allowed the licensing of radio stations as a way to reduce radio interferences by competitive stations, but this created the Federal Radio Commission (FRC) which was later removed by the FCC in 1934. Several issues were brought upon the passing of this particular act. The larger issue at hand was the use of the radio being protected and an expression of the First Amendment followed by equal transmission, individual licensing, licensing based on the public interest, and broadcaster responsibilities for operations meeting public interests. Although the FRC did not mention any type of commercial influences being implemented in the radio, commercial interests followed. Fearing that the government's power over licensing may convert into a censorship rampage, Section 29 of the act would prohibit the power to censor the content of programs for it was sought to not violate the First Amendment.

Reference Citation

Morrison, Sharon L. "Radio Act of 1927." *The First Amendment Encyclopedia,*

www.mtsu.edu/first-amendment/article/1091/radio-act-of-1927.

Appendix D

The FCC Definition of Non-Profit Educational Television

As claimed by the *FCC Programming Requirements* header, it states, "TV stations must show that the licenses will be used 'primarily to serve the educational needs of the community…' include[ing] transmitting 'educational, cultural, and entertainment programs'" (314). Regarding to educational programming, the FCC left it loosely defined and only upholding for non-profit initiatives outside and during airing. It was later determined that there is potential in commercializing non-profit based television. Hence, small TV stations in the early 1950's was the first to prove its potential and benefits regarding this circumstance.

Reference Citation

"Nonprofit Media." Federal Communication Commission. Accessed March 8, 2019.

Appendix E

What are NCTM Affiliates?

Under the "Affiliates" hyperlink, the NCTM website states that "[a]ffiliates are independent organizations that play a specialized role at the grassroots level and have goals that align with the mission of the National Council of Teachers of Mathematics (NCTM). Most affiliates are organized by geographic region, although some Affiliates-at-Large are organized around a specific topic in mathematics education" (NCTM). This information was last checked and use April 3, 2019.

Reference Citation

"Join an NCTM Affiliate." *National Council of Teachers of Mathematics*,

www.nctm.org/Affiliates/Directory/. Accessed April 3, 2019.

Appendix F

A Short Summary of Charette's Argument

Robert Charette's article, "The STEM Crisis Is a Myth", Charette argues that the STEM anxiety is based on a business tactic to generate more STEM professionals as a display of national abundance and innovation. Although he is not discrediting the STEM field, he feels that there is a shortage of STEM knowledge. Charette proposes for more literacy of sciences, technology, and arts and "create more STEM jobs that are enduring and satisfying…" (Charette).

Reference Citation

Charette, Robert N. "The STEM Crisis Is a Myth." *IEEE Spectrum: Technology, Engineering, and Science News*, 30 Aug. 2013, 14 GMT, spectrum.ieee.org/at-work/education/the-stem-crisis-is-a-myth. Accessed April 3, 2019.

Appendix G

STEM vs. Humanities According to *Tell Me More*

NPR's "Is The STEM Education Crisis A Myth?" article is a transcript of the *Tell Me More* podcast hosted by Michael Martin. Martin interviews Anthony Carnevale, a research professor and director of Georgetown University Center on Education and the Workforce, to discuss the STEM crisis. Carnevale settles that STEM education cost more for universities and the government. He advocates for a proportional, institutional, and governmental aid to students who do plan to study STEM. However, in terms of the debate between STEM versus Humanities disciplines, he inserts that the issue is that there is not a well-rounded integration of disciplines which narrows specific skill sets and makes the economy competitive. Carnevale feels that all "ought to be responsible for their own future, and their own success…[T]hat success depends almost entirely on how well they do in school…" (NPR).

Reference Citation

"Is The STEM Education Crisis A Myth?" *NPR*, NPR, 25 Nov. 2013, 11:36 AM,

www.npr.org/templates/story/story.php?storyId=247166532&utm_source=npr_newslette

r&utm_medium=email&utm_content=20190308&utm_campaign=npr_email_a_friend&

utm_term=storyshare. Accessed April 3, 2019.

Appendix H

Is Modeling another Country's STEM Education Effective?

Fareed Zakaria's article, "Why America's Obsession with STEM Education Is Dangerous",

argues that America is trying to model itself to Eastern and Asian educational systems to

compete with STEM fluency in American students. Zakaria warns that this modeling proves

ineffective. She proposes that critical thinking and creativity is where the success of STEM

moguls come from and their origins from Humanities disciplines.

Reference Citation

Zakaria, Fareed. "Why America's Obsession with STEM Education Is Dangerous." *The*

Washington Post, WP Company, 26 Mar. 2015,

www.washingtonpost.com/opinions/why-stem-wont-make-us-

successful/2015/03/26/5f4604f2-d2a5-11e4-ab77-

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Assessing the Brand Image of Public Television in a Multichannel Environment."

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