From the faculty adviser-

Welcome to the third volume of the Vanguard, an innovative, interdisciplinary journal for undergraduate research, produced entirely by a student editorial board. In these pages you will find the fruits of many hours of labor as the authors honed the methods of inquiry and creativity for their disciplines. Students may pause to reflect on their own pursuits, appreciate the investment of mind and time by these authors, and take away a bit of inspiration. And if so, the Vanguard staff would consider its mission as met.

To truly appreciate the interdisciplinary nature of the Vanguard, one might observe the editorial staff at work, as is my privilege. They each bring their own sense of what constitutes quality scholarly and creative work in their discipline, and draw upon that knowledge to set a high standard for the Vanguard. They also bring other talents that contribute to real interdisciplinary collaboration—leadership, intellectual curiosity, technical expertise, and pursuit of excellence in all they do.

Senior members of the editorial board, many of whom have served since the journal’s inception, deserve our thanks and admiration. Cami Christopulos and Laurel McKenzie, our Co-Editors in Chief, have provided strong leadership for a talented staff including Taylor Kloha, Ben Massat, and Richard Stauffer. We thank these seniors for establishing a strong foundation for the next editorial staff.

Enjoy your reading of this year’s Vanguard.

Dennis Munk

Faculty Adviser to the Vanguard

Associate Provost for Faculty Development & Research

Professor of Education
From the Co-Editor in Chief of Natural Sciences and Humanities -

Three years ago, a handful of sophomores, juniors, and seniors came together to create what might be the first of its kind: an interdisciplinary undergraduate research journal, completely written, edited, and published by students. Now that the last of those founders are preparing to graduate in a few weeks, the Vanguard will move on into a new stage of its development, continuing to add to Carthage’s exemplary research community. While it pains me to leave Carthage and this group with which I have such an integral connection, I am incredibly proud of the legacy we have created; I look forward to see where our new editors, reviewers, and researchers will take this experiment in the future.

The Carthage Vanguard seeks to promote and encourage student research. Its devotion to all disciplines represented on campus speaks to the diversity of our student body and the educations available to us. In part, the Vanguard strives to make connections between disciplines and departments; by associating the fine arts with the natural sciences, the professional studies with the humanities, we hope to inspire new ways of thinking, learning, and discovering. In addition to our interdisciplinary approach, we have always hoped to augment the already exemplary tradition of research here at Carthage. From independent studies to summer research experiences to senior theses, the work being produced by students is admirable in both quantity and quality, and the greatest shame is that we are not better able to share with our peers the subjects we find so fascinating. Here, the Vanguard hopes to make a difference, by soliciting and publishing this kind of student-driven work in a student-drive environment. Our reach and scope changed over the few volumes that the Vanguard produced, but the passion and diligence devoted to the research continues on. I expect the publication will adapt and change throughout the years, but I truly hope it maintains its student-oriented values and beliefs.

Of course, every student group needs a mentor. To that end, now is the time to express a fervent gratitude to Dennis Munk, Associate Provost for Faculty Development and Research, professor of education, and stalwart advisor to the Vanguard team. His commitment to our cause was evident since the first day, and his gracious decision to become our advisor at the end of last year proves to be a lucky break for us. Without his calm and collected support as a faculty member, the students of the Vanguard would have seriously questioned their sanity and the value of this publication.

Finally, the graduating members of the Vanguard must express their thanks for those young and determined enough to take on this challenge in the years to come. And to all of our reviewers, editors, and authors who worked exceptionally hard this past year, volunteering many lunch hours, afternoons, and late nights to make sure the Vanguard published a third volume, thank you. This is truly a student-operated organization to be proud of, and you are those students who made it possible.

Thank you once again for your commitment to research and learning, and please enjoy the third volume of the Carthage Vanguard.

Laurel McKenzie
Co-Editor in Chief
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A Culture of Consumption: How Quack Medicine Dominated Nineteenth-Century American Advertising

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By: Laurel McKenzie

Abstract

Newspapers from local and regional papers of nineteenth-century America were often statted by advertisements for quack doctors and the wares they peddled, known as snake oils or patent medicines. Despite bizarre treatments, ridiculous promises, and grave medical consequences, these advertisements and the suspect goods and services they promoted were pervasive fixtures of American culture well into the twentieth century. This project focuses on primary sources from the late nineteenth century in order to understand what cultural, economic, and technological factors contributed to the rapid expansion of the quack medicine industry during the last half of the nineteenth century. A secondary focus of this project examines how the technology and culture of the era hindered the response of licensed physicians in their attempts to shut down the quack medicine industry. Overall, this project contributes to the historiographical study of nineteenth-century American medicine and advertising by identifying the connections between consumer culture, public health, and new information technology.

Key words

Nineteenth-century America, telegraph, quackery, newspapers, advertising

AUTHOR NOTE: This submission is an excerpted section from the complete essay of the same title. For the sections on American culture and health, as well as how licensed physicians responded to quack medicine, email

In 1906, Samuel Hopkins Adams, a reporter for Collier’s Weekly, published The Great American Fraud: The Patent Medicine Evil. While his book would eventually help bring about public health reform at the start of the twentieth century, the collection of articles it contained raged against societal scourges that had simmered unchecked since colonial days: patent medicines, commonly referred to as snake oil cures, and the quacks who peddled them. These medicines were unproven and unreliable, and, often a toxic mix of opium, alcohol, metals, and cocaine, they typically did more harm than good. The path to eradicating these false miracle cures and fabricated elixirs was hardly a straightforward one, and Adams’ detailed descriptions of how the patent medicine industry worked its way into the press, the medical profession, and the culture mindset showed how deeply entwined quack medicine was in domestic American life. The people who consulted quacks for medical help not only bought, ingested, and often died from patent medicines, they demanded them. When Chicago’s Economical Drug Company Store posted a sign in their window reading, “What is ANY OLD PATENT MEDICINE Worth?” the company’s intention was to boycott the patent medicine industry that had upset the natural order of physicians and pharmacists, while saving the public from often toxic and addictive medicines. The sign continued, responding to the question it had posed: “Our honest answer must be that [patent medicine] is WORTHLESS… When sick, consult a good physician. It is the only proper course.” This was sound advice, and the store was lauded in 1913 by the Medical Women’s Club of Chicago, as the “ONE ethical drug store within the ‘loop district’ of Chicago.”

In spite of support from the medical field, however, the initial push to rid druggists’ shelves of patent medicines failed spectacularly, and the company was soon making almost a third of their profits from patent medicine sales. While this store attempted to place the wellbeing of its customers above lucrative products, the demand by the public for a return of patent medicines overpowered their good intentions. The customers’ demand for patent medicines demonstrated that the patent medicine industry was not passively buoyed by abused citizens; instead, it attained a new level of life by the end of the nineteenth century, when society—newspapers, average citizens, and even doctors, in their own way—fought the quacks’ battles for them. Growing from small-scale advertisements to national campaigns and distribution, the patent medicine industry mobilized to become a self-perpetuating machine, the center of a culture of consumption that demanded to be poisoned.

This paper will discuss the impact of culture and technology on the growth of the quack medicine trade through the psychology of the consumers in the nineteenth century, examining which implicit cultural attitudes provided the ideal grounds for a patent medicine industry. Then the paper will consider the advent of new communication technology, focusing largely on the telegraph and how the device’s spread across the Midwest inadvertently
expanded the reach of quack medicine advertisers. After explaining the numerous tactics advertisers used to gain customers, this paper will conclude with an analysis of how licensed physicians’ attempts to save the public from quacks ultimately backfired and instead contributed to the continued success of the patent medicine industry. The scope and eminence of late nineteenth-century quackery and patent medicines were fostered by a fortuitous combination of American culture, new technology and advertising tactics, and a turgid response from licensed physicians.

Marketing to the Masses

The telegraph and the subsequent evolution of information sharing would indeed boost the quack medicine industry to new heights, but an understanding of the quack’s primary tool, the newspaper advertisement, will be outlined here before addressing the diverse and effective ways a quack could use it to market medicines. Advertisements of all kinds underwent a massive change in the late nineteenth century that paralleled the growth of newspapers in general. For one, the ads themselves became larger, often dominating two or three full columns in order to pack in all the necessary information. The information itself often followed a template that would first introduce a specific medicine as a brand, followed by a laundry list of symptoms and promises to heal the sickened. As more print space became available, advertisements also featured testimony that quoted the successful treatment of “Mr. A, or Mrs. B, or C. or D., in New York, Baltimore, or New Orleans,” which King complained excused the advertisements of all responsibility, since very rarely would a potential customer contact purportedly cured testifiers to verify their claims. Testimonies would also regularly feature professionals: doctors, politicians, religious leaders to further back the ad’s claims. The final and most important feature of the advertisement was directions for how the reader could acquire the treatment. As the following paragraphs discuss, this too shifted because of new technology, as local drug stores were cut out of the process in order to better connect the distant patent medicine maker with customers. These elements of brand, symptoms, promises, testimonies, and acquisition were all key aspects of the patent medicine advertisements, and quacks were able to effectively use them to their advantage, thanks to some fortuitous technological advancements.

Like any new invention, the telegraph was considered to be the crown jewel of an idyllic civilization, but its long-term implementation created significant financial challenges for local markets. At its outset in 1844, the technology’s ability to negate the correlation between time and distance was hailed as a great equalizer in economic matters. Promoters of the telegraph felt that with the length of time to communicate national or even international information suddenly standardized, small businesses would be on the same footing as their monopolistic competitors. The telegraph was indeed successful in changing the functions of the economy and communication systems of the nation. After all, “it saved time, cut down the need for large inventories… and allowed for elimination of middlemen and wholesalers,” Richard du Boff explained in his article, “The Telegraph in Nineteenth Century America: Technology and Monopoly.” This, in addition to the ease of information collection and distribution, seemed to prime the United States for economic decentralization in favor of small businesses everywhere. However, while these communication and economic advantages were realized soon after the introduction of the telegraph, it became clear not much later that the benefits of this technological evolution only managed to reinforce inequalities present in the pre-telegraph economy. Although the telegraph made information a standardized asset, the use of the wires was not cheap. Already profitable business simply grew bigger, fed by the broadening market that had become available to them. Meanwhile, smaller companies spread out across the western half of the nation remained dependent upon the east-to-west flow of goods and information. The result, du Boff summarizes, was that these comparatively larger industries “took particularly vigorous action to penetrate local markets, hitherto the preserve of the small proprietorship and the hand trade.” Despite being hailed as an economic equalizer, the telegraph in fact widened the gap between big and small businesses, disrupting the regional isolation that had preserved local markets up to that point.

Newspapers were particularly impacted by the introduction of the telegraph, as information became a commodity that everyone wanted but few could afford. The explosion of information sharing certainly prompted the rise in the weekly and daily newspapers, from two hundred in 1800 to four thousand by 1860. Further regions of the nation had access to news that was more immediate and complete, but with the surge of technology came a surge of monopoly. The Associated Press, founded in 1846 as a cost-sharing method for five New York City papers, quickly began to centralize the information industry. Dominating information distribution and partnering with the eventual telegraph monopoly Western Union, AP represented a significant threat to local and even regional papers of the contemporary west. The phenomenon of immediate dispatches on stocks and in-
The distinction between finances and media ethics, though hardly clear to begin with, became altogether lost among ad contracts, editorials, and political battles. While in the early nineteenth century newspaper commentaries on quack medicine were unconvincing and moderated, Samuel Hopkins Adams relates examples “from some years ago” of newspapers unapologetically, and in some cases willfully, throwing their weight behind the quack industry. One of these was the anecdote of the Illinois legislator, who attempted to fine a prominent patent medicine producer, F. J. Cheney, for failing to disclose his medicine’s ingredients. The legislator, whose name Adams failed to mention, was booted from office not because Cheney took any express action against him but because a number of local and regional papers published editorials calling for the legislators’ expulsion. This was thanks to coercion from Cheney, who explained to the forty-odd papers who printed his advertisements that “if this [formula] law passes, you and I must stop doing business.” As Adams quotes Cheney, “the next week every one of them had an article [condemning the legislator] and Mr. Man had to go.” The practice of leveraging advertising money for unwavering media support became widespread, as Adams detailed. In many cases, newspapers were played off each other the editor who could get the most prominent politician to fabricate testimony in support of a patent medicine would be rewarded with the contract to advertise it.

Perhaps the most concerning anecdote of the patent medicine industry’s strengthening grip on information systems occurred in Wisconsin, which Adams related in great detail: The state legislation’s proposed formula bill, which would require medicine producers to reveal what they were hailing as cures, clearly threatened to undermine the validity of many patent medicines’ claims. Completely unspurred by the medicine manufacturers, the newspapers of larger cities “took it upon themselves to drum up the smaller country papers and get them to write editorials opposed to the formula bill.” At this point, the patent medicine producers reached the ultimate goal: without saying a word, they could trust newspapers to defend the industry, all while maintaining the essential advertiser income. Technology had irreversibly changed the way newspapers distributed information, through both their own articles and through the advertisements they chose to print. While quacks did not necessarily utilize the telegraph itself to promote their wares, the massive impact telegraphy had on all communication forms resulted in the growth of a medium that was incredibly useful for patent medicine advertising. In this way, the new technology helped advertisers develop effective marketing approaches for quacks to successfully exploit in
their promotions.

Prior to the establishment of the telegraph, health care providers relied on personalized advertisements written specifically for the towns they were serving. The health care available in 1845 to the residents of Elgin was a handful of physicians, two of whom practiced together locally. The advertisements only published their names, “Torrey & Daggett,” and where they could be found in town. Two other physicians appear to have been traveling doctors, an early iteration of the quack, who “would respectfully announce to the inhabitants of Elgin and vicinity” that they were in the area for the next three to four weeks. One of these, “E. Sanford, physician and surgeon” commented briefly on his training in “New York Hospital and Eye Infirmary,”” while his colleague “Dr. L. A. Kimball” included an encouraging poem to inspire confidence in clients: “He uses such balms as have no strife / With nature, or the laws of life; / His hands / With blood he never stains, / Nor poisons men to ease their pains.” This was conceivably an early example of quackery, as these men were not locals and felt the need to more aggressively advertise their services. However, the lack of testimonies and the promotion of the doctor himself, not a brand of medicine, exemplified an earlier, more localized form of quack medicine. These physicians were advertising their services in a consumer culture yet to be changed by the coming evolution of information sharing; in less than five years such personal ads would not suffice in the deluge of advertisements.

Media saturation, not just a matter of advertisements on pages but of newspapers in towns and products on the market, was a formative consequence of the new information technology. The ability to bombard the consumer with slogans, logos, images and testimonies was the ideal tool for advertisers, not simply to move product but as a well to benefit from and ultimately define the American consumer culture. In Fables of Abundance, Jackson Lears examined the transformation advertising underwent due to the “the spread of market exchange beyond traditional boundaries of time and place.” To Lears, an advertisement was much more than an attempt to sell a product; it represented the artist’s and the audience’s sub-conscious cultural ideals. Without diving into the psyche of the average American reader, it can be safely surmised that newspapers promoted an expanding consumer culture that had greater reaching effects than the decision to buy a liniment. This media saturation showed how increasingly difficult it was to escape these promoted ideas, in turn contributing to the next great coup for advertisers on the wires: the national market and the ideal consumers who shopped there.

The shift from local middlemen to direct producer-consumer exchanges fortified the patent medicine business and paved the way for a homogenized market. Lears calls the ads for patent medicines the “earliest and most successful national advertisers,” an accomplishment that would become a staple in mass marketing. Initially, patent medicines were, like all other goods and services, promoted locally through advertisements in newspapers unique to the county or even the town. For example, in 1850 an advertisement directed those suffering from “disorders of the kidneys,” to purchase “Dr. Meyer’s extract of sarsaparilla, wild cherry, and dandelion,” which was “for sale at the Elgin Drug Store by A. D. Balcombe, Authorized Agent.” The term “Authorized Agent” appears quite frequently throughout advertisements of the 1850s and ’60s, and while it might sound suspicious, it rarely pinpointed the quack in the transaction. Working through a specific local druggist or apothecary was necessary in order to bridge the distance between the consumer and the manufacturer, which was often in New York City. The locally residing “agent,” A. D. Balcombe, was not a quack, though he peddled patent medicine. He was the owner of Elgin’s local drug store, and he stocked a number of items, including several apparently competing sarsaparilla extracts, school books, and stationary, all of which were advertised in the same column and represented a very localized approach to medicine promotion and distribution. This use of a familiar face to sell patent medicines changed when national advertising became popular. Only a year later, in 1851, advertisements were already losing their local charm. Comstock and Company, an enormous patent medicine producer in New York, bypassed the middleman. Instead of going through specific drug stores in Midwestern towns, such as Kenosha, the company instead sent a multi-column advertisement directly to the local Daily Ledger that began by proclaiming “the following indispensable family remedies may be found at the village drug stores and soon at every county store in the state… if the merchant nearest you has them not, urge him to procure them the next time he visits New York, or write for them.” Comstock had no qualms about reaching every store in a state a thousand miles away. Because of the advertisements’ lack of detail, this kind of ad was copy that could be printed by any newspaper in any state. No longer written for or by specific druggists, patent medicine makers produced one advertisement and sent it in a dozen directions on the wires. In his article, Richard Du Boff corroborated this practice as a “one-way, routinized” flow of information, which not only simplified the process but was far more cost-effective for patent medicine producers. Newspapers proved to be ideal tools for spreading advertisements and even editorials and articles supportive of patent medicines and quacks. Daniel King
professed his own frustration with the press not just because of its corruption and bias but because of its apparent laziness. In order for newspapers to save on time and effort, “the publisher of some paper is paid for inserting an editorial article [and] the publishers of other papers, being paid for it, copy the article into their papers. And by these means such falsehoods are circulated is disguise, all over the country.” An acknowledgement of the homogenization of consumer culture and the consumers themselves, nonspecific advertisements and their many applications were pervasive. The sheer size of newly realized markets allowed patent medicine advertisers to generalize not just geographically but demographically as well. The dramatic increase in access to the population granted to advertisers simply made it statistically easier to reach specific groups, and often the ideal customer, to market their products and services.

