

Bhavana Veeravalli

Maria Savasta-Kennedy

North Carolina Bar Association

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### Plastics: The Modern Menace

Discussions of environmental sustainability as a teenager are tricky. Whether talking about air pollution or groundwater contamination, it is easy to be dismissed by others as an idealist. So it's not surprising when I get the same response when discussing the plastic problem. However, accompanied with the usual eyeroll of annoyance, I notice a key phrase that always pops up in discussions: "I know plastics are bad, but it's convenient."

And this is the problem: convenience. Plastic's reach is expansive. It is not just used to make tupperware for leftovers. It is in everything. Since plastics are easy to produce, it is used to make mattresses, car seats, appliances, kid's toys. Fast food chains and restaurants have their customized plastic bags with their logos to publicize their corporation. While some businesses try to reduce their plastic footprint by using recycled plastics, it isn't a smart economic choice. In 2016, Planet Money cofounder Stacey Vanek Smith interviewed recycling specialist Tom Outerbridge. He explained that petroleum prices in the United States have declined as the nation turned to different mining methods to decrease dependence on OPEC countries. A barrel that used to cost a manufacturer \$100 dropped to \$30, and he explained that the problem with cheap petroleum is that "Plastic is made from oil, so when oil gets cheap, it gets really cheap to make fresh plastic" (Outerbridge). Outerbridge expresses how this presents a problem for the for-profit recycling industry. Americans do not know that although the green recycling bins they use to

throw their used paper and plastic bottles are issued by government municipalities, it is individual corporations that process these materials to be processed and sold on the market. Plastics are made from Polyethylene terephthalate (PET), made primarily with petroleum. When oil prices drop, creating more PET plastics costs less than the expenses of collecting, processing, and remanufacturing older plastics. Furthermore, with cheaper new plastics being made with more efficient technology, the recycling industry must spend more money sorting what is and is not recyclable in hopes that businesses will buy their recycled premium plastic. It is a futile process because in the end, businesses boil their decision down to what is the easiest, and thus new plastics continue to reign.

Plastic consumption presents challenges because it is an ingrained part of people's lives. Unlike the fight to address climate change, where some individuals question the credibility of scientists' research because its effects are not immediate, plastic has clear consequences. According to the Pew Research Center, thirteen metric tons of plastic waste are produced annually, and most of this ends up starving, choking, and drowning aquatic species because the plastic waste entangles their bodies (Reddy). The rate of decomposition of plastics also negatively impacts people's health. Often called "nurdles," bits of plastic litter can be found on shores of rivers and beaches all over the world carrying harmful pathogens. Research from the University of Stirling in Scotland found that 45% of nurdles collected from five beaches in the European Union, all only the size of a lentil, were contaminated with E coli, and 90% tested positive for Vibrio. Both of these bacterias are painful stomach viruses known to be most fatal if exposed toward young children (McVeigh). As a result, plastics have assumed a new skill in their environmentally destructive resume: carriers of disease.

Knowing the degree in which plastic has infiltrated the economy and its effects on the environment and human health, it is logical to assume that governments need to take action. The recycling industry on its own does not stand a chance in addressing plastic waste, so a stronger centralized entity can help facilitate the urgency of the matter with the force of law. However the degree of action, if any, depends on where one lives. In the United States there is a wide variety of laws and bans due to the federalized nature of the states. California has been labeled a trailblazer for plastic justice, but in Tennessee, a 2019 House Bill “Prohibits local governments from regulating in various ways auxiliary containers,” which includes plastic bags (Schultz). Essentially, the state passed a ban on banning plastics. The disparity between California law and Tennessee law on plastic regulation serves to show the varying degrees of urgency of the problem. In North Carolina’s case, the state falls in between the two extremes. In 2010, the North Carolina General Assembly passed SB 1018, a bill supposedly meant to regulate plastic bag use in North Carolina. However, the bill only applied “in a county which includes a barrier island or barrier peninsula,” meaning the Outer Banks area. The bill did two things: ban retailers from supplying plastic bags unless they were reusable and require signage from county retailers in the barrier peninsulas specifically saying they discourage “the use of single-use plastic and paper bags [in order] to protect our environment from excess litter and greenhouse gases,” but 100% recyclable paper bags would be provided instead if needed (North Carolina State, Legislature). Although good intentioned, the bill met heavy opposition as retailers had to take on the personal responsibility of providing 100% reusable plastic bags with no government funding. Additionally, the bill was confined to a single area, rather than the entire state, making it ineffective in curbing plastics since the rest of the state still produced the same amount. The

intention of the bill was to reduce plastics that end up in North Carolina's coast, but instead, it placed an unfair financial burden on a single area of the state. After boycotts and lax enforcement of the bill, it was repealed in 2017. The nature of plastic regulations in the US are eclectic, and without federal action, it seems like there is no way to gain traction for the issue.