Women proved to be ideal target audiences for quacks and patent medicine makers. The blatant sexism saturating the advertising pages was painfully clear, and today it does not take an expert in gender studies to discern the socialized prejudice evident in ads for flowery sewing machine and serial literary magazines that accommodately printed “articles for women.” However, as far as the patent medicine advertising industry was concerned, women represented a significant proportion of the population that could easily be branded in and targeted for advertisements. As Jane Marcellus wrote in her article on patent medicine marketing’s use of stereotypes, “nineteenth-century women were deemed increasingly superfluous” by a society that had industrialized more and more of their domestic work. Greater and greater emphasis was placed on simple care-taking, which in turn presented the perfect opportunity to sell some disguised alcohol—if not to women themselves, then to their infants and children. An advertisement in the Elgin Advocate implores, “Mothers! Mothers!! Mothers!!! Don’t fail to procure MRS. WINSLOW’S SOOTHING SYRUP FOR CHILDREN TEETHING.” As mothers, wives, and sisters, women often took the role of healing their families, and patent medicine makers understood how to use that responsibility to turn a profit.

Beyond the real concerns women had for their families, advertisers were quick to imply illnesses in women themselves by listing vague symptoms and everyday discomforts as indications of illness specific to the female condition; such a tactic could exponentially broaden the demand for patent medicines from the limited pool of those who knew they were sick to those who could be convinced that they were sick. In the same issue of the Elgin Advocate mentioned above, a treatment of “Vinegar Bitters” is advertised to help the incredibly broad, nonspecific affliction called “Female Complaints.” The ad did not emphasize symptoms associated with such “female complaints,” but rather enforced the idea that simply being a woman, “young or old, married or single, at the dawn of womanhood or the turns of life,” was cause for concern. By grouping the indistinct troubles of “womanhood” with a number of specific ailments, including “indigestion,” “rheumatism,” and “skin diseases,” the advertisers of Vinegar Bitters highlighted, encouraged, and took advantage of societal standards that women were weak and sickly.

This trend was not lost on Adams, who offered several examples of how quacks pointedly acknowledged this imbalance and subsequent opportunity. He pulled an example of this from the article, “Why Patent Medicines are Dangerous,” from a 1905 issue of Ladies’ Home Journal by Edward Bok. According to Bok, an apparently prominent quack proclaimed that the “men are ‘on’ to the game… it is the women we are after.” Making no attempt to disguise his meaning, the anonymous quack was confident in the success of the patent medicine industry, so long as “we can make [women] believe that they are sick… We can make them feel more female troubles in a year than they would really have if they lived to be a hundred.” A trend that became more present in the 1880s, it was nonetheless an effective, if not deplorable, strategy. In an 1885 issue of the Alton Telegraph, “Merrill’s Female Tonic” was sold to cure “complaints which afflict nearly every woman in all classes of society.” The advertisement associated “uterine function” with virtually every ailment a woman could suffer, and according to the advertisement’s text, the tonic, of undisclosed ingredients, was “pleasant to the taste and may be taken in all conditions of the system with perfect safety.” The advertisement concluded that “brief instructions for treatment of all ordinary diseases [can be] sent free to any address.” Producers of the “Female Tonic” created a market for cures where there was no symptomatic disease; simultaneously, they cleverly undermined the licensed physician by encouraging long distance diagnoses over mail. By promoting cures for nonexistent issues and identifying womanhood itself as an ill in need of treatment, quacks could easily capitalize on the stereotypes and cultural sexism of the nineteenth century. Such tactics were not limited to women, however, and by writing advertising campaigns for the chronic or terminal illnesses, other population groups proved to be a target for the patent medicine industry.

In tandem with women, “incurable patients” were an obvious boon to quacks and patent medicine producers, who went to great lengths to advertise their cures for a number of chronic or terminal illnesses in spite of
obvious contradictory facts. In addition to curing common colds, fevers, and typical gastrointestinal malfunction, advertisements would often promise relief from the nineteenth century’s most virulent and fatal epidemics. Cholera, a waterborne bacterium that causes severe diarrhea and dehydration, and consumption, an infection of the lungs and better known as tuberculosis, or TB, today, were rampant among the rapidly centralizing populations of the late nineteenth century. As today’s medical professionals can attest, these diseases remain technically incurable even with the benefit of modern medicine. Treatments for tuberculosis in particular are dependent on intense antibiotic regimens that can backfire and contribute to drug-resistance in bacteria. Given these complications even in the modern era, it is clear that selling a miracle cure for tuberculosis or cholera was simply a fraudulent strategy utilized by quacks and patent medicine producers to profit from false hope. Adams clearly summarized the medical truth that was, “thoroughly and definitely understood by all medical and scientific men… Consumption is a disease absolutely incurable by medicine.” However, as early as 1849, the Western Christian printed an advertisement featuring a modest paragraph entitled, “Consumption Cured,” thanks to Dr. Townsend’s Compound Extract of Sarsaparilla. Despite the promise and glowing testimony in support of the cure’s success, advertisers continued to use essentially that exact headline for the next several decades in order to promote their own miracle treatments. An 1854 issue of the Illinois Weekly Palladium printed two separate claims to a cure for consumption, one a “Cherry Pectoral” syrup and the other an early form of an inhaler; both of them touted a cure for tuberculosis, along with other lung afflictions.

This focus on dosing patients with medicines instead of tending to the patient’s needs is evident in John Holly Knapp’s diaries. The most vivid examples of how quack medicine attempted to treat his chronic nose sores appear in 1873 and 1878, when he consulted a “magnetic doctor,” and a “Thermo Water Cure” respectively.

The “magnetic doctor,” a quack named Chas Koch, was known for “some remarkable cures by magnetism, [and] said he could cure me in 9 days.” In what could be interpreted as an effort to avoid curing this profitable chronic illness, Koch “did nothing but put his hands on my face and the other on back of my head for half minute.” The other remedy Knapp tried, the “Thermo Water Cure,” was in fact a glorified Turkish bath in Milwaukee. The laundry list of illnesses it claimed to have cured included “disease of the Kidneys and diabetes; Diseases of the Lungs and Air Passages; the Liver, the Womb, the Heart, the Head, and the Skull.” This connected both another ineffective cure, as Knapp wrote his nose remained “w/o change” after trying it, and the widely printed promises advertised for the cure, which appeared in a number of local Wisconsin papers, such as the Janesville Gazette. Overall, the most telling example of Knapp’s experiences as an “incurable” patient was when he consulted a British physician, Dr. Crancav. The only professional who broke the pattern of confidently diagnosing and treating Knapp, Crancav informed Knapp that he had either lupus or epithelial cancer, but either way there was no cure at all, which, Knapp wrote, “makes it very sad for me.” This one example of honest doctoring was a stark contrast to the plethora of appointments and promises made to Knapp on his search for a cure, but the benefits quacks reaped from such hollow assurances were clear in Knapp’s entries: while Dr. Crancav never came up again, Knapp wrote that he paid Dr. Brooks “his bill $20,” Dr. George “$85,” and Dr. Gates “$200 for the past two years of medical services.” As Knapp and other “incures” were constant sources of income, physicians were completely comfortable with diagnosing, treating, and failing in their efforts.

The trend continued well into the 1880s, although it seemed advertisers became warier of unattainable promises to customers. Unlike its predecessors, an advert for a “Golden Medical Discovery” that “cures all humors,” cautioned its customers that the “scrofulous disease of the lungs” would certainly be cured by the advertised treatment “if taken before the last stages of the disease are reached.” This attempt to moderate the promises made to consumers, and likely relieve the advertisers of responsibility, shows a changing approach to how the public interacted with advertisers; pressure from unlucky patients might have pushed the advertisers to concede some fallibility in their products. However, this hardly excuses the fact that regardless of some liability mitigation, the patent medicine producers continued to promote their wares as miracle cures. In the same “Golden Medical Discovery” advertisement from above, the advertiser explains that “Dr. Pierce thought seriously of [the treatment] his ‘Consumption Cure,’ but abandoned that name as too limited for a medicine which… is unequalled, not only as a remedy for consumption of the lungs but for all CHRONIC DISEASES of the liver, blood, and lungs.” Whether patent medicine makers and quacks believed in their particular substances’ abilities to cure these chronic ailments is difficult to parse out. However, Adams implied that behind closed doors quacks were perfectly content with failed treatments, stating that, “incurable disease is one of the strongholds of the patent medicine business.” Adams went on to complain that, “the ideal patient, viewed in the light of profitable
business, is the victim of some slow and wasting ailment
in which recurrent hope inspires to repeated experiments
with any ‘cure’ that offers.” At the heart of curing the
incurable, it seemed, was that the inability to suppress the
disease of the day only ensured a profit for tomorrow.
The chronic and terminal illnesses of the age proved to
be ideal platforms on which advertisers could sell patent
medicines and quack services not just once per customer,
but over and over again.

Patients, regardless of gender or ailment, de-
veloped a reliance on quacks because licensed physicians
became markedly less sympathetic to their patients and
far more expensive to procure than the advertised and
branded version of health care. The “heroic” method of
treatment, a nineteenth-century approach to medicine in-
volving blood drawing and individually prescribed cock-
tails of toxins, proved to be just as mortifying to patients
as the diseases themselves. The painful plasters that John
Holly Knapp applied to his nose were one case, and an-
other example was apparent in the letters Uriah Oblinger,
a Midwestern farmer during the late nineteenth cen-
tury. Writing to his first wife, he informed her that he had
come down with “the flux,” a regional term for dysentery,
and treatment had commenced with mixed results. He re-
counted that “the doctor was called again… he gave me
two calomel powders making twelve [powders] in all and
none have worked off and I tell you I was getting pretty
sick with flux and medicines.” Eventually some turpen-
tine and castor oil appeared to “work things off,” but his
final word on the subject maintained that only when “the
medicine got out of me I began to mend.” Both Knapp’s
and Oblinger’s experiences showed how the public de-
veloped distrust in upper class professionals, which created a
gap in treatment that quacks were more than happy to fill.
With this in mind, it is understandable how advertisers
subtly undermined the practices of licensed physicians
by promoting perfect cures without hassle or discomfort,
even as licensed physicians balked at the risks of patent
medicines. However, the disagreement was not just be-
tween quacks and licensed physicians. Quacks would of-
ten play off each other to appear more relatable or trust-
worthy to the public. In an issue of the Elgin Advocate,
the quack Dr. Dumont C. Dake advertises his services as
“safe, sure, and speedy cures,” which omit known poisons
such as mercury. Another quack, William Radam, was
more than happy to turn the tables on those like Dake
“who write M.D. after his name,” skewing such amateur
professionals as clinical and untrustworthy. Curiously,
Radam goes on to directly attack “medical books which
tell [a patient] how to cure himself,” and the doctors who
publish books “ostensibly for public use, but are of no value… [leaving] the reader still at the mercy of the con-
sulting physician.” The irony was clear, as Radam shared
this information in his own medical self-help book, Mi-
crobes and the Microbe Killer. Such irony is apparent not
just for Radam, but for the patent medicine industry as
a whole. As Young explained, quacks and patent medi-
cine makers “condemned the regular doctor’s barbarous
methods, his exorbitant fees, his secret Latin prescription,
his high degree of failure. Yet [quacks] sought a sort of
respectability by pretending medical degrees they did not possess.” King identified the tension among quacks
themselves as yet another layer of their advertising tech-
niques by, “the most rascally of nostrum-makers,” who
“often talk loudly against quackery and very earnestly
cautions the public against counterfeitts.” This helped to
reconcile the positions of Dake and Radam. The two,
though they may seem at odds, are just examples of how
varied the techniques utilized by quack advertising could
be. Both were still highly aware of the complicated mis-
trust yet deference the general public felt toward studied
physicians. Quacks and the patent medicine industry were
able to capitalize on the shifting attitudes towards profes-
sionalized medical care in order to undermine physicians
and reach a larger portion of the American population.

Conclusion

The cultural perception of medicine, doctors,
and disease of the nineteenth century created a vacuum
that quacks were more than happy to fill. A growing dis-
like of physicians’ often expensive and painful methods
meant more citizens turned to quacks for cheap and mi-
raculous cures. Coupled with the aversion to doctors, the
prominence of disease and a deep-seated faith in miracles
and science all contributed to the ideal atmosphere for
the patent medicine advertisers. These advertisements
played on numerous fears and symptoms, verified or in-
vented, legitimate or rational, to convince readers of the
need for cholera drops, feminine cures, hair restorers, and
consumption syrups; the patent medicine industry was
so pervasive and convincing that when confronted with
stores and newspapers attempting to boycott the indus-
try, the citizens themselves demanded the return of the
suspect products to their shelves and papers. Americans
insisted upon the services that quacks could provide, and
in return quacks continued to feed a climate that perfect-
ed a roaring trade through newspaper advertisements.

The greatest catalyst for the successful and wide-
spread advertising campaigns, which were spearheaded
by patent medicine producers, was the telegraph. While
quacks may or may not have found the telegraph itself
expressly useful, the new technology expanded the reach
of media tenfold and spawned the creation of a popu-
lous but poor newspaper industry. The sense of wonder audiences of dailies and weeklies of the Midwest had for instant news quickly faded, and the public was soon expecting constant updates along the wires from distant urban centers. To make ends meet, newspapers took on whatever advertisement they could muster, which often left them at the mercy of their sponsors. Quacks took full advantage of the papers’ needs to maintain income, and the corruption of the press was evident in the prevalence of patent medicine advertisements and the lack of articles about such medicines’ risks. With relatively immediate access to every town and village dotting the country, quacks were able to enforce a saturation of their messages and their products.

Advertisers themselves encouraged this trend through a number of techniques and approaches. Prior to the telegraph, medical care was promoted through personalized ads that featured only the necessary information for contacting specific, local physicians or druggists. The shift in advertising and economy caused by the telegraph cut out these local middlemen in exchange for direct consumer-producer interaction over long distances. This extreme expansion of the market made it statistically viable to target sections of the population that were perceivably more vulnerable or in need of patent medicines; women and the chronically ill proved to be the perfect groups on which to focus. Mothers, fulfilling roles as housekeepers and caretakers, made excellent customers because their children were so often in need of treatment, but women themselves were also the targets of vague advertisements that listed a number of everyday symptoms as indicators of a much more serious, often “female” problem. The fabricated, imprecise ailments were marketed as a result of simply being a woman, and advertisers acknowledged this approach as one of the best ways to keep the quack industry alive. The other way, which also proved to be incredibly successful, was selling treatments to chronic sufferers. Those with chronic and often terminal illnesses, known as “incurables,” were often the most desperate for medicine, no matter how harebrained, and the patent medicine industry’s explicit failure to cure chronic and terminal diseases such as tuberculosis and cholera was precisely why it was able to sustain itself for so long. Capitalizing on the fears, stereotypes, and the limited medical knowledge of the age, advertisers for patent medicines and quacks were able to print incredibly effective ads that kept their consumers coming back for more.

Obviously threatened by the runaway success of the patent medicines and quacks, licensed physicians attempted to band together to squash the industry by differentiating themselves publicly from their adversaries; unfortunately, this meant staying out of the public eye altogether. Convinced that advertising medical practices in newspapers was the sign of a bad doctor or conniving quack, licensed physicians drew up codes that forbade public advertisements and wrote extensively on how such pandering for patients was simply the wrong approach. Reaping fewer benefits from the telegraph than the quacks, these licensed physicians limited their influence in a field which had already handicapped them. By essentially letting quacks and patent medicine makers take over the newspapers without a fight, doctors could very much influence the course of medicine in America, just not at all in the way they had hoped.

In a nineteenth-century culture steeped in individualism, disease, and print media, professional doctors were unable to fend off the popular movement of quack medicine. With convincing and inescapable ad campaigns, advertisers manipulated not only the public but the press into supporting the industry, which remained strong well into the twentieth century. The result of a fortuitous combination of American culture, new technology and advertising tactics, and turgid responses from licensed physicians, quackery and the patent medicine industry flourished in the late nineteenth century.

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Bridging the Gap for STEM Students: Increasing Retention Rates in Higher Education Institutions

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Abstract

STEM (Science, Technology, Engineering, and Mathematics) students are sought out now more than ever for the advancement of society, yet only about 40% of students in the US who enter into STEM undergraduate curricula as freshmen will actually graduate with a STEM degree. This study aimed to uncover why STEM retention rates are low. Through secondary research, the results of this study conclude the main reasons to be lack of financial assistance, inadequate preparation for college, and lack of connection to the campus in terms of mentorships and faculty encouragement for future success. By looking into existing programs that address personal, classroom, and campus-wide low student retention factors, the programs were classified into providing mentorship opportunities, developing partnerships with other academic institutions, using online-based support, and creating academic support systems. Using primary research to learn what students need for success, STEM students indicated that they take part in a variety of STEM related activities, and feel that hands-on learning experiences are the best part of the fieldwork. Such students value professors who take the time to help them, and advisors that are knowledgeable and invest time in their advisees. By taking existing program efforts and developing new strategies based on the research conducted, this study presented key ideas for an effective retention program that can be developed to increase retention rates and educate today's youth for an increasingly competitive and highly technologically based global economy.

Introduction

The lab space in a science classroom is more than just an experimental site – it is the place where education blossoms, new ideas are implemented, and students become the teachers and researchers. STEM (Science, Technology, Engineering, and Mathematics) students are sought out now more than ever for the advancement of society, as our local and global economic future is dependent on this discipline (Wilson, Iyengar, Pang, Warner, and Luces, 582; Patton). According to the U.S. President's Council of Advisors on Science and Technology, “we will need approximately one million more STEM professionals than we will produce at our current rate” (Blair; Gates and Mirkin). The importance of the STEM field is growing in the United States because it “serves as one of the primary vehicles for technological innovation, economic prosperity, national security, and advancements in public health” (Nathan, Tran, Atwood, Prevost, and Phelps 422). Unfortunately, research shows that only about 40% of students in the US who enter into STEM undergraduate curricula as freshmen will graduate with a STEM degree, while the other 60% “switch to non-STEM fields or drop out of college entirely” (Blair; Gates and Mirkin; Wilson et al. 582). These statistics are relevant to student retention rates college-wide, as “40% of students who initially enroll at a four year college will transfer to another prior to graduation” (Ackerman and Schibrowsky 309). Various reasons for low student retention exist; however, low-income at-risk students often face greater challenges, especially when paying for their STEM degree (Wilson et al. 582). Also, women are more likely to leave this field compared to men; both of these facts concerning minority groups directly affect the diversity of STEM student demographics (To Recruit and Advance 50). This statistic not only illustrates the lack of STEM professionals for the future field, but also explains the surprisingly low student retention rates.

Student retention is problematic across all fields: first year and first generation students (those for whom “neither parent has completed a four year higher education course”) are more likely to drop out when compared to second year students (O’Keefe 606). Lower student attendance means “lost revenue for the higher education institution, the subsequent misappropriation of funds from state and federal governments, the weakening of the labor market and potential exclusion of young, [and] low-skilled workers from employment” (O’Keefe 606). Given that institutions tend to focus on student recruitment rather than retention, college freshmen are not receiving effective support when transitioning into their institution, which makes them feel lonely and undervalued (Ackerman and Schibrowsky 324; Pearson 191). The goal of higher education is to broaden young adults’ knowledge and in turn assist society in improving upon current practices; this goal cannot be accomplished, however, when students are struggling academically and financially.

Thus, there is an increasing need to establish social relationships in the STEM field to facilitate better academic preparedness along with financial and social support (Noble and Henderson 79-80). Implementing more reten-
tion programs will increase new strategies and promote successful existing methodology that can be adapted based on the institution. In researching the reasons why STEM student retention rates are low and learning what students need for success, ideas for a more effective retention program can be developed to increase rates and educate today’s youth.

**Uncovering the Factors that Cause Low Student Retention**

It is imperative that college administrators and faculty members understand the underlying reasons for students to change majors or drop out of higher education. In this particular study, switching out of the STEM major will be highlighted. By analyzing the causes of low student retention and improving these factors, universities can enhance current student success in college and draw future students to their institutions.

To measure the most prominent factors that cause low student retention, primary and secondary research was conducted. A qualitative survey was administered to 47 students currently studying in the STEM field. The survey included both open and closed questions about students’ experiences in the STEM field in regards to their interest, the quality of professor instruction, and whether or not they will continue to pursue a major in STEM. Additionally, questions were also asked about the students' general college experience, specifically in regards to interactions with advisors and potential mentors. The responses to these questions are found in Appendix C; key questions are further delineated in Appendix B. These selected responses will be used to support ways in which to improve student retention in the future.

Along with the survey, secondary research was conducted and the information synthesized into three key areas that cause students to drop out of a university: personal factors, factors within the classroom, and factors within the campus setting. The charts in Appendix A will be used to evaluate whether or not current program efforts are effectively addressing the key factors that cause low student retention. Both primary and secondary data illustrate the factors that higher education institutions should consider in order to retain students, both in and out of the STEM field.

**The Evaluation of Current Programs to Engage and Retain Students Role of a Mentor and Support Team**

Adapting to a college community is a daunting task, especially when a student does not have the proper social support; as such, a mentor should provide support and encouragement during the first weeks of freshman year (Noble and Henderson 80). Studying at an American university, a biological engineering student from Ghana stated that she just “wanted encouragement…that her degree was worth all the struggle” of studying so far from her home (Redden). A lack of the familial support system can affect the success of first year students due to a new environment and social context. Despite the age, undergraduate and graduate mentorships are needed for personal and professional achievement (To Recruit and Advance). Unfortunately, a lack of programs and inadequate mentorship are the main causes for low retention rates; as Appendix C highlights in question 18, only 39 out of the 47 participants currently have a mentor. Thus, retention programs should implement mentorships and team based environments to provide students a role model for educational and personal success.

**MentorNet**

An effective mentor must communicate concisely and provide constructive feedback (Pearson 192). Those who work at MentorNet embody these attributes; as a nonprofit that “makes online connections between mentors and private companies,” the organization supplies mentors to “female and minority students in the STEM disciplines… [to] help them navigate a classroom or anticipate a workplace in which they may be the only female or foreign or minority employees” (Redden). MentorNet caters to those at-risk students who face minority and financial issues, and helps 95% of students remain in STEM majors until graduation.

MentorNet’s model is unique in that all mentoring relationships start online. Beginning with setting up an online profile, students can “contact peers and prospective employers, browse job boards, upload résumés, and trade advice in forums” (Redden). The system matches them with a mentor through an algorithm based on their profile. After the pairing, “MentorNet guides the online relationships between students and mentors with e-mail prompts” and career related talking points (Redden). The development of “web-based mentoring to increase students’ access to female science professionals” allows for these minority gender students to receive guidance even if they are “geographically dispersed” (To Recruit and Advance 58). While this form of communication allows the organization to reach more students worldwide, the lack of face-to-face interaction is a concern as the mentorship may seem less genuine: “face-to-face mentoring and advising may be preferable” (To Recruit and Advance 58). This program effectively addresses two key factors from Appendix A: 1) lack of sense of belonging and 2) inadequate mentorship/social support/role models.

**Connect2Complete**

Connect2Complete allows opportunities for mentoring relationships to develop through service opportunities. The program “provides low-income students who are in remedial classes with peer mentors…
[where] the students, mentors, and instructors participate in a service-learning project that is connected to their coursework” (Mangan). Financially at-risk students receive much needed guidance and support, as well as hands-on, experiential learning experience in giving back to their community. Hands-on learning is a key aspect of the STEM field that intrigues students (Appendix B); therefore, the service-learning project reflects the work of STEM majors and serves as inspiration for students to pursue these types of fields. Through the $3.2 million grant from the Bill & Melinda Gates Foundation as part of Connect2Complete, the Campus Compact program was developed to help strengthen students’ “career aspirations and [a] sense of connection to their instructors and their classmates”; peer mentors and faculty members also benefitted by becoming stronger leaders and being more prepared to help students succeed (Mangan). This program effectively addresses four key factors from Appendix A: 1) outside class assistance; 2) inadequate mentorship/social support/role models; 3) lack of campus connection; 4) no push for future success/profession.

**University of Arizona**

To promote relationship building among its faculty and students, the University of Arizona "created a living-learning environment for women in science, engineering, math, and technology that offers programs and services such as mentoring, tutoring, study groups, writing assistance, and social and cultural events” (To Recruit and Advance 63). Harassment is a key issue for why women leave the STEM field, and this cohesive learning environment caters to individuals of the same gender and similar majors (To Recruit and Advance 52). The University of Arizona provides women STEM majors with a physical, supportive surrounding, which includes women mentors; this shows the University’s dedication to retaining its women STEM majors for future success. This program effectively addresses three key factors from Appendix A: 1) lack of sense of belonging; 2) inadequate mentorship/social support/role models; 3) harassment.

**Louisiana State University**

Louisiana State University enhances educational experiences through partnerships and community outreach efforts; the University also strives to retain students “through the incorporation of academic support and professional development” by providing them with a mentoring support team (Wilson et al. 583). The team is developed through the Office of Strategic Initiatives (OSI) program, where each student would receive mentoring from a “faculty [member], Office of Strategic Initiatives (OSI) staff, and a cohort of students in other OSI undergraduate education programs” (Wilson et al. 583). This diverse group of individuals allows the student to receive guidance from different perspectives of the college life. In the program, “students are required to meet with OSI staff each semester” where they are “introduced to learning and study strategies regarding topics such as metacognition, time management, stress, test anxiety, and discipline-specific learning strategies” (Wilson et al. 585). These basic yet most necessary skills to survive college academia are important for students to learn in a one-on-one setting with a dedicated staff member. The OSI mentoring program is said to nurture and enhance students in an interdisciplinary, academic environment to become “Inspirational Teachers, Exemplary Mentors, and Effective Leaders” (Wilson et al. 585). Developing teams that cater to student success allows the student to feel valued, which in turn makes the student more apt to stay at the given institution. This program effectively addresses four key factors from Appendix A: 1) poor academic performance; 2) overwhelmed by curriculum/material/technology; 3) inadequate mentorship/social support/role models; 4) no push for future success/profession.

**Character Quest**

The Character Quest Leadership Training and Development program is evolving to reach all students at Carthage College. Founder and former Carthage College graduate, Dean Matthews, began Character Quest in 2007 as a program that involved outdoor experiential learning and group-based discussions to help sophomore through senior level students uncover their true leadership potential. As of Fall 2015, Matthews and members of Carthage’s Center for Student Success (CSS) developed a coaching program, where sophomore through senior level students apply to serve as a coach to incoming Carthage freshmen. The program was developed as a way to combat the College’s low student retention rates.

The CSS recruited and trained 160 upperclassmen throughout the fall semester on how to effectively work and address different personality shapes during their freshmen coaching sessions. Each coach was assigned five freshmen and conducted six coaching sessions over their first fall semester. After each coaching session, the upperclassmen filled out a form online to track the freshman’s progress in class performance and social adjustment. The CSS staff analyzed the responses, and the outcomes will be discussed at the end of the semester.

The program provides a Carthage freshman with a peer mentor and coach to aid in the college tran-
tion and give them leadership advice for the future. The one-on-one discussion meetings make the program more personalized and tailored to the freshman's needs. Though the pilot program is not yet finished, directors can already see what should be improved for the future. Many students do not return their coach's phone calls and messages when they tried to reach out to schedule a coaching session; this may be because the program was not mandatory or graded. Additionally, not all the coaches chosen for the program seem to be fully invested in their freshmen, as shown by lack of communication with their freshmen and attendance to bi-weekly training sessions with the CSS faculty. Therefore, while the program will serve as a new way for Carthage to improve its retention rates, the staff must work with the current coaches to evaluate the strengths and weakness of the program to improve for the future. This program effectively addresses two key factors from Appendix A: 1) lack of sense of belonging and 2) inadequate mentorship/social support/role models.

**University Partnerships**

When developing retention programs, it is important to collaborate with other individuals outside of the university to generate the most benefit for students. In working on developing a student retention management model, administrators should keep in mind that student retention is “everyone’s job and not a responsibility assigned to one person, office, or program” (Ackerman and Schibrowsky 319). Thus, it is beneficial for universities to partner with each other and local high schools to encourage student success.

**Santa Fe**

Santa Fe Community College is creating a local partnership with a nearby high school through their “Ticket to College” program. The President of the College, Sheila Ortego, “shows up at local high-school graduations and personally hands each graduate a letter of acceptance to the college” (Bushong). This personal interaction with the administrator appeals to students’ desires to have connected relationships with faculty at their universities. Through the College’s efforts of personal outreach with the program from 2006 to 2008, there was a 32% more of these high school students enrolling at Santa Fe (Bushong).

Many of these students are weary of college; yet Ms. Ortego says that Santa Fe “just couldn’t stand the idea of leaving a student behind” and puts in the effort to make sure students are acknowledged and cared for their continuous efforts. Santa Fe clearly cares about these high schools students: “producing the letters requires substantial cooperation between the college and high schools, but the effort helps reduce a psychological barrier potential students face” (Bushong). The partnership of the College and high school creates new opportunities for students and an easy transition into the college life. This program effectively addresses four key factors from Appendix A: 1) lack of sense of belonging; 2) lack of self-esteem/confidence; 3) inadequate mentorship/social support/role models; 4) no push for future success/profession.

**University of Texas**

As high school and college partnerships increase, more bridge programs are developed. The University of Texas at El Paso “raised graduation rates in STEM disciplines by nearly 50 percent and more than doubled the number of STEM baccalaureate degrees awarded to Hispanics” through implementing a bridge program (Gates and Mirkin). This growth made the University “the largest producer of Mexican-American STEM graduates in the country” (Gates and Mirkin). Not only did the College use these types of programs to connect high school students’ curriculum to the college level, but it also created a supportive community for the new, ethnically diverse STEM students while providing them first-hand research opportunities.

Through these curriculum-based and faculty-based supports, students have an easier transition into a new environment, while still working with the same STEM material. This sense of consistency provides students the chance to be grounded on a basic level in order to advance their creativity and thought processes in a new setting with more resources. This program effectively addresses three key factors from Appendix A: 1) lack of sense of belonging; 2) lack of adequate preparation for college work; 3) lack of professor approachability/kindness.

**College of Science and Mathematics**

While higher education institutions cannot directly address the fact that “40% of STEM majors reported inadequate high school preparation as a problem in their current coursework”, they can create courses at their universities to teach the basic skills to entry-level STEM students (Koenig, Schen, Edwards, and Bao 23). Through their Scientific Thought and Methods course (SM 101), the College of Science and Mathematics strives to use this scientific processing course to prepare students more advanced STEM courses (Koenig et al. 29). The instruction
helps students with scientific reasoning as well as mathematics; math scores are often low for incoming freshmen and tend to be a hindering factor from progressing in STEM courses and the major. Therefore, while a partnership was not actually created, the SM 101 functions as an introductory course to connect past STEM content to future courses to keep students interested in STEM and remain in the field through graduation. This program effectively addresses three key factors from Appendix A: 1) loss of interest; 2) lack of adequate preparation for college work; 3) inadequate classroom instruction.

**Project Lead the Way**

Along with the growing appearance of bridge programs, Project Lead the Way (PLTW) is in 10% of US high schools in all 50 states adopting the program. It offers pre-college engineering curricula that integrate STEM practices “into the students’ academic program of study at the middle and high school levels” (Nathan et al. 411). The courses offered include foundational and specialized instruction, ranging from Principles of Engineering to Computer Integrated Manufacturing. Completion of these courses “can be used for credit at some PLTW-accredited colleges and universities”; the program is beneficial to gain introductory insight for STEM college majors, and to aid at-risk students struggling financially by allowing them to pay for fewer courses when at the university (Nathan et al. 411).

The success of PLTW is incredible, partly due to the extensive professional development program that the faculty must complete to teach PLTW courses. The training makes “teachers proficient in project- and problem-based instruction,” and gives them the chance to “earn graduate-level college credits” for their efforts in developing themselves to help their students (Nathan et al. 411). Thus, PLTW advances the education of STEM students and improves the instruction provided by its teachers. These steps will lead to retention of both students and teachers in the field by faculty obtaining adequate knowledge and preparation through the courses and training. This program effectively addresses four key factors from Appendix A: 1) no push for student future success/profession; 2) lack of adequate preparation for college work; 3) inadequate classroom instruction; 4) money problems/lack of financial support.

**California Universities**

In an effort to “help students connect with minority faculty members”, four leading California universities formed an alliance through a $2.2-million grant from the National Science Foundation (Patel). Through the grant, the California Institute of Technology, Stanford University, and the University of California campuses at Berkeley and Los Angeles will “try to increase the number of minority researchers in science and engineering on their campuses, as well as at universities nationwide and federally supported science facilities” (Patel).

Given that many STEM students feel a sense of isolation because of the individual nature that comes with the major, part of the grant money will create a “‘cross-institutional community’ that essentially pools their collective resources” together for students (Patel). The grant will also provide resources to house an annual retreat for mentors and their student mentees to meet and interact in a more formal setting. Moreover, the program is “offering travel stipends up to $1,000 for students to visit professors at other campuses” (Patel). These California universities, though in competition with each other, are dedicated to have effective mentors for their students; their efforts could only be accomplished through this special type of partnership with each other to provide the best for many students. This program effectively addresses four key factors from Appendix A: 1) isolation/loneliness 2) inadequate mentorship/social support/role models; 3) money problems/lack of financial support; 4) lack of sense of belonging.

**Use of Online Resources**

The increasing need for STEM majors is evident by the current exponential growth in technological advancements, such as the Internet; recently this resource is being used to assess and improve student retention rates. Given that Generations Y and Z grew up with the Internet, it is easy to develop systems through this channel for students to assess themselves and for faculty to track student progress.

**University of Wisconsin – Oshkosh**

During her first year at the University of Wisconsin at Oshkosh, Callie S. Blakey and her fellow classmates “took three surveys through EBI MAP-Works, a retention-and-success program that uses predictive analytics to identify at-risk students” (Vendituoli). The survey gave her an indication of her academic strengths and weaknesses. When reviewing her results with a counselor in Student Support Services – a program for students coming from disadvantaged backgrounds – Blakey found out that her study habits were not optimal; thus,
she “worked to improve [them] and is now a rising junior studying finance and is active in three honor societies” (Vendituoli). These “electronic data systems can help college advise students, plan their academic schedules, and see—by way of “early alerts”—who might need some kind of intervention” with the “hope they will raise retention rates without straining budgets” (Vendituoli). This program effectively addresses two key factors from Appendix A: 1) poor academic performance and 2) lack of adequate preparation for college work.

**DePaul University**

Technology is providing a way for students to learn more about their skills sets while also keeping track of their own progress. In redefining its goals, DePaul University decided to emphasize “progress-toward-degree as a key metric” and revamped “its strategies to better serve the needs of all students” (Hoover). With the focus on first year student performance, a degree audit system was implemented that “allows students to track their own progress” regarding their class performance and coursework grades. Students can then address any concerns they see online through the site. Also, DePaul “redesigned gateway courses in accounting, chemistry, and math, and urged faculty members to give early assignments—and feedback” which pushes teachers to think about their instruction in a different way and provides students with more coursework and performance information to develop in these STEM related courses (Hoover). The online tracking system and course redesign proved successful as students’ “four-year completion rate has increased to nearly 60 percent, up from about 40 percent in 2000” (Hoover). Online systems, when paired with effective course instruction, can provide students the necessary tools to obtain new knowledge while keeping track of their own progress for success, leading to more STEM major graduates. This program effectively addresses three key factors from Appendix A: 1) lack of structure; 2) no push for student future success/profession; 3) inadequate mentorship/social support/role models.

**Central Piedmont Community College**

Clint McElroy, Dean of Retention Services at Central Piedmont Community College, implemented an electronic database that focuses on improving students’ sense of self-efficacy. The “Online Student Portal learning system...assesses the learning styles of at-risk students (whether they learn best through reading, hearing, or hands-on work) and helps them understand how their personality traits might connect to study and career choices” (Fischman). The system provided an ‘early alert’ to college counselors and classroom instructors if a student is struggling in a class, and also keeps a record of these interactions to track students’ progress.

The online portal proved successful from the years 2004 to 2008; when paired with enrollment in a ‘college success’ course – developed for students who need extra remedial help – students were “9 percent more likely to stay enrolled...11 percent more likely to get A-through-C grades in their courses, and about 3 percent more likely to graduate” (Fischman). The College’s retention rate for first year students also reached 87 percent (Fischman). Thus, the use of technological surveys can help students and faculty assess their needs, and plan accordingly.