Despite the varying degrees of plastic regulations across the United States, it has not stopped individual organizations from taking on the daunting task of disentangling citizen's reliance on plastic. Cal Cunningham, a Democratic politician and former state senator, helped found the Waste Zero company chapter in Raleigh, North Carolina. This company, founded in 1991, aims to primarily reduce waste through two methods: Pay-As-You-Throw (PAYT) and Enviro-Bag programs. The company identified that citizens do not think about the cost of their waste because cities and towns pay a flat disposal fee to trash collecting services for trash and plastic recycling. Instead, Waste Zero works with local municipalities to "reduce or eliminate flat fees and replace them with variable pricing" so that those who "throw away more pay more, while people who throw away less pay less" ("Pay-As-You-Throw"). This creates a mutually beneficial monetary relationship as the local government will not have to spend more money than they need on disposal services, and citizens are more inclined to generate less waste to save money. The program has been working: nearly \$140 million dollars is saved each year in the Raleigh area and is present in states all around America. The Environmental Protection Agency reports that in the first year of adopting a PAYT program, Gainesville, Florida decreased its waste by 18%. Similar progress has been reported in Virginia, Rhode Island, and New Hampshire. Likewise, the Enviro-Bag initiative works to remove hard-to-recyclable or non-recyclable plastics from the waste stream. The program is citizen based. Residents that live

in participating municipalities receive a specific Enviro-Bag in order to collect hard to recycle plastics like styrofoam, packaging from delis, etc. Once the bag is full, residents place their Enviro-Bag with their recycling pickup, where it is taken to a processing facility to be reused in building materials, converted to liquid oil or other innovative solutions (“Enviro-Bag”). These programs are only a couple of many grassroots initiatives emerging to fight the plastic waste stream, but these programs’ positive impacts are limited in scope. Even though the Waste Zero chapter that makes PAYT and Enviro-Bag possible is making great headway in Raleigh, it is not widespread throughout the state—the same problem seen with the SB 1018 bill in 2010.

The challenge of integrating programs throughout a nation is not a new one. Fortunately, case studies like that of Thailand’s efforts to popularize safe sex education can serve as a model. The HIV and AIDS epidemic gained notoriety in the 1990s for its decimation of the Thai population, with nearly 400,000 people infected with HIV by 1992 (Shenon). Seeing the health crisis’ detrimental impacts on the people and the severe stigma around those that were carriers of the disease, Mechai Viravaidya, then chairman of Thailand's Population and Community Development Association, created a massive governmental effort to normalize safe sex in Thai society. The key was ensuring everyone was educated on safe-sex and contraception. The government allocated money for departments working to prevent HIV and AIDS, introduced education on the subject that continued from primary school until college, required businesses to hold frequent seminars with their employees, created family planning initiatives in rural communities, and “broadcast half a minute of AIDS education during every hour” on Government stations (Viravaidya). In essence, the saturation of sex education in Thai society

ensured no citizen missed the message. By 2004, the HIV infection rate was down 90% and was estimated to have saved 7.7 million lives (“Mechai Viravaidya Foundation”).

Although Thailand’s massive efforts to curb the spread of HIV and AIDS cannot be applied directly to the United States, the level of involvement and relationship with education can be used as a model to solve the plastic problem. States can only control matters within their boundaries, so it is up to North Carolina to take the similar initiative as Thailand to make plastic regulation a staple issue part of citizen's life. The previously mentioned initiatives demonstrate that North Carolina is not blind to the issue of plastic, but the limited outreach of programs are working against progress. I propose education systems from preschool to high school integrate sustainability programs in the curriculum so that being a sustainable citizen is not a side note, and creative solutions are fostered. This can be done with incubation learning where students are taught to think creatively when addressing a problem. According to the stage theory of creativity, there are four stages to the creative process: preparation, where the problem is identified, incubation, where the problem is set aside for a bit so an individual can learn about the issue from various standpoints, illumination, where a solution is realized, and verification, where the solution is tried and tested (Hines et al. 36). The stage of incubation is integral in plastic education because it supplies students with the knowledge needed to form an encompassing solution once they understand the subject. The incubation model of learning has three phases: heightening anticipations, which arouses students’ curiosity, deepening expectations, which sets precedents on what students can expect to learn, and keeping it going, where students apply what they have learned beyond their classroom (Hines et. al 39). This model can take many forms in schools. For instance, after identifying the problem of plastics in

phase one, phase two of deepening connections can have students researching a specific plastic each week and tasked to understand how it is made, where it is used, and how it affects communities in different sectors of their local economy. In phase three, the students can work in groups to identify how their schools use the plastics they researched and come up with a proposal outlining how they could reduce the presence of those plastics. Taking initiative in small parts like this, in classrooms and individual businesses, can create a multifaceted solution to the large plastic problem.

Every individual in North Carolina is exposed to the education system whether they are current students, past students, parents, or educators. This is the largest demographic that can be accessed to create solutions for this plastic problem. North Carolina has the power to be the vehicle of change. All it has to do now is equip the people with knowledge.

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