Central Piedmont sees that their programs can be adapted to other institutions. The “Next Generation Learning Challenges, a nonprofit group focused on improving college readiness and completion,” will provide the technology, “free, to six other colleges to see if the Web portal can produce similar results in other places” (Fischman). Asheville-Buncombe Technical Community College finds this assistance helpful monetarily and student based, as they received a 13 percent budget cut; through the system, they can remain in contact with students much easier (Fischman). The generosity of Central Piedmont to other institutions shows their dedication to provide the best systems for students to learn more about themselves for the future. These online surveys and consistent faculty interaction move students one step closer to improving self-efficacy. This program effectively addresses two key factors from Appendix A: 1) poor academic performance and 2) lack of adequate preparation for college work.

**Conditional Acceptance Program (CAP)**

In order to better assist those students identified as at-risk, in this case those who “do not meet the standard admission requirements can apply for admission,” the Conditional Acceptance Program (CAP) provides students the chance to enhance their academic knowledge in similar environments (Laskey and Hetzel 32). CAP students are enrolled in the Freshman Year Experience course and freshman level psychology courses, and receive effective scholastic and character instruction. Having the same group of students in each class provides the chance for friendships to be formed more easily for these new freshmen. These various courses, when taken concurrently, allow for students to get both varied and
relevant instruction for educational advancement.

In CAP, students also take the online Five Factor Inventory (NEO-FFI), which measures students Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. The scorings in these factors contribute to student retention and use of services:

“Students scoring higher in extraversion were less likely to be retained” because they “were more concerned with socializing than… academics”; “students who scored high in conscientiousness and agreeableness positively accepted direction from adults and utilized tutorial services” more often; “students scoring higher in neuroticism might do better in school because they are worried about overall success” (Laskey and Hetzel 38.)

The online survey provides higher education institutions the chance to quickly and easily gain insight to key factors to look for when assessing how to retain students, on an individual basis.

Overall, the CAP program was a success, with a 66% retention rate. These students used tutoring services more frequently than others (Laskey and Hetzel 37). The personalized tutoring experiences connect with past research showing the need to create “an institutional climate of caring and belonging, which has a universal mission of educating, supporting, and retaining its students” (Laskey and Hetzel 34). Students must attend tutoring on a regular basis because it fosters consistency. This program, along with many others, use online tools to learn more about their students and provide necessary tutoring services, which proved to be a “positive effect on at-risk student retention and GPA” (Laskey and Hetzel 39). This program effectively addresses four key factors from Appendix A: 1) lack of campus connection; 2) lack of adequate preparation for college work; 3) lack of sense of belonging; 4) lack of professor approachability/kindness.

Developing an Academic Support System

In order for students to succeed in the classroom setting, the environment itself must be conducive for learning. Faculty members and administrators of higher education institutions must provide the necessary tools for students to engage with academics and campus life, develop a sense of belongingness, and desire to continue their studies in the field at the given institution. Therefore, it is necessary for universities to implement academic and community support systems to ensure that students are receiving high quality instruction and guidance.

University of Southern Queensland (Australia)

Creating a sense of community allows for a student to feel whole in a new environment. The University of Southern Queensland sought to do just that when developing their FYI (First Year Infusion/For Your Information) program. This pilot program created “a supportive learning community where first year education students, academics, and learning and teaching support staff were able to consider the multiple realities that characterise students’ learning journeys” (Noble and Henderson 81). With this goal in mind, the FYI program looked into the Learning Circle approach, where learning communities are created to “enhance critically reflective skills, incorporate tacit knowledge and engage in dialogue” (Wenger, 1998) to enhance their learning and teaching” (Noble and Henderson 81). The hope is that these comfortable spaces would allow for more open dialogue and problem-solving reflections between students and teaching staff. Through this opportunity, students “developed genuine appreciation and respect for their peers and themselves as learners” (Noble and Henderson 86). Furthermore, staff were “enthused that there were advantages to them” as they became heavily involved in working with students to develop solutions for problem-solving and learning activities (Noble and Henderson 87). Thus, the FYI program was beneficial for all.

It should be noted that the students were not required to attend regularly, but were given the chance to partake in the services. The responsibility was placed on the students to seek out help; however, due to fear of judgment from other students and professors, they may not seek out the help they need. Thus, making these community discussions mandatory, at least for freshmen students, would cater to all whether they feel they need the services or not. Thus, the FYI program provides “a more integrated and infused approach to supporting students socially and academically” and enhances collaboration among students and faculty to provide “a sense of place and belonging in the university context” (Noble and Henderson 82). This program effectively addresses four key factors from Appendix A: 1) lack of campus connection; 2) lack of professor approachability/kindness; 3) lack of adequate preparation for college; 4) lack of sense of belonging.

Bournemouth University (England)

In an effort to increase participation in English higher education groups, Bournemouth University developed the GROW@BU program, which “aims to develop
students’ resilience and independence, thus encouraging learners to reach their full potential” through social integration (Gail Thomas and Hanson 59). At its foundation, the program developed two core elements: “the Student Engagement Team (SET) and the promotion of a more fundamental change in guiding and advising students based on professional coaching behaviours” (Gail Thomas and Hanson 59). The initial members of SET were all BU graduates, and therefore were “both familiar with the university environment having experienced it as students, but were also full members of university staff, which afforded them access to privileged information about university systems” (Gail Thomas and Hanson 63). Nevertheless, they still partook in training with “Student Support Services teams, Students’ Union officers and staff within academic schools” and focused on “coaching behaviours, tools and techniques” (Gail Thomas and Hanson 63). This training helped SET become fully equipped to create effective programs for students.

Given that social events are a large part of college life, “SET members acted as a bridge between informal social networks and formal university structures to foster closer relationships between the students and staff” (Gail Thomas and Hanson 65). Therefore, social events were created but not successful, with limited attendance; part of the reason could be that the events took place “too late in the autumn term, by which time some students had already formed friendships, so they did not act as the trigger to building relationships as originally anticipated” (Gail Thomas and Hanson 65). In order to help students develop social interactions, colleges need to provide students with opportunities from the first day on campus to excite and connect with students through shared experiences. For the future, SET plans to create more social events in the beginning of the fall term for students.

One-on-one meetings with SET members also allowed students to become empowered when working through the GROW coaching model. SET members and first year students engaged in discussion about student challenges by “clarifying their Goal (where do you want to get to?), checking Reality (what is the current situation?), reviewing Options (what could you do?) and finally, agreeing their action (What will you do?)” (Gail Thomas and Hanson 65). The model generated effective discussion as students talked through problems, created their own solutions, and further bonded with the SET member, developing a sense of trust. However, not all students are the same, and it was found that the model was not effective for all. Therefore, SET realizes that “some groups have different needs” and “[they] plan to diversify the range of activities for specific demographic groups” (Gail Thomas and Hanson 65). This diversification will allow the program to reach and positively affect more students, which will increase the amount of students retained at the University. This program effectively addresses five key factors from Appendix A: 1) lack of adequate preparation for college; 2) lack of campus connection; 3) lack of faculty/advisor consistency; 4) lack of sense of belonging; 5) lack of self-esteem/confidence.

**Items to Consider when Creating a Student Retention Plan**

The number of young adults attending college is increasing. Therefore, the need to keep students in school is a priority. Furthermore, society needs today’s students to help advance our future, especially in the STEM field. However, this will not be done with current practices.

To create an effective retention plan, an institution must remember that the “initial structure results from a combination of underlying economic and technical characteristics of the industry” (Porter 162). Institutions must take into account both past actions and current restrictions when formulating a plan. Although it is still in the introduction phase, “advocates envision the next frontier of retention as combining advising, degree planning, alerts, and interventions in software programs that can draw on predictive analytics” (Vendituoli). These upgraded systems within student retention plans will turn student-affairs officers and academic advisers into “student-success scientists” (Vendituoli). In order to create these scientists, institutions should hire faculty and staff that can keep the program’s fundamental principles intact while still motivating students and fellow faculty to feel the passion for what they are doing (Collins 108-109). Institutions must have a set plan in place and the right people to uphold it to create a lasting effect for students and universities.

As this study’s primary research survey results indicated, there are multiple components of the STEM field that intrigue students. The main one, however, is that the field is all-encompassing in terms of the content it covers, and STEM majors are working to advance society with its ever-changing needs. To accomplish this goal, these majors do a lot of hands-on learning both in the classroom and in extracurricular activities. Given that these STEM related activities can help keep students’ interest in the field and stay at the college, it is important for universities to offer these types of opportunities for students.

**Student Recruitment**
In order to implement a sustainable program, it is necessary to recruit the “right” students for a given university. When determining if someone should be admitted to a university, the staff should look not only at education background, but also character attributes, so as to see if a student’s demeanor would enhance rather than hinder the university’s environment (Collins 51). Furthermore, colleges need to look at the cost of serving its buyers—whether or not a student can truly invest money in an institution. Universities may create a “customization or modification” for a student, in the form of a scholarship or compensation package, if they possess particularly impressive attributes that the college strives to promote and enhance (Porter 118). By matching a buyer’s purchasing need to a firm’s capabilities, a firm can achieve higher product differentiation and minimize the cost relative to competitors. In higher education institutions, students are less likely to leave the institution if provided scholarships, and therefore retention rates will increase.

All buyers want to see growth potential in a product. Colleges need to be conscious of substitutes and social trends that could cause shifts in both academia and campus life. A good buyer will look for “features of a particular seller’s product or service that are unique” (Porter 113). Universities must effectively market the attributes that make them unique to capture these “good” buyers, or students, and make them stay by continually maintaining this distinctiveness. Thus, a key factor in retaining students is to make sure that the college is first selecting the right students to attend the institution.

**Improving Classroom Instruction**

In order to keep students in the classroom, instruction needs to be improved. Students are more successful and aspirational “knowing even one faculty member closely” (O’Keeffe 608). Therefore, the quality of professor and student relationships is important when creating a “climate of trust and building connectedness”; at the same time, faculty must align their curriculum to fit the students’ perspectives and change it over time to accommodate new ways of thought (Noble and Henderson 80). In order to challenge students, professors must keep them motivated and engaged in an environment that promotes cooperative learning through creativity and exploration. For STEM classrooms, it is useful to have “science on display” to engage students in an environment that is conducive to what they are learning (Blair). Instructors should “lead with questions, not answers” (Collins 74). This methodology challenges students to uncover the answers, making them arrive at the conclusion through independent processing. One way to do this is through a flipped classroom style, in which students “complete homework prior to class” allowing for “richer face-to-face interactions when students are actually in class…they spend their time asking questions, participating in hands-on activities, and even getting involved in university research efforts” (Blair). Engaging STEM students in these types of discussions presents the opportunity to share findings and discuss methodologies with others, which creates a successful research environment (Pearson 189). These practices equip students with the knowledge for their STEM classes, as math and chemistry deficiencies are a root cause of students’ inability to progress in the STEM field (Pang; Perez, Cromley, and Kaplan 327). These student-centered environments allow for the acquisition of necessary abilities in the subject matter, enticing students to continue their studies in the STEM field and increase retention.

Given that “higher teacher expectations were positively and directly associated with students’ own educational expectations and post-secondary academic attainment,” it is important that the professor’s personality and demeanor fit the needs of his or her students (Nathan 410). As Appendix B illustrates, the top quality students look for in a professor is their ability to effectively answer questions, be available with open office hours during which time informal conversation can occur, as well as portray a willingness to help their students (Jenkins, Ackerman and Schibrowsky 318). Thus, professors must be flexible, accessible and approachable for the student and situation at hand (Jenkins). Instilling and enhancing a students’ “self-efficacy, confidence, and an overall ability to do well in school” while will creating a sense of belongingness, allows students to feel more comfortable in the self-exploration of their interests (Laskey and Hetzel 40). By engaging in self-exploration early on, students will put forth the effort to achieve success (Perez et al. 322, 324). Allowing students to develop and explore their passions will increase student retention rates, while encouraging a perpetual learning mindset.

**Improving Campus Initiatives**

Improving student retention from a holistic view, “an industry must be viewed as an interrelated system,” and hence an institution’s systematic approach to address this issue must begin by implementing campus wide initiatives (Porter 200). Thus, higher education institutions must have the “right people” that value “personal service” and provide “quality…[and] individualized responsive service is being provided” through a variety of means of communication for both students and parents (Collins 51, Porter 198, Hoover). An institution is like a...
business and needs to work on relationship marketing to develop a lifetime value for customers (Ackerman and Schibrowsky 311-312). Students are more likely to be retained “if trust is developed, if they are satisfied with the product or service, and if they are committed to the institution” (Ackerman and Schibrowsky 318). Appendix B further illustrates students’ responses regarding the qualities they look for in an advisor: advisors should take an interest in their students and their goals, and be knowledgeable about the classes and requirements for each specific major. If institutions provide effective and personalized attention throughout students’ college careers, students should perceive an increased value in their experience at the university, leading to higher retention numbers.

Universities can use partnerships with other schools; by creating outreach opportunities to bridge the transition from high school to college, students will feel more comfortable and more competent entering into college level classes. (Gates and Mirkin, To Recruit and Advance 3, Wilson et al. 584). Once in the university, students should be given the chance to collaborate with other colleges that “offer experience with cutting-edge scientific research to broad groups of students” as well as “expand educational technologies, [and] provide internships” (Gates and Mirkin). In creating retention specific programs, there should be elements of fun through social events for students to interact with fellow peers, “network, form friendships, and plan collaborations” (To Recruit and Advance 60). Along with relationship building, it is important that faculty members are trained to “help students navigate their freshman year”; this is most effective when there are regular monthly meetings between students and an advisor or mentor (Fuller, Pearson 188). The importance of student support throughout their time at the university is critical for success; therefore, having a mentor that provides “emotional and psychosocial support, direct assistance with career and professional development, and role modeling” is beneficial to further feel a sense of connectedness to the campus (O’Keeffe 610; Pearson 192, 188). As mentioned previously, face-to-face mentoring interactions allows for both the mentor and mentee to read each other’s nonverbal cues, which further strengthens the communication and connection in a the relationship. Therefore, effective outside partnerships and mentor-based retention programs will allow for students to more easily transition, connect to an institution's campus, and remain at the university to further develop new and created relationships with others.

**Conclusion**

In order to create effective retention programs that can increase rates and educate today’s youth, higher education institutions should consider the main causes for low student retention. These causes include money programs and lack of financial support, lack of adequate preparation for college work, inadequate mentorship and social support, lack of campus connection, and no push for student future success. While some of the programs mentioned adequately addressed these factors, they did not highlight helping students financially; at-risk students need this type of support in order to get into and remain at universities. Programs should focus on including all these factors, but primarily focus on monetary assistance.

In terms of programming, colleges should create programs that are academic support based, while including opportunities such as mentorships, partnerships, and use of online resources. In recruiting and retaining STEM students, universities must create learning environments that are hands on and provide STEM related activities to further engage the students. Faculty and advisors should also be knowledgeable, take interest in their students’ well being, and be willing to help them and answer questions. It is the responsibility of an institution to provide the best for its current students to make sure they feel valued and educated at the given college or university for the advancement of themselves, and society.

**Works Cited**


Appendix A – Factors Related to Low Student Retention

![Figure 1](image1.png)

The data collected in this graph illustrates that money problems/lack of financial assistance is the main personal reason for low student retention. This is relevant to most at-risk students who struggle financially. Higher education institutions must address this in developing an effective retention program.

![Figure 2](image2.png)

The data collected in this graph illustrates that the factor of lack of adequate preparation for college work is the main classroom reason for low student retention. While higher education institutions cannot directly address high school curriculum, it can develop bridge program partnerships with the high schools to aid in smoother student transition with their coursework.

Appendix B – Survey Responses

![Figure 4](image4.png)

The data collected in this graph illustrates that the best part about majoring in STEM is that it is an all encompassing major, it advances society, and provides the chance for hands-on learning. The aspect of hands-on learning is key when developing new skills, and thus this type of exploratory learning should be implemented in both STEM and non-STEM courses at all colleges.
organizations provide academic related content knowledge and the chance to interact casually and socially with like people interested in a certain subject matter. These opportunities should be open for STEM students at all colleges.

**Appendix C Survey Questions and Responses**

1. Year
   - Freshman: 3
   - Sophomore: 6
   - Junior: 15
   - Senior: 23

2. Type of College
   - Private College: 43
   - Public University: 3
   - Community College: 1

3. Major within STEM field:
   - Science: 40
   - Engineering: 2
   - Mathematics: 5

*4. Why did you decide to pursue a major in STEM?
   - Skill: 6
   - Need it for future career: 26
   - Interested: 26

*5. What is the best part about majoring in STEM? – This question is further illustrated in Appendix B
   - All encompassing/advancing society/hands on learning: 26
   - Answers to problems/analytical thinking: 5
   - Challenging: 6
   - Enjoyable: 2
   - Professors and classes: 4
   - Work toward dream job: 4

*6. What are your career aspirations with a STEM major?
   - Business related: 3
   - Environmental: 5
   - Graduate school: 3
   - Medical field: 24
   - Not sure: 2
   - Research: 6
   - Teacher: 4

7. I am interested in my major and what I am studying:
   - Neutral: 1
   - Agree: 8
   - Strongly agree: 38
8. My professors are helpful and care about me and my future:
   Neutral: 2
   Agree: 11
   Strongly agree: 34

9. I feel comfortable approaching my professors with questions about the course or asking for help with the coursework:
   Neutral: 1
   Agree: 15
   Strongly agree: 31

10. How often do you speak with your professors outside of class?
    Daily: 5
    Once a week: 14
    A couple times a week: 22
    Bi-weekly: 3
    Less than once a month: 3

11. What is the best form of contact between you and your professors?
    Email: 18
    Face to face: 32
    Phone: 1

*12. What are qualities you look for in a professor that would make them more approachable and accessible? – This question is further illustrated in Appendix B
   Answer questions/more office hours/willingness to help: 17
   Interest in students: 10
   Kind/outgoing: 13
   Knowledgeable/Passionate: 7

13. My academic advisor is helpful and cares about me and my future:
    Neutral: 5
    Agree: 16
    Strongly agree: 26

14. I feel comfortable approaching my academic advisor with questions and when seeking educational advice:
    Disagree: 2
    Neutral: 3
    Agree: 16
    Strongly agree: 26

15. How often do you speak with your academic advisor?
    Daily: 2

16. What is the best form of contact between you and your academic advisor?
    Email: 15
    Face to face: 32

*17. What are qualities you look for in an academic advisor that would make them more approachable and accessible? – This question is further illustrated in Appendix B
   Availability: 7
   Interest in students: 14
   Kind/outgoing: 12
   Knowledgeable: 14

18. Do you have a student, faculty, or alumni mentor?
    Yes: 8
    No: 39

19. If answered no to question #18, please check “N/A”.
   If answered yes please answer the following question: I feel my mentor is helpful and cares about me and my future.
   Neutral: 1
   Strongly agree: 7
   N/A: 39

20. If answered no to question #18, please check “N/A”.
    If answered yes, please answer the following question: How often do you speak with your mentor?
    Daily: 2
    A couple times a week: 2
    Bi-weekly: 3
    Once a month: 1
    N/A: 39

21. If answered no to question #18, please check “N/A”.
    If answered yes, please answer the following question: What is the best form of contact between you and your mentor?
    Email: 1
    Face to face: 7
    N/A: 39

22. Do you participate in programs and/or extracurricular activities outside the classroom that relate to your major?
    Yes: 36
    No: 11
23. If answered yes to question #22, please list the programs and/or extracurricular activities outside the classroom that relate to your major that you participate in: – 
   This question is further illustrated in Appendix B
   Academic Fraternity/Society: 20
   Club: 18
   Job/Internship/Volunteer: 5
   Research opportunities: 5

24. Do you plan on remaining in your major for the rest of your college career?
   Yes: 47

25. If answered no to question #24, please provide the major you plan to switch into and why.
   N/A: 47

* These questions required open-ended responses. The answers to the following questions were compiled and summarized into key conclusions. Some of the responses fell into more than one conclusion category, hence why the total number may exceed the 47 main individual responses.

If you wish to view larger images shown in this research, please contact cchristopulos@carthage.edu
Managing the Friction Between Five Generations in the Workplace

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Abstract

The stereotypical corporate workplace consists of “seasoned workers”, or those with 20 to 30 years of experience in their fields, and the young “hot-shots” who possess a know-it-all and entitled attitude. As the differences between generations in the workplace become increasingly apparent, the impact of this divide directly influences hiring managers, corporate leaders, and employees alike. In any industry, company and department leaders are going to interact with individuals outside of their immediate generation. With the presence of three distinct generations in the workplace, and another cohort emerging rapidly, the potential for conflict is incredibly high. Organizations must have a strategy to address and resolve multigenerational workplace challenges in order to focus on generation-specific tasks, attitudes, and needs.

Defining the Generations

A generation is a group of people who have shared the same events through news, music, mood, education, parenting styles, and more during a certain point in time (Murphy, 2007). It is important to note that the general characteristics and core values of a cohort do not apply to every individual. As strategic leaders adapt to a multigenerational workplace, familiarity of generational characteristics aids in understanding colleagues and fostering a cohesive workplace.

The table below is an overview of characteristics specific to a particular generation. In order to appreciate the differences of each cohort, it is essential to examine characteristics specific to each generation.

### The Traditionalists (1928-1945)

Commonly referred to as Veterans, Maturists, or the Silent Generation, or the Greatest Generation, Traditionalists are the most senior members in the workforce. Although not many Traditionalists are still in the workforce, the recent economic downturn kept these workers in the workforce past the typical age of retirement. These individuals are characteristically loyal, reliable, and very knowledgeable in their respective fields. Formative experiences included World War II and the Great Depression, resulting in a time of political and economic instability for many of these individuals (Hahn, 2011). Traditionalists are products of this time period, and as such, view work as a privilege rather than a right. They contribute a variety of assets including dedication, wisdom, focus, and perseverance when faced with adversity. More often than not, Traditionalists will follow managerial directions without question, due largely in part to being uncomfortable with conflict and their opinion that work is a privilege (Murphy, 2007).

### Baby Boomers (1946-1964)

Until recently, Baby Boomers made up the majority of the workplace. This cohort was born in a time of economic prosperity following World War II, and like Traditionalists, have a very well developed sense of workplace duty. Significant events of this generation’s childhood include the Apollo 11 moon landing, the civil rights movement that swept the nation, the assassination of President John F. Kennedy, and the Vietnam War (Murphy, 2007). Stereotypically known to be workaholics, Baby Boomers are characteristically loyal to their employers and often spend decades working for the same company or corporation. Even though this generation is approach-
ing retirement age, most Baby Boomers are prolonging their time in the workplace due to financial and personal instability. Some choose to pursue a different career or passion instead of fully retiring in order to continue earning income, or simply because the thought of seeking challenging, meaningful work and learning opportunities is appealing (Murphy, 2007; Dowd-Higgins, 2013).

**Generation X (1965-1976)**

This cohort is characteristically independent, adaptable and flexible to change, and resilient in nature (Murphy, 2007; Dowd-Higgins, 2013). Generation X witnessed a majority of mothers entering the workforce and an astoundingly high divorce rate. These individuals were considered the original group of “latchkey kids”. This generation had a front-row ticket to some of the most tumultuous events in world history. It was during this time that the energy crisis, Richard Nixon’s Watergate Scandal, and Three Mile Island occurred. These events, coupled with the excessive AIDS outbreak Chernobyl, and the fall of the Berlin Wall, make this generation’s childhood riddled with governmental corruption, environmental catastrophes, and instability.

Xers prefer to work autonomously in a flexible space, have freedom to complete tasks on their own time, and thrive on challenges. After their parents invented the 60-hour work week, Generation X displayed a desire for a work-life balance, often times working less time in order to achieve that. This has led to other generations labeling Generation Xers as lazy and slacking on the job. These individuals have also been viewed as cynical, distrustful, and skeptical of peers and managers (Alsop, 2013).


This generational cohort thrives on technological advancements and instant communication. A member of this generation typically has a smartphone attached to their hand, allowing social networking sites to be accessed from remote locations. Having grown up with 24/7 access to the Internet, Millennials are digital natives. This technological experience shaped how individuals of this cohort search for information, solve problems, relate to others, and communicate (Valcour, 2013). The technological fluency has had an effect on personal interactions with others, placing the communication divide at the root of workplace conflict between Millennials and Baby Boomers. Baby Boomers were raised in hierarchical workplace environments, characterized by a severely controlled flow of information. Baby Boomers placed the development of personal relationships at the forefront to moving up the corporate ladder. Millennials, who expect information immediately and who communicate through text messages, want nothing to do with that hierarchy and reject traditional top-down communication (Valcour, 2013).

Millennials grew up in a period focused on multiculturalism and were involved in multiple activities (Hahn, 2011). Due to the varied activities of this cohort, they often display optimism, high levels of sociability, and are excellent team players.

Like their grandparents and great-grandparents, Millennials have a highly developed civic duty and strive to contribute to organizations targeting the greater good of the world (Hahn, 2011). This generation experienced an era of violence highlighted by the Gulf War, the Columbine school shooting, the Oklahoma City bombing, and the beginning of the War on Terrorism after September 11, 2001 (Hahn, 2011). The individuals in this generation are the up-and-coming leaders of the corporate world, as they have begun to fill the openings left by retiring Traditionalists and Baby Boomers.

**Generation Z (Born after 1996)**

Defined as those born after 1996, this generation is the first born into a completely digital world (Dupont, 2015). Formative events include the conditions that resulted from 9/11, the Great Recession that plagued the economy, the War of Terrorism, as well as a multitude of school shootings and climate changes. This cohort has also seen a radical shift in governmental regulations regarding gay marriage and the legalization of marijuana. This group accesses all this information easily and quickly through mobile devices (Dupont, 2015).

Findings from a Pew Research report, “Teens and Technology 2013” indicated that approximately 78 percent of Generation Zers have mobile phones and about 74 percent of those can access the internet on their mobile device. The drastic shift in communication and news sources reflects the quickly morphing line of news, so companies must adapt and reach this generation through sharable content. One survey found that Generation Z has the highest level of technological connectivity, with many spending virtually all of their waking hours connected to a computer, tablet, smart phone, or other electronic device (McCafferty, 2013).

The bar graph below from the Bureau of Labor Statistics Employment Projections indicates that within the next five years, Millennials will be the majority leader in the workplace make-up. Generation X and Baby Boomers are very close, weighing in at approximately 20 percent and 22 percent, respectively. This trend demands an increased social media presence, a large collaborative effort, and a complete understanding of technological advancements.
Mentoring

To combat the growing technological divide between Baby Boomers and their children or grandchildren, large corporations created various roles to help their older employees keep up with industry trends. Mentoring has been proven to be a beneficial tool for both individuals and the organizations that participate.

Traditional mentoring is characterized as a work relationship between an older, more experienced adult (mentor) and a young adult (mentee or protégé) that enhances career development (Kram, 1983, 1988). Kram found that mentors provided both career development and psychosocial support resources that directly correlated to mentee career success (1983, 1988). The clear distinction in experience was a way to retain knowledge within the workplace. The senior level employees would mentor and guide the junior level employees, thus emphasizing the career and personal development of future corporate leaders.

Traditional mentoring functioned as a way to spread knowledge from one cohort to another; this process is also seen in reverse mentoring relationships. Reverse mentoring is a way to exchange ideas between generations, but adopts a different mentor and mentee structure than traditional mentoring. According to Reverse Mentoring at The Hartford: Cross-Generational Transfer of Knowledge About Social Media, a report from the Sloan Center on Aging & Work in collaboration with the Boston College Center for Work & Family, The Hartford’s reverse mentoring program began with a small group of Millennial employees who already were formulating and changing the face of technology. Managers used these young workers to help magnify the understanding of social media usage and expansion. This opportunity led to career development opportunities for the Millennials, as well as overall benefits for the business (DeAngelis, 2013).

Corporate changes regarding social media allow for new telemarketing tactics, new and improved social media policies, as well as increased employee proficiency of company information-sharing policies. The report has proven the benefits of reverse mentoring. Of the mentees that went through the program, the incremental increase in business development as well as personal development has grown steadily over the different waves of participants (DeAngelis, 2013).

While traditional mentoring has proven to be a beneficial tool for employees, reverse mentoring functions as an excellent tool for senior members to gain technical knowledge, explore current trends in technology and society, develop a multicultural global perspective, and communicate with the younger generation in the workplace. Reverse mentoring is an innovative way to encourage learning and facilitate cross-generational relationships (Murphy, 2012). This relationship involves pairing a younger, junior employee with an older, senior level colleague. The junior employee will act as the mentor and the senior level as the mentee.

Jack Welch, the former CEO of General Electric, is credited with introducing the formal concept of reverse mentoring in 1999 when he ordered 500 of his top level managers to find young employees who could teach them about the Internet (Greengard, 2002). Since its beginning, reverse mentoring has been used in mainstream business practices, particularly among several large corporations, including Dell (Harvey & Buckley, 2002); Proctor & Gamble (Greengard, 2002); and Time Warner (Hewlett, Sherbin, & Sumber, 2009). Strategic companies and organizations access Generation Y’s expertise and technology savvy minds to instruct other generations on the technological trends and the benefits of technology advancements in the workplace.

Reverse mentoring is an innovative and cost-effective professional development tool that capitalizes on building bridges between generations (Meister & Willyerd, 2010). Although the older mentee may not appreciate being taught by a mentor who is half their age, the generational difference allows both cohorts to understand the similarities between themselves. In reverse mentoring relationships, both mentees and mentors serve as idea generators. The open communication encourages both parties to participate in this information exchange because they are not being directly evaluated on performance or work level. The reverse mentoring dynamic allows both participants to engage in an innovative process that generates new approaches to problem identification, data collection and analysis, solution generation, and idea implementation (Zhang & Bartol, 2010). The combination of Millennial mentors, who have an entrepreneurial
spirit and a new perspective on products, services, and the organizational process, with Baby Boomer mentees, who understand the long-standing traditions of the organization, creates abundant opportunities for businesses to drive innovation and flourish in the future.

While the characteristics of reverse mentoring and traditional mentoring overlap, the structure of each provides a different overall emphasis on certain goals. According to Murphy (2012), reverse mentoring relationships are characterized by several elements, including (1) unequal status of partners; (2) knowledge sharing with the mentee focused on learning technical or content expertise and gaining a generational perspective from the mentor; (3) emphasis on professional and leadership skill development of younger mentors; and (4) mutual commitment to the shared goal of support and mutual learning.

For some senior executives, the unequal status of partners in a reverse mentoring relationship poses a serious challenge. This partnership requires relinquishing control and demonstrating an open and willing attitude to learn from their mentor (Murphy, 2012). One Baby Boomer executive said, “It is difficult not to slip into our traditional roles, but the arrangement allows for building relationships” (Meister & Willyerd, 2010). Baby Boomers can learn plenty from their younger colleagues during reverse mentoring partnership, which in turn allows the organization to function as a cohesive unit.

It is important to foster communication between all generations as it provides direction, respect, and a level of commitment to the overall goal of the partnership. The main focus of reverse mentoring partnerships is learning from mentors through knowledge sharing and skill development. While mentees learned a great deal from mentors in traditional mentoring partnerships (Kram, 1988), the main education consisted of advising about certain situations because of amassed years in a particular industry. Reverse mentoring, however, focuses on the Millennials’ knowledge about current trends/advancements in technology and a broad generational outlook.

Reverse mentoring is a way for Millennials to cultivate previously underdeveloped leadership skills. As both generational partners move through this process, the potential for personal and professional development increases (Murphy, 2012). Personal development is a combination of communication, listening, critical problem solving skills, and relationship development. These interpersonal skills influence how well a mentor will develop and excel in the workplace. The mentee must also adapt to a style that coincides with the mentor. Having two opposing personalities may prove to be a disastrous partnership, due in part to different beliefs, values, global perceptions, and moral development. Organizational leaders can combat the potential for personality disagreements through continual support and awareness of personality characteristics.

In reverse mentoring partnerships it is imperative to develop a space for both mentor and mentee to share the goals of mutual support and learning (Murphy, 2012). These shared goals will help mentees feel more accepted as they learn from their younger colleagues. Oftentimes, the mentees are the same age as the parents of these millennial generation mentors. This can pose as a problem for the mentees if their attitudes are left unchecked and they do not have an open mindset. The differences in this reverse mentoring relationship are unique in that traditional roles state that more expertise and experience determines the mentoring role. Yet, it is through the younger cohort’s technology savvy minds that the advancement of organizations occurs. Millennials are privy to the constantly changing interfaces of technology, allowing for a clear understanding of industry trends. This means that, from a social networking standpoint, Millennials can identify the benefit of heading in a particular direction in order to reach the largest amount of people.

The figure below represents what a reverse mentoring relationship should be designed to echo. While the model contains information about junior level and senior level executives, it is important to note that the four elements of reverse mentoring are included. The outcomes of reverse mentoring differ from traditional mentoring relationships, making the figure below representative of a practical program that can be created for the workplace.

The model here uses the traditional mentoring research done by Kram (1983, 1988) and implements a mixture of interpersonal skills, role reversal, and leadership development. Although it is evident that reverse mentoring is structured differently than traditional mentoring roles and goals, the outcomes and benefits to an organization are drastically different. The positions of mentee and mentor are structurally different, highlighting the unique exchange of power and influence.

While reverse mentoring is an important way
to develop generational partnerships between colleagues of junior and senior level status, enacting a program that correctly works to utilize resources and garner workplace support is essential for success. It is important to note that executive leaders need to be visible and supportive during the reverse mentoring process (Murphy, 2012). Visibility and support from top management signals the organizational belief that this program is very important and should be taken seriously. Top management is the face of the company, so it is essential to have participated in programs similar to this as well. As the partners move through the mentoring process, it is beneficial to receive encouragement and support from the executive level team, thus instilling the idea of a creative and collaborative workplace atmosphere.

The table below shows a brief comparison between traditional mentoring and reverse mentoring roles. The substitution of roles allows reverse mentoring to develop a different section of employees in the organization. It is important to note that both traditional mentoring and reverse mentoring functions provide career development, psychological support, and role modelling; however, the main differences are seen in the notes section of the table. It is evident that the traditional mentoring relationship contains a certain level of protection that is not required during reverse mentoring, but in the reverse mentoring role, the junior level employee is able to add management onto the career development skill set. This system of give and take is manifested between the traditional and reverse mentoring functions. Both types of mentoring relationships allow for an information exchange to take place between the parties involved in the organizational process.

<table>
<thead>
<tr>
<th></th>
<th>Traditional Mentoring</th>
<th>Reverse Mentoring</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Career Development</td>
<td>Teaching, protection, providing challenges, constructive criticism, exclusive and visibility</td>
<td>Teaching, providing challenges, constructive criticism, exclusive and visibility</td>
<td>Protection is removed, but management is added.</td>
</tr>
<tr>
<td>Psychological Support</td>
<td>Acceptance, guidance, counseling, support, and friendship</td>
<td>Acceptance, guidance, counseling, support, and friendship</td>
<td>Approval is removed.</td>
</tr>
<tr>
<td>Role Modelling</td>
<td>Effective involvement and support of mentor, trust, support, and promotion of high standards</td>
<td>Mentor acknowledges and supports the mentee, and promotion of high standards</td>
<td>Trust and respect are removed.</td>
</tr>
</tbody>
</table>

ACORN is an acronym introduced to summarize the five operating ideas successful companies use to build organizations (Zemke, Raines, & Filipeczak, 2000). These five ideas begin to develop a workplace that is comfortable, accommodating, flexible, positive, and encompassing in nature.

1. Accommodate employee differences—Employees should be treated as well as customers. Employers must learn about what is important to employees, recognize specific needs, and understand their values in order to achieve a well-developed workplace atmosphere.

2. Create workplace choices—Companies that are generationally friendly allow the employees to shape the workplace in an effort to enable employees and shorten the chain of management.

3. Operate from a sophisticated management style—Savvy managers highlight detailed goals and measures, but empower workers to perform as they see fit. This prevents micro-managing and allows workers the freedom to complete the tasks in a manner they determine to be the most effective. Providing feedback, recognition, and rewards encourage staff to continuously perform at a high level.

4. Respect competence and initiative—Managers display the trust and respect needed when they believe in employees, no matter their experience level. Generationally friendly managers assume that each employee has great potential.

5. Nourish retention—Companies can improve employee retention by providing initiatives, performance and coaching opportunities, as well as a friendly environment.

These strategies can be used as a framework to determine how best to work within a given scenario. In addition to the ACORN strategies, Hahn (2009) offers strategies for nurse managers on how to work with a multigenerational staff: (a) self-assessment of personal managerial style and generational cohort; (b) education about generational characteristics and core values of each cohort on staff; (c) embrace the similarities of staff; (d) create an unprecedented level of respect and work to maintain that; and (e) bridge the growing generation gap. To better understand the effect of ACORN, the following scenario about a disagreement on the current social media policy on Emergency Department nurses, presented by Hahn (2009), will be analyzed using Hahn’s Five Strategies and the above ACORN strategies.

Education

In order to help employees at any level succeed, educational programs designed to teach different communication styles and develop a comfortable work environment need to include ways to manage multigenerational conflict. With plenty of research done on how to manage a multigenerational workplace, key points discussed in conflicting workplace scenarios will allow application of these skills to be understood.
(ED) has been posting on a social networking site her professional work experiences to include graphic photos of an ED cubicle following a multiple trauma case. No patient identifiers are being used but details of the circumstances of the multiple trauma and resulting injuries are discussed along with the nurse’s personal feelings. Other ED nurses are part of her social networking group and are reading and commenting at the workplace about the postings. This young nurse defends herself to her coworkers by explaining that she is not using patient names and has the right to her own personal thoughts and the freedom to discuss them when not at work. Staff members have begun to take sides in this issue and communication between the younger nurses (Millennials & Generation Xers) versus the older Baby Boomers has resulted in tension and a lack of team synergy. Not all staff members have taken sides and there are those in the middle (of varying generations) who verbalize that they can identify with both sides of the issue (Hahn, 2009).

Because social networking is prevalent in today’s technologically based culture, the social nature of shared experiences functions as a communication tool. The main issues that exist are questions of ethics and professionalism. When applying Hahn’s Five Strategies to this scenario, it is the job of the ED nurse manager to understand her emotional intelligence regarding social networking and the communication freedoms that exist among this medium. The next step would be to take note of the generational discrepancies and which cohort finds fault with certain ethical practices. It would then be helpful to engage the staff in ways to combat the issues of an ethical workplace and foster a sense of open communication between every nurse involved in the discrepancy. These two skills lead to increased learning for all involved, as well as workplace proficiency for future conflicts of this magnitude and style.

Viewing this scenario using the ACORN Imperatives (Zemke et al., 2000) can provide guidance on how to battle the ethical issues, the lack of professionalism argument, as well as the legality of posting about certain cases on personal social networking accounts. The following ACORN Imperatives situational break down includes beneficial reasons to use the structure, as well as how to apply it to a situation that is common in the workplace. The social networking disconnect between distinct generational cohorts is not a new problem; rather, it is important to understand the process to find a compromise on an acceptable level of work-related posts through the implementation of these strategies.

1. Accommodate employee differences—The Millennials and Generation X nurses have grown up with technology, so these tools are second nature to them. As students, these individuals accessed information from a variety on online resources, allowing for a seamless integration of electronic communication in the workplace. The opposing side is made up of Baby Boomers, a cohort that is not familiar with the increased level of social networking that happens in the world. This can cause issues in how social networking and media posting is perceived among staff.

2. Create workplace choices—Communication about this issue should be conducted in a neutral area, in which each side can voice their opinions about the social networking discrepancy. It would be beneficial to discuss organizational social networking policies and listen to the grievances of each generational cohort before enacting any changes to the current media policy.

3. Operate from a sophisticated management style—During this step, the nurse manager would have to assume an air of objectivity while looking at the case. This means refraining from judgment and animosity during this discussion process, no matter which generational cohort the nurse manager falls under.

4. Respect competence and initiative—Each of the nurses involved in this scenario are educated professionals in their chosen field, so each should be treated with the deserved level of respect. Every nurse has a specific idea about social networking, so bridging the generation gap to include the nurses who were not on one side or another may foster an understanding between both sides. These nurses can act as moderators, in that they understand the grievances from both sides, while remaining objective and informative for both parties.

5. Nourish retention—This is when each of the previous steps are critical. The ED nurse major needs to adopt an unbiased perspective characterized by objectively looking at all sides of the disagreement and listening to the individuals involved, providing each nurse support and the chance to feel connected to their workplace and fellow nurses.

When implementing Hahn’s Five Strategies and the ACORN Imperatives, situations that pose difficult problems in the workplace are solved in a professional and timely manner. While some may argue that implementing these strategies are not practical, may result in generational tensions, or take too long to resolve the issues at hand, it can be seen that from the given scenario the ACORN Imperatives are a structured way to deal with commonplace issues, as well as concerns about media trends.

Communication and Collaboration Styles

In order to build innovative multi-generational teams, it is important to acknowledge that due to technological advancements, current employers now have the
ability to unite an increasingly diversified workplace into the most effective teams. The advantage of using online collaboration tools is that they are accessible from remote locations where WiFi is present.

As previously mentioned, Baby Boomers possess an incredible wealth of knowledge about the workplace and how work has evolved. Accessing this information is imperative to create successful teams to collaborate on a multitude of projects. Millennials are mainly characterized by their immense use of technology in every facet of their lives. Social media is an important part of the communication process for most Millennials, and while at work, this cohort often check on their sites in order to keep up with current trends. Employers should encourage these different platforms because they allow this cohort the ability to collaborate on different projects and gather ideas from a group of other people that would have been unreachable without social media.

To attract Millennials, organizations need ensure that they are providing their employees with top-quality hardware platforms, such as notebook computers, tablets, and smartphones (Ferri-Reed, 2014). These top-notch technology platforms are linked to Internet presence, a very important variable when Millennials search for information. As the current customer base shifts from home systems to mobile platforms, companies need to create an interactive, dynamic, and “highly-responsive” website that provides easy navigation (Ferri-Reed, 2014). As the digital age is moving at an astounding rate, organizations need to make sure that they are creating a mobile optimized website that customers can access from a mobile device or tablet.

As the Millennial generation continues to develop skills with technology, they are particularly adept at working in remote locations and achieving high levels of productivity. Online work collaboration tools make in-office meetings more productive, while also allowing remote collaboration at any point in the project. Adopting a collaborative project management and social platform allows groups of employees to discuss ideas and follow through with them until a tangible solution is developed. The ease of using of particular platforms is attractive to, and directly benefits, Baby Boomers and Generation X, as these two generational cohorts are often not as characterizedly tech-savvy as their millennial counterparts. Bertrand Dussert wrote in Forbes Magazine, “For collaboration to deliver value, it must integrate with business processes and encourage tangible results across a dispersed, diverse workforce. Most essential work today is not attributable to a single staff member; it takes a team to achieve success,” (2014).

Communication sites function to connect mem-

bers of a team or organization through an easily accessible platform. These platforms function as central hubs of information collection, as well as ways to develop ideas for future company initiatives or projects. Yammer, Microsoft Office’s social networking platform, is one of the sites designed to bring together employees and external collaborators in an effort to compile a single source of information. Yammer makes it easy to quickly bring a team together so they can have conversations, collaborate on files, and more. The service gives project teams a home so that people, conversations, and data can be accessed from anywhere. Yammer allows the users to collaborate beyond the immediate organization by allowing projects to be streamlined to customers and vendors in conversations. This allows the whole team to work together on one platform so that details and information are not lost in data transfers.

Another platform that increases productivity and group collaboration is Trello. Within the Trello software, projects are represented by boards, which contain task lists. Lists contain cards, which correspond to specified tasks. The cards are created to progress from one list to the next via a drag-and-drop forum, which mirrors the concept of idea creation to organizational implementation. The users are able to assign cards and tasks, while being grouped into different organizations.

Trello supports iPhone, Android and Windows 8 mobile platforms, and is mobile optimized, allowing it to be accessible in most mobile web browsers. Users can organize projects through the software forum of boards, lists and cards, all of which develop a data hierarchy to facilitate effective management of projects, jobs and tasks within the organization. The versatile nature of Trello, coupled with the unique information displays, connect to each of the generations. Millennials have a platform that is accessible through tablets or smart phones, while Baby Boomers can directly view the tasks and progress of certain projects.

The implementation of a project management software that is easy to use and access from multiple locations would ensure the successful completion of work-related tasks. While monetary prices for organizational adaptation to a specific product would be steep, the overall impact that product management software has on the performance level of individuals far outweighs the cost. The return on investment can be seen during the immediate implementation due to the ease of use for all users. The interactive platforms allow for streamlined projects between multiple departments and contributors, while providing a centralized location for all documents, reports, and completed task lists.
As the workplace is constantly in a state of flux with technology advancing at an astronomical rate, the generation gap is widening. This poses a problem for managers and organizational leaders in that their older employers are left behind and intergenerational conflict will develop in the workplace. By 2020, the majority of the workplace is going to be occupied with Millennials and the incoming Generation Z. It is imperative for companies to grow and develop at a rate that is comparable in order to achieve continual success.

While there are five generations in the workplace today, the Traditionalists and Baby Boomers are transitioning out of the workplace. Communication with these generations is important, due in part to their unmatched level of expertise and industry knowledge. There should be several opportunities for younger employees to learn from these wiser colleagues.

To bridge the gap in technological and digital literacy, mentoring programs need to be invoked in all organizations in order to fashion partnerships between junior and senior level employees. Traditional mentoring has clear benefits including career development, psychosocial advancements, as well as the ability to develop organizational leaders. While reverse mentoring is characterized as a younger, junior employee acting as mentor and the older, senior level colleague acting as mentee, the exchange of information transcends both parties involved. Implementing a mentoring program allows an information exchange to flourish between varying company employee levels.

To combat disagreements between younger managers or employees and their older employees or managers, it is essential to implement Hahn’s Five Strategies and the ACORN Imperatives. Using these frameworks to solve difficult issues will provide a safe, generationally competent workplace. This educational tool will give managers and employees alike the ability to solve problems between different cohorts in the most effective way possible.

Building an innovative multigenerational team requires new collaboration tools that have easy-to-use interfaces, but make it possible to solve complex challenges and develop creative solutions to company problems (Ferri-Reed, 2014). Using social networking sites and project management softwares to foster cross-departmental and multi-generational collaboration allows organizations a way to create effective and successful business projects. Implementing a reverse mentoring program at every single level of the organization is essential to bridge the gap between generations in the workplace. This will allow employees from different generational cohorts the chance to learn and further technological and leadership development skills. Coupling this mentoring program with education about how to deal with difficult situations will provide managers a way to work seamlessly with their multigenerational teams. Each generation cohort has specific characteristics and understanding the differences between them is essential in order to perform at an optimal rate.

Allowing the tech-savvy Millennials the chance to implement online collaborative sites in the workplace empowers employees, but also gives a solid social networking platform on which to build. Yammer by Microsoft Office allows for remote access, streamlined projects, and external collaborative efforts. Trello’s well-developed project management software makes it easy to develop comprehensive boards that have tasks to complete for an employee at any level. A combination of these alternatives provides an understanding of generational needs in the workplace, while also keeping up with industrial advancements in technology.

Works Cited


If you wish to view larger images shown in this research, please contact mbalcerzak@carthage.edu
The Power of Perception: How Design Impacts Consumer Behavior

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By: Taylor Kraft

Introduction
The mind is a very interesting place. It controls every single function of daily life. Each person uses his or her brain constantly, but more is still being discovered each day about how the brain works. The visual cortex processes countless images within a given time period and then people have to make decisions based on what they see. This is extremely important in multiple facets of life, particularly, when consumers are shopping. The package designs and advertisements that consumers see convey immense meaning, and making product choices based on what is displayed has a direct relation to quality of life. If consumers see a product with superior design, they are more inclined to interact with it. By analyzing strategies and tactics along with consumer feedback, more can be done to connect to consumers and develop brand loyalty. Designers and marketers alike need to make better and more informed choices that will lead to increased brand value and subsequent higher sales.

Why Design?
Design functions as the ultimate medium to express meaning from one group to another. The visual elements contained within any given design are the key components that speak to consumers. These elements are the determining factors between motivating a customer to buy the product, or losing the sale to a competitor. There are a variety of aspects that influence the way that consumers react and interact with various designs, whether print materials, packaging, or on the internet. The level of involvement consumers have with different products affects the level of thought that must first go into a design and thus affects overall customer experience. For example, a billboard has a very low level of involvement for consumers, therefore the level of paper and printing used is a lot less important than that of a box of cereal that consumers are directly interacting with. The cereal box needs to have high-quality paperboard, precise printing, and a clean finish. These aspects, along with the actual design of the product, have a major influence on the way consumers behave.

The type of materials that are used in design is dependent on the avenue in which the design is delivered to consumers to ultimately influence their behavior. Digital efforts use an exclusively online means of distribution, but can be spread across multiple websites, such as Facebook, Twitter, or through Google’s AdWords and AdSense programs. Many webpages use advertising via Google through their large display network to connect with consumers on a more intimate scale, as well as through the use of cookies and site tracking data to create a personalized experience. In all other aspects, physically distributed products need to use the same kind of precision that online marketers use in selecting which avenues to advertise on. For consumer packaged goods, or CPGs, the kind of paper, plastic, or other material used needs to reflect the quality and image that a brand has. If there is incongruity between the product and brand image, consumers get confused by the mixed signals and then are turned off by the product. The colors, shapes, and textures of the product are also important in influencing consumer behavior. To expand on CPGs, different people find a white bottle of Pantene much more attractive than a colorful bottle of Herbal Essences. Depending on the internal and external influences on the consumer, various stimuli like shapes, colors, and other design elements on the package have unique influences on consumers’ behavior.

One Day You're In, The Next Day You're Out
There is always something new in the design world that becomes a huge mainstream trend. In the late 1990s and early 2000s, designers and marketers worked to put every interesting thing on packaging, websites, and advertisements. The surface of the product was packed so full of elements that it became overwhelming and confusing. At that point in time, designers and marketers thought that the highest amount of interesting things they could fit on the product the better. From the late 2000s and into modern day, design has greatly shifted away from all the craziness and clutter that plagued store shelves and websites, and into an era of simplicity with clean lines and sleek design. Products were then designed with a higher level of refinement and greater attention to details. Marketers saw the need to change what they were doing because of the lack of clarity that was presented. The purpose of the product is to convey information to the consumer, and this renewed emphasis on the presen-
All information was greatly influenced by consumer demand. Minimalism and flat design have become even more prevalent in the past couple of years, with increasingly more companies adopting this approach to design. For example, Starbucks redesigned their logo, pictured to the left. The company stripped down their previous logo to promote simplicity and clarity. "The idea behind removing the "Starbucks Coffee" around the previous logo was because the company plans on creating more ventures outside of coffee—it wouldn't make sense to sell bottled water or wine with a logo that says "coffee" on it," (Gaines, 2011).

Starbucks is one of few companies that executes its current product offering in addition to having an actual plan in place to introduce new product lines under the Starbucks brand. If they would have kept the "Coffee" wordmark, consumers would still affiliate the company with strictly coffee drinks rather than the new wine experience that they have recently been testing in select locations around the country.

Minimalism and flat design are sweeping across every major industry, indicating a desire for improved and refined logos, advertisements, and brand image. A recent example of this is how Frito-Lay redesigned the entire global line of Doritos packaging. According to Alastair Whiteley, creative director for Hornall Anderson UK, the design firm tasked with creating Doritos’ new brand identity, “No matter where in the world a brand lives, success comes when consumers can instantly and intuitively recognize and assign meaning to it. Packaging serves as one of the key filters through which consumers experience the brand, so there needs to be a sense of consistency and relevance, no matter where you call home,” (Mohan, 2013). Hornall Anderson was tasked with a huge project to bring continuity to the Doritos brand by bringing together a cohesive vision for the United States and internationally. This meant that the design of the package had to be refined and able to be flexible to various international markets. One such example is the package in the United Kingdom that features the Doritos chips being dunked in dips to promote their culture of the sharing occasion.

One other goal was to create an emotional connection with the target demographic of teens and young adults: the bold graphics and typeface convey this message very well. This connects back to activating the brand narrative and reestablishes Doritos’ category leadership and cultural distinctiveness no matter where on the globe consumers are.

One particular trend in CPG design is the cutaway – a portion of the packaging is removed or made transparent for higher visibility of the product. Consumers wanted to see what they were purchasing to make sure that their money was being spent wisely. This feature, like the multiple view options offered by online retailers, assisted consumers in their decision-making process to better identify a product that fit with their life.

These options offer peace of mind to a business’ customers and provides them more happiness than if there were no such features. One company who has embraced this philosophy is Hershey. The Hershey Company has used this feature on many of its bagged candy products over the past few years, and most notably, as pictured above, an almost completely transparent cutaway on the front of their Miniatures mix of candy. Hershey wants to make sure that their customers know what they are buying and can see the value in the product. The transparent cutaway
on the most current iteration of the Miniatures package has led to a fun depiction of the classic Hershey bar on the front of the package and gives customers a true feeling of enjoyment.

**Retailing Revelations**

All of the features and elements stated have a great impact on how stores, both physical and online, function. First looking at physical retail spaces, companies take very specific steps to ensure that their products are visible and accessible to consumers. This process includes first making sure that the products are carried in the stores that their target market will frequent. Thanks to good geographic information systems, census data, and other collected data, companies can more accurately determine the location and demand for products, as well as taking into account historical demand. Walmart is a pioneer in shopping cart analysis through their use of scanner data. This process gives Walmart real-time data on what products are being sold and in what quantities. Their advanced data collection programs monitor levels of stock in each individual store and can automatically reorder products with a low on-hand quantity (Benchley, 2013). With Walmart’s extremely efficient transportation department, customers can always rely on the retailer to carry the product they need. Once the product actually reaches the store, it is another challenge to determine where on the shelf each product should be positioned and in what proximity to its brand’s and competitor’s products.

Each product that comes into a store needs to find a home on the shelf. Stores can make independent decisions as how to set up each shelf section. This process is done by specialized teams at the corporate level and then distributed down to each of the store locations. It is then the responsibility of each store to set up every section according to the plan-o-gram provided to them, such as the plan-o-gram for a cereal section pictured on the next page. In certain cases, individual companies that produce the products being stocked on store shelves conduct consumer research to determine what kind of shelf set up would benefit their products. For example, Kellogg’s can conduct testing to see how consumers react to various shelf sets for their Special K line of cereal products. After determining the results, Kellogg’s can go to a retailer, such as Walmart, and deliver the results saying that each company can make more money if the shelf is set up in this specific way. If the brands are set up in this specific sequence, customers are more likely to buy a specific brand, and in turn boost that store’s overall revenue. In this instance, plan-o-grams are skewed to highlight name brands with the highest share and diminish the visibility of “lesser” competitors in favor of more profitable brands. Decisions regarding a shelf set are only made a couple times a year to reduce unnecessary work and save consumers a lot of confusion. If a new product is introduced, this process is even longer and more tedious, as retailers try and figure out how it fits with the current product line and surrounding products, as well as the physical aspect like “will this fit on the current shelf or will the section need to be completely reset to accommodate it?”. Then a decision about what will be removed or reduced in facings is needed to adjust for this new product on the shelf. For customers, the way items are organized on the shelf is a very important aspect of shopping: they are wondering where their brand is whenever they enter a certain section. “OK, I’m here for one thing and one thing only: anti-frizz serum. It’s time to take action. It’s time to smooth things out. Ooh, but maybe hairspray would be better? I think my hairstylist said hairspray is better than serum. Or maybe she said mousse is better than styling wax… Why was I here again? Oh yeah, anti-frizz stuff. I’ll come back for that tomorrow,” (Dimco-Ediger, 2011). This excerpt from a customer’s internal monologue in the hair care aisle shows that it can be overwhelming and the wide array of products and abundance of information from other people on the subject can all become very confusing to consumers. By creating clear and thought out shelf schematics, customers can make better and more informed choices while at the point of purchase. If companies do not have the customer and their experience in the shopping environment in mind while determining the shelf position of products, they are not delivering the best possible service to their customers. The color of packaging is a key influencer on consumer behavior. Garnier Fructis is a prime example of how color plays a huge role in the success of a brand. Years ago, every product they sold came in their signature green bottle. As time went on, stores reported that the Garnier products were not selling at the same pace as competitor Herbal Essences was selling. Garnier Fructis owner L’Oréal could see this as well and decided to make a change. In increments, the Garnier line was split into col-
or-coded segments to signify each line of products. The brand now houses lines coded in red, yellow, orange, and pink bottles as well as the classic green bottle to distinguish one group of products from the others. This change greatly helps consumers in locating a desired product quickly and efficiently while shopping in the hair care aisle, rather than sort through a whole section of green bottles to try and find the one product that will help volumize hair. The color-coding method works well for almost every brand, ranging from Suave to Matrix. This method allows companies to differentiate their products and help customers shop more effectively.

The main goal of retail is to provide an enjoyable experience to customers and allow them to shop as effectively as possible, and that is what is happening now with online retailers and other e-commerce websites. Historically, shopping online was viewed as a chore and hassle, so much that people would not want to do any shopping online. In recent years, online shopping has grown at an exponential rate compared to shopping at traditional brick and mortar retail stores. By the end of 2015 in the United States, it is projected that e-commerce will account for $350 billion in sales, or 12.7% of retail sales (Centre for Retail Research 2015). This is a stark contrast as compared to the last decade or two when looking at sales figures for online retailers, which only made up a few percent of overall sales. Now, people are buying a wide range of products online due to the ease and convenience it provides to customers: consumers don’t even have to leave their old, worn out couch to buy a brand new one. Any major retailer should have an online store as well if they wish to capture any amount of the booming online shopping market. If not, they are missing out on millions of dollars in sales because they have yet to see the benefit in selling products online.

It is important that in this day and age that websites, both desktop and mobile, as well as apps are well designed and provide customers an excellent shopping experience. Creating a seamless, responsive user interface is the ultimate goal of companies when it comes to online shopping. Because customers are limited to a screen, each facet of the website or app needs to be thought out extensively and executed to perfection. As shown by the chart below, mobile usage is at its all-time high, and therefore must be put at the forefront due to its immense importance. The use of desktop and laptop computers still dominates the online shopping range of devices, but as the data shows, the rise in mobile shopping usage needs serious attention. The United States, United Kingdom, and Germany are all at or above 20% mobile share of online shopping. Companies that operate in these specific countries need to have thought out and well executed online shopping experiences for consumers. For retailers like American Eagle Outfitters for example, it is crucial that they have a prime mobile application, desktop website, and mobile optimized website to reach their target market of teens and young adults who are the most frequent shoppers on mobile and online platforms. Retailers, in addition to offering their usual sales, may often have online only exclusive sales that are limited to their web and mobile interfaces. This boosts online sales when traditional in-store sales may be lacking. This tactic is commonly used in conjunction with online exclusive merchandise and extended sizes, colors, and styles that can only be purchased through online avenues.

This gives customers another incentive to shift their purchase behavior away from shopping at traditional stores and to making more online purchases. Since marketers examine the way that their customers want to live their lives, the marketers can institute pivotal changes in the company. In the instance with online shopping trends, marketers need to work in tandem with designers to build a sublime online shopping environment to build more brand value.

Consumers Have Spoken

The next piece of the equation in determining the degree of power design has in impacting consumer perceptions and behavior is to delve deeper into what consumers think and believe when faced with various de-
signs. This phase of the research first consists of a qualitative focus group of 6 individuals who each gave their own input when asked about design elements and their impact. The second part of this phase of research is all about the quantitative survey that was distributed over the internet to a wide range of people using a convenience sample of respondents. The survey includes questions that require identification, ranking, and thoughts about design elements spanning both open- and close-ended questions. To see the full list of questions, please see the attached survey in the appendix.

The focus group that was conducted gave very good insights into what consumers thought about a number of different design aspects and applications. Some examples of products and items discussed include: initial thoughts about design, identification of major design elements, analysis of a soft drink package evolution, comparison of clothing retailer websites, and then the participants final thoughts on design and everything that they have seen. The main thing that can be seen from the various responses that were collected during the focus group is that people are not receptive to packages and designs that do not put in the amount of effort necessary to grab their attention and persuade them to make a purchase decision. Another notable thing that was extracted from the focus group responses was that the respondents were much more attentive and open to including design into their thought process and purchase behavior while shopping. Taking a look at the images to the left, the participants felt that they were not attracted to the Great Value Fruit Spins because the milk to cereal ratio is unappealing and it is hard to read the words in orange, whereas Froot Loops got much better feedback from the group as a whole because it shows nutritional information right on the ribbon across the top and entices kids with the animation and saturated colors. This shows that Kellogg’s and most other national cereal brands understand what consumers are truly looking for in a package. Others still have yet to understand the importance of connecting with their customers and creating lasting relationships, in turn building brand value. The same can also be said about the uninspired and tumultuous journey of the Sierra Mist brand of soft drink. Its packaging has changed six times since its introduction in 1999 and has not made much of an impact in connecting with consumers. As shown by the timeline of cans, Sierra Mist has used every design trend from the past decade and a half when redesigning its packaging. PepsiCo has yet to find a cohesive design and marketing plan that attracts consumers to the product. The brand has faced years of inconsistent and unclear marketing and design. When packaging is clear, customers can make better-informed choices and are more highly satisfied by their decision, rather than have to muddle through cluttered and overwhelming packaging that does not help the consumer make a purchase decision (JohnsByrne, 2015).

If a company puts out a product that does not meet the needs of its consumers, then the brand value plummets and consumers do not make any meaningful connection. This is very concerning for a company because without that core group of customers who wholeheartedly believe in the product and what it stands for, the brand does not have a strong enough following to continue to operate.

The other facet of this research was the survey that was conducted. The survey used predominately close-ended questions with a couple open-ended questions to give respondents an opportunity to express any additional thoughts and feelings they may have. The questions cover what the consumer looks for when shopping, what is considered important, and feedback on designs that are presented. After the analysis of the survey data, respondents overwhelmingly felt that the price and the brand name are the most important things that are looked for while shopping, with the size of the package and images on the package following right after. As shown by the series of pie charts to the right, survey respondents are very receptive to packaging and the impact that it has. Consumers are much more involved in the purchase
process than some may think; people are much more involved in what they are buying and thus pay much more attention to what the label says (Spinner, 2014).

This means that people are very receptive to brands and the way that their brands market themselves. Companies need to start with a solid and thought out brand strategy to make sure that they have the consumers in mind every step of the way as to build meaningful relationships and more brand value. This also leads to less brand parity. Packaging, advertisements, and other communications materials are necessary to build a strong brand that customers enjoy interacting with. The last question asked about the respondents’ final thoughts on various design elements and then their thoughts on design overall. As the data shows, other elements such as font, shape of the package, size of the package, and package material are not as important as the brand name and images used. This question was particularly insightful because it showed a clear shift in thinking from the beginning to the end in how the respondents thought about design and its importance. Since consumers are more involved in the purchase process than ever before, creating packaging that caters to a wide range of people is especially important. Elements like the brand name, images, and colors are familiar to repeat consumers, while bold statements and eye-catching graphics are used to draw in consumers that do not have the same relationship to the brand as others many have. This information is very helpful for marketers because it can be used to better design subsequent packaging as well as create marketing campaigns for the product.

**Designing Reimagined**

The way products are designed has such a strong impact on the way consumers behave, and thus needs to be a much higher priority in many companies. Designers and marketers for those companies who lack forming quality relationships with their customers need to take a step back and reevaluate the true purpose of what they do. The consumer should always come first. With this research, marketers and marketing teams are able to develop new tactics and strategies more catered to their target customer and make adaptations to current strategies as to not alienate existing customers. This allows for a greater reach into multiple market segments and caters to various needs instead of having a singular focus on the target market. Similarly, designers and design teams are able to analyze what features and processes work well with the target segment as well as additional market segments. Designers can then develop new skillsets and strategies that are targeted to the customers and build stronger relationships and higher brand value.

If both the designers and marketers have this kind of information, they would be able to collaborate and create better products, better packaging, better advertisements, and better relationships with customers. Marketers and designers need to have a much closer relationship with each other because they are the voice of the consumers and they decide how consumer thoughts and concerns are manifested. An integrated workflow...
between these two departments is needed to ensure that the consumer is put first. Integrated teams create a better sense of cohesion and continuity so that fewer mistakes are made, resulting in a more efficient use of time and resources. This means that employees are working for both the company and the consumer alike.

All of the information that has been presented has one common purpose: to help the consumer. Each of the elements that make up an engaging and unique design work towards helping inform the consumer, build higher brand loyalty, and ultimately give consumers a higher quality of life. Similarly, all of the work that goes into making the designs also helps the business immensely. Creating designs that build customer relationships builds brand value, creates less brand parity, increases customer involvement, and ultimately contributes to higher sales. This is possible because when consumers feel like a company cares about its customers and puts in the time and effort and actually listen to their comments and concerns, it translates to higher brand loyalty, often to the point of being a brand ambassador and evangelizing on behalf of the company. These core groups of consumers, along with the general market segments, are responsible for the success and eventual innovation of the brand and its image.

**Final Thoughts**

The benefits of this kind of research becomes more and more helpful with each new set of eyes that comes upon the survey. The data becomes increasingly relevant to designers and marketers because then a larger number of consumers have a voice in what they want to see out of their favorite brands. Consumers wanted more choices out of Starbucks, so the company dropped the “Coffee” from its name and revitalized its image. Putting a stronger focus on design is beneficial for both the consumer and the company. Stronger designs create better relationships with the consumers as well as set the brand apart from competitors who still have yet to understand how important the consumers and their thoughts are. Companies need to have marketing and design plans centered on cohesion and continuity to ensure that the products evolve into meaningful brands.

Since more and more companies are seeing the importance of high-quality design, the retail environment is becoming more and more competitive. With each business developing newer and better ways to connect with customers and grab their attention, it is becoming increasingly difficult to stay relevant and top of mind with consumers. But that is what this research is doing: keeping the industry up to date on how consumers think and what that will reveal about their behavior at the point of purchase. Newer and newer iterations of this research will delve deeper into the mind and uncover information that was not pertinent before. Design and marketing tactics and strategies must stay ahead of the curve in order to truly create meaningful connections with consumers and increase brand value. As consumers’ minds evolve, the brand and business must evolve with it to succeed.

**Bibliography**


If you wish to view larger images shown in this research, please contact tkraft@carthage.edu
The Effects of Transracial International Adoption on Cultural Identity

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Introduction
As stated by Brodzinsky et al. (1992), “Being adopted can be something that colours a person's relationship with their adoptive parents, their emerging sense of self, and the intimate relationships they forge for the rest of their life” (Reinoso, Juffer, and Tieman, 2012, p. 264). The phenomenon of developing a cultural identity for transethnic international adoptees (TRIAs) is no new concept, “Approximately 80-85% of international adoptions are transracial and 40% of all adoptions in the U.S. are transracial…A majority of these families are composed of White parents and an adopted child of color” (Baden, Treweeke, & Ahluwalia, 2012, p. 387). With such a large population of these adoptees, it is important to understand how adoption by White parents has impacted the cultural identity formation of transracial adoptees. The proposed study will identify how the experience of being transracially adopted has impacted adoptees’ cultural identities.

Conceptual Framework
This study will benefit social work practice by providing insight into the cultural identity and its development by transracial international adoptees. Information learned will help increase the cultural competency of professionals working with TRIAs.

As revealed in the review of the literature, previous studies failed to address the influence of specific birth cultures on a child’s cultural identity. Most literature looked at TRIAs as a whole and failed to identify whether or not specific biological races have an effect on the adoptees. While reviewing the literature, this author began to question whether the importance of family and the uniqueness of Latino culture would have an effect on a TRIA’s development of a cultural identity. Therefore, this study will solely focus on the Latino TRIA population. The literature also often focused on international adoptees as a whole, failing to identify if an adoptee was transracially adopted. A transracial adoptee refers to an individual who was adopted by parent(s) who identify as a race different from the biological race of the adoptee. An interracial adoptee is an individual who was adopted by parent(s) who identify as the same race as adoptee. As this study looks to gain insight into cultural identity development, the distinction between transracial and interracial adoption is significant.

The proposed study is a qualitative study, it provides information for analysis of possible themes that will allow the researcher to develop a theory, otherwise known as grounded theory. This method was chosen due to the lack of research on the complex experiences of Latino TRIAs. The study will provide information for further research of this population and their experiences.

This study utilizes the term TRIA, in reference to individuals who have been transracial and internationally adopted. These are individuals who were adopted into a different country than the country they were born in and by parents who are of a different race than their biological mother. This study defines adoptive parent(s) as an individual or couple who is not biologically related to a child and has completed all the legal requirements to adopt that child. This study defines culture, in accordance with Sherman (2010), as being a shared system of values and ideas used to interpret the world. Based on this definition of culture, this study defines cultural identity as an individual’s self-determined identification with the culture they feel reflects their interpretation of the world around them. As this study aims to look at Latino culture, this is defined as the culture of individuals who’s ancestry originates from Latin America.

To further aid in the research of the relationship between adoption and cultural identity, the existing theories through which to view this issue must be discussed. Social learning theory suggests that learning is a cognitive process that takes place primarily through observation. This conceptual framework would suggest that TRIAs identify with their adoptive parents as they directly observe their culture through everyday experiences with their adoptive families. According to social learning theory, the community in which a child grows up in contributes to their cultural identity as they observe behavior in the classroom, neighborhood, and other interactions. This would suggest that if a child grows up in a diverse community, they may be more likely to develop a biracial identity.

This study takes an ecological approach to cultural identity. The Ecological Model acknowledges that
there are complex systems such as, race, ethnicity, and culture which influence the identity development of an individual (Ung et al., 2012). The ecological model of the study looks holistically at how factors on micro, mezzo, and macro levels interact and influence one another and the individual. In the context of this study, an ecological approach suggests that TRIAs identities are developed as a result of a multitude of factors including, but not limited to, their adoptive parents, families, communities, and ties to their birth culture.

Literature Review

In the current extant literature, there is a lack of clarification in regards to the terminology associated with the transracial adoption. To better understand the topic, there must be clarity in the terminology used. As defined by Baden et al. (2012), transracial adoption refers to “the adoption of a child of one race by a parent or parents of a different race than that of a child” (p. 387). For the purpose of this article, transracial and international adoptees are referred to as TRIAs (Baden et al., 2012, p. 387). The term ethnic identity is “that part of an individual’s self-concept which derives from his knowledge of his membership of a social group (or groups) together with the value and emotional significance attached to that membership” (Scherman, 2010, p.129). As stated by Sherman (2010), culture is “the system of shared ideas and meanings, explicit and implicit, which a people use to interpret the world and that serve to pattern their behaviour” (p. 129). As they often overlap and have shared characteristics, it is hard to distinguish where an ethnic identity ends and cultural identity begins (Scherman, 2010, p. 129). This article will therefore be referencing ethnicity and ethnic identity as it relates to the difficulties TRIAs have in establishing a cultural identity.

Development of a strong cultural identity has been shown to influence many aspects of an individual’s life. Friedlander, Larney, Skau, Hotaling, Cutting, & Schwam (2000) found a close relationship between ethnic identity and self-esteem (p. 188). As TRIAs differ racially and ethnically from their adoptive parents, society often mislabels or culturally misunderstands TRIAs. This impacts the development of self-esteem. One way to counteract this impact on self-esteem is through the development of a strong ethnic identity.

Not only does a strong ethnic identity raise self-esteem, but it also has been shown to help children cope with stress. Hernández, Conger, Robins, Bacher, and Widaman (2014) highlighted the importance of ethnicity in regards to coping with stress caused by the transition to adolescence. They found that “a sense of ethnic pride may help minority children successfully cope with these stressful circumstances” (Hernández et al., 2014, p. 695). Further, ethnic identity has been related to positive development and has been shown to help individuals cope with adversity (Hernández et al., 2014, p. 696). This concept exemplifies how individuals handle adversity in a healthy manner when they feel they have the support of a group. In the case of TRIAs, a strong ethnic identity allows them to feel a part of a group and enables them with coping skills in the face of adversity.

However, establishing a strong ethnic identity becomes complicated for TRIAs, who experience being racially different from their adoptive parents. The result of this difference is the ability (and the challenge), of deciding where they identify culturally, as racial identity and ethnic identity “mutually influence each other” (Scherman, 2010, p.132) and as stated, often overlap with cultural identity. This overlap allows TRIAs to examine their racial and ethnic identity differently over time and when in different settings (Phconix & Simmonds, 2012). As they grow to establish their cultural identity, transracial adoptees often develop a bicultural identity, which “is simply an extension of ethnic identity, whereas one simultaneously identifies with two different ethnic groups” (Scherman, 2010, p. 130). This can be further understood by taking into consideration that

The transracially adopted child is raised within the cultural experience of her or his adoptive parents. In the cultural milieu of American society as well as in the psychological literature, adoptees are forever tied to being associated with their birth culture. Expectations exist that adoptees’ birth cultures are their cultures forever, with little recognition that adoptees’ actual lived cultures (postadoption and through adolescence) are almost always the White American culture of their adoptive parents (Baden, 2008). (Baden et al., 2012, p. 388)

This clash of cultures leaves an interethnic adoptee with the difficulty of deciding, regardless of what those around them may say, where they feel they belong not only in regards to their ethnicity, but also their cultural identity. TRIAs must find a balance between their biological culture and adoptive culture (Scherman, 2010) in order for TRIAs to develop a bicultural identity, as they often do. When asked how they identify, responses from TRIAs often include both their birth and adoptive cultures. In studies done by Friedlander et al. (2000) and Andujo (1988), transracial adoptees were asked how they identified ethnically. The responses reflected a combined identity such as being Korean American. This clearly displays the blended cultures of a bicultural identity.

Baden et al. (2012) found that TRIAs also identify their culture as “adopted.” In some cases, TRI-
As feel more connected to the community of adoptees than those of their birth culture or even those of their adoptive culture. As they experience the phenomenon of falling between the divisions of cultures, TRIAs may find themselves identifying closest with others in similar situations. As Baden et al. (2012) describes, adoptees may feel that neither their birth culture nor their adoptive culture truly reflects their cultural practices or experiences. Instead, they may identify primarily as an adoptee and associate with other adoptees…these adoptees may feel dissatisfied with their adoptive parents’ culture and may have made efforts to reclaim or reculturate to their birth culture…However, the adoptees in this outcome may not feel they belong in either their birth culture or their adoptive parents’ culture and instead consider their culture that of being adopted. (p.395)

Thus, transracial international adoptees create their own culture rather than identifying as their birth or adoptive cultures and experiencing feelings of cultural conflict.

In order to thoroughly explore the topic, it is essential to also understand how cultural identity forms. This process often begins on an individual level of curiosity about birth culture as they desire to know more about their life before adoption (Baden et al. 2012). Thus, TRIAs develop their cultural identity through the process of exploring their birth culture and evaluating their sense of connection. As many TRIAs lack opportunities to maintain genuine cultural ties with their birth culture, this process often becomes complicated (Baden et al., 2012). As their lived experiences often reflect “the honorary White status they attain through their adoption by White parents” (Baden et al., 2012, p. 389), TRIAs often identify as being White for periods of their identity and cultural identity formation process. Although, there often comes a point in their lives where they feel unable to continue “passing” as White children because of their White adoptive parents. It is at this point that TRIAs explore their birth culture (Baden et al., 2012). During the process called reculturation, many TRIAs feel the need to disclose that their adoptive parents are White (Baden et al., 2012), suggesting conflicting feelings of belonging and acceptance into their birth culture. With the dissonance of so many feelings, it is no wonder that TRIAs often create their own, distinct, cultural identity.

The literature suggested another major influence during the development of cultural identity, adoptive parents’ involvement and encouragement in the child’s developing identity. It is imperative that adoptive parents recognize and explore the ethnic and cultural heritage of their child, as it is an essential part of a child’s development of a sense of self (Andujo, 1988). Research has shown, “children whose parents provide birth-culture socialization have better adjustment outcomes than those children whose parents emphasize dominant-culture socialization” (Scherman, 2010, p. 128). Thus, parents should make a conscious effort to promote a child’s curiosity about their birth culture. Literature on cultural identity has successfully identified the key role parents have in a child’s identity development.

Research has also shown that a TRIAs social environment plays a role in their cultural identity. As Bailey (2006) stated, “identity is developed via a “social categorization” of the self. This social categorization is internalized in that a sense of self is derived from the variety of groups, including ethnic groups, to which a person feels she or he belongs. Thus, attaining an identity is a process in which one actively constructs a concept of the self from an array of social groups. (p. 3)

TRIAs exposed to social groups of various ethnicities may develop a diverse environment, which may reflect in their cultural identity. Those who are not involved in diverse groups may reflect in a singular cultural identity. In order to fully understand a TRIAs cultural identity, their environment must be taken into consideration. Stated by Ung, O’Connor, & Pillidge (2012), “an adequate theory of racial identity development for transracial adoptees must account for the inner experiences of this population, in addition to the impact of the environment on a transracially adopted person’s sense of self and identity” (p. 74). In particular, diversity in a child’s neighborhood is reflected in their cultural identity (Hernández et al., 2014). These findings suggest that those around them contribute to how an individual identifies ethnically. For TRIAs, not only does differing from the ethnicity of their immediate family affect their identity, but the neighborhood in which they grow up also matters.

The development of a cultural identity, is a process which most often takes place over years. Current research and theories, however, fall short in taking account lifespan in the development of an identity (Ung et al., 2012, p. 76). As supported by Erikson’s stages of psychosocial development, children ages 13-19 enter the stage of “Identity vs. Role Confusion” in which they begin to question who they are. It is important to take into account that during this stage, an adolescent’s cultural identity may fluctuate as they navigate through this time of identity formation. This stage can cause an abnormal amount of confusion for TRIAs, who are already experiencing the phenomenon of developing a unique cultural identity.

Cultural identity is inherently flexible, as an individual moves through childhood, adolescence, and adulthood. Cultural identity changes as TRIAs experience and develop over the course of their lives (Ung et al., 2012).
For this study, the population of transethnic international adoptees was narrowed down to specifically individuals who were born Latino and adopted into White American families. There are a few aspects of Latino culture which, in contrast with the experiences of TRIAs, highlight unique characteristics of the Latino population and call for further research. Latino culture emphasizes the importance of obligation, honor, and respect for family and parents (Roche, Caughy, Schuster, Bogartm Dittus, & Franzini, 2014, p. 1389). For TRIAs attempting to become accustomed to Latino culture, this may prove to be discouraging, as these adoptees were raised by a non-Latino family which may therefore heighten their feelings of displacement. For this reason, TRIAs of a Latino heritage may be seen at a disadvantage in their journey to develop a cultural identity.

Another aspect that must be taken into consideration is the desire of Latino children raised in America to have the same amount of independence as their peers (Roche et al., 2014). TRIAs trying to gain exposure to their birth culture are likely to reference those in their social groups who identify as Latino. This may make for inconsistencies in their experience of the Latino culture. Just as TRIAs may be turning to their Latino-identifying peers for cultural reference, similarly, their peers may be turning to them for the same. This interdependence may create a misconception about Latino culture for TRIAs (Roche et al., 2013).

There are several consequences of a lack of research in this area. The process of establishing an identity can be stressful for anyone, it involves coming to the inner conclusion of who they are and then informing the rest of their environment that is who they intend to be, or moving from internalized identity to externalized identity (Ung et al., 2012). For TRIAs experiencing the process of developing a cultural identity, “acculturative stress disorder can occur when an individual attempts to negotiate two cultures and adapt to the cultural changes required of the individual to fit into the new environment” (Baden et al., 2012, p. 388). They often experience identifying as opposite or different from what others have already categorized them, which may add a seemingly insurmountable amount of stress and lead to mental health risks (Baden et al., 2012).

Another repercussion, not only applicable to TRIAs but to all adoptees, “children who are adopted internationally are at risk for losing their ethnic heritage” (Bailey, 2006, p. 2). Those practicing in the field of adoption should encourage adoptive families to support their adoptee to explore their birth culture to prevent a loss of heritage. Further research should explore effective ways for families to encourage their children to explore culture and identity.

Lack of research also leaves TRIAs at a higher risk of marginalization, as TRIAs may feel they do not truly fit into either their birth or adoptive cultures, causing them to feel excluded (Sheerman, 2010). Research will help to prevent the marginalization of TRIAs and promote a societal understanding of the complexity of their experiences.

This study seeks to better understand the bicultural and adoptive identities of Latino TRIAs. The phenomenon of being transethnic and internationally adopted provides further insight into how culture is experienced and cultural identity is formed. As the experiences of TRIAs challenge societal norms of cultural identity, further research on this topic is necessary (Phoenix & Simmonds, 2012).

**Methodology**

The participants of this study will consist of 3-5 transracial international adoptees who’s birth parents identified as Latino. The study will include only adoptees who were adopted by American, White parent(s). The study will exclude anyone under 25 years old and persons adopted after the age of three. For this study, the researcher will recruit from various settings, such as adoption agencies, education professionals, and healthcare professionals, using snowball sampling.

After confidentiality is explained and written informed consent is obtained, the study will consist of three semi-structured interviews by interviewers who will be Latino-Americans. This will allow the interviewers to be well versed in American culture, as well as Latino culture to promote a sense of belonging with participants. The interviews will be held consistently with the same interviewer for all three interviews and at San Diego State University. Scheduled appointments will be made at the convenience of the participants. The interviews will include questions relating to how the adoptees racially identify currently, and how their identity has changed or solidified in adulthood. They will also be asked who or what influenced their cultural identity. A semi-structured interview will be used to direct conversations to focus on cultural identity while allowing the researcher to ask any other questions they feel pertinent to better understand how participants developed their identities.

To triangulate this information, interviews will also be held with the TRIAs parents. Triangulation of data is necessary to ensure validity of the information collected. The interviews held with parents will consist of three semi-structured interviews. These interviews will be set up in the same manner as those held with the adop-
tees. They will consist of questions related to the information gathered from the parents’ child.

To confirm the information gathered is accurate to the information conveyed by the TRIAs, interviewers will allow the adoptees to read notes, manuscripts, and findings of the research. This will allow the interviewees to member check and correct any mistakes or miscommunications in the data.

**Discussion & Conclusion**

This study is modeled after Friedlander et al. (2000) with a few changes in the demographics of participants. Sampling methods for this study will also differ from those used in Friedlander et al. (2000), as the study recruited participants from local adoption support groups. However, it is likely that families involved in adoptive support groups are proactive in familiarizing their children with their birth culture, creating bias in the participants. This study will recruit from differed settings to avoid that potential bias. In the modeled study, the adopted children had various heritages. This study will include only adoptees of Latin American heritage to gain insight into the unique experiences of biologically Latino TRIAs.

Limitations of this study will include the inability to generalize data collected. While the information gathered may hold true for the participants, their experiences may not be generalized and established as “typical” for all Latino TRIAs or TRIAs of all heritages. This information also cannot be extended to adoptees who were adopted over the age of 3. Any theories or emerging themes developed from the data may only be extended to the participants of the study and cannot include a larger population. However, the insight this study would provide may be used as a basis for further research on TRIAs cultural identity development.

The information gathered in this study would benefit social work practitioners by furthering their cultural competence when working with TRIAs. It will also allow them to better understand the complexity of the development and influences on cultural identity. With this knowledge, social workers may advocate for programs and services that aid TRIAs in the healthy development of a cultural identity. Also, identifying the major influences in this development will allow practitioners to encourage those influences in their involvement with TRIAs. Further research on the topic of cultural identity and TRIAs should expand to incorporate adoptees of other heritages to provide a more comprehensive understanding of the way in which individual cultures influence their experiences.

**References**


The Impact of Diversity on a Small Liberal Arts College in the Midwest

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Abstract
Diversity takes multiple and overlapping forms in college and university settings, including race, gender, sexual orientation, religion, age, disability and political viewpoint. As current research heavily focuses on race, this research expanded on current knowledge by looking at the many dimensions of diversity to analyze the factors of support among college students towards diversity initiatives on campus. The factors included: race, gender, religious identity, class standing, prior experiences with diversity, vicarious experiences through friend groups, and comfort levels with diversity. The theoretical framework of conflict theory and cultural theory expanded understanding on the impact of prejudices on student support of diversity initiatives. This research utilized the concept of Myrdal’s vicious cycle to gain a deeper understanding of prejudices toward race and sexual orientation. This project found comfort levels were an intervening independent variable for student support of diversity initiatives, and gender, race and student comfort levels with diverse situations were the biggest predictors of student support of diversity initiatives.

The Impact of Diversity on Institutions of Higher Education

Numerous studies have been conducted on the impact of a diverse student body on campus and in the classroom at colleges and universities across the United States. Several of these studies focus on the impact of affirmative action and the impact of the Supreme Court decision to not allow measures, such as racial “quotas”, in college and university enrollment decisions (Carroll, Tyson and Lumas 2001; Epple, Romano and Sieg 2008; Inkelas 2003; Smith 2006). Among these researchers there was an agreement of the positive effect of affirmative action measures in college enrollment decisions on students of underrepresented populations. Not only do affirmative action measures positively influence minority groups, but also the student experiences throughout their time on campus. Former Harvard president, Neil Rudenstine published an article arguing the importance of diversity in his college to stimulate all students to live and learn from their peers, whose perspective and experiences differ from their own (Rudenstine 2001). It has been argued the loss of racial quotas in admission processes has harmed minority groups’ ability to enter post-secondary schooling. Therefore, colleges and universities must develop means to foster formal and informal diversity experiences for their students for student’s benefits. This is especially important when studies have shown most pre-college experiences with diversity either lacks any experience or for those with exposure to diversity the experience lacks significance or meaning for individuals (Carroll et al. 2001; Goldstein 2013; Parka and Change 2015). Studies have also found college to be important formative years for students to experience diversity, either through the classroom or vicarious experiences with friends there are long term effects on students understanding and appreciation of diversity (Bowman 2012; Park and Chang 2015).

Therefore, this thesis studies the impact of affirmative action and the loss of racial quotas in higher education on minority groups and student experience. It examines the impact of formal and informal diversity experiences on white, non-Latino students and students of underrepresented populations. Pre-college experiences are studied to see the impact on students’ college experience and time after college. Finally, this thesis examines the impact of diverse experiences beyond race and ethnicity, such as gender, social class and other diversity variables to examine the impact of students’ time on campus. This thesis examines these variables as well, because research has shown the impact these variables have on a student’s ability to adjust to college life (Goldstein 2013; Villalpando 2004). I will examine these different dimensions on colleges and universities in order to inform and answer the question, “How do attitudes and perspectives about diversity among college students influence their support of diversity initiatives at a small liberal arts college in the Midwest?”

Literature Review

Affirmative Action and Its Effect on Minority Group Success
The United States has a long history of inequality: the Constitution excluded blacks and women for decades from many rights, most obviously voting, the government failed to abolish slavery until 1865, and even today minority groups continue to fight for equality. As a means to overcoming these inequalities many different social institutions across the country implemented affirmative action measures. This is also true for institutions of higher education interested in creating more diverse campus communities. This shift to the use of affirmative action measures in college enrollment measures began after the Supreme Court ruling to end the use of racial “quotas”, stating race could not be the sole factor in acceptance at public institutions of higher education. Therefore, examining the impact of affirmative action on colleges and universities proves essential to a better understanding of its importance for underrepresented populations in education, but also the benefits this has to the overall student body, which will be discussed in following sections.

Epple, Romano and Sieg (2008) argued the ability for colleges and universities to include race in factors for acceptance of minority students greatly increased the ability to receive acceptance into colleges and universities, especially at top tier schools. Carroll, Tyson and Lumas (2001) argued affirmative action efforts led to a dramatic decrease in the gap between students from underrepresented groups and whites on campus. Carroll et al. (2001) found one of the key factors to success for minority groups was the “home” community they found on campus with increased numbers of minority students. According to Epple et al. (2008) race-blind admission policies would most dramatically decrease minority students in the most selective colleges and universities, but also leads to declines in all institutions of higher education across the United States. With a loss of affirmative action measures a decrease in minority students at all college and universities would occur and this “home” community may cease to exist. This may dramatically affect the academic and social success of the remaining minority students on campus.

Smith (2006) examined why this opposition to affirmative action measures and diversity initiatives existed on campuses. Smith (2006) argued the main opposition stemmed from three factors: gender (male), reactionary racism and cultural pathology stereotypes, which accounted for 76% of the variance in student’s opposition to curriculum with diversity efforts. The first two of these variables, gender (male) and reactionary racism, were the most significant and the best predictors of opposition. Smith (2006) found affirmative action and social justice demands were impeded on by “colorblindness”. This is seen by a shift in racist perspectives in which whites no longer strongly oppose racial equality, but there is substantially less support for race targeted efforts. In general, Smith (2006) found white and Asian-American students are less supportive of diversity initiatives. Inkelas (2008) studied Asian Pacific American (APA) students and their views of affirmative action and perspectives and programs on campus. APA students are sometimes referred to as the “invisible population” or “model minority” as they are more likely to conform to dominate ideology. APA students, as seen in Smith (2006) study, are just as often placed with white students as with other minority students for their beliefs and support of different diversity initiatives. Inkelas (2008) found APA students’ social beliefs and their college environment greatly influenced their perspective of affirmative action. Social beliefs included APA students’ adherence to dominant ideology, and their college environment included interracial interaction on campus. The more an APA student believed in the dominant ideology, the less likely they would support affirmative action measures. Dominant ideology is a common social belief throughout the United States which encompasses argues everyone should receive the same amount of government assistance regardless of economic standing. Dominant ideology strongly believes hard work will always be the most effective way to achieve goals that barriers due to race and other diversity variables do not really exist in today’s society. Dominant ideology is largely influenced by colorblindness, in which students claim they do not see the color, race or ethnicity of others, abstaining them from being capable of racism. However, the more often an APA student had informal conversations about diversity, the more likely they were to support affirmative action. As it will be shown in the following section, dominant ideology and informal diversity experiences influence more than just APA students’ support of diversity among college campuses.

The research of Carroll et al. (2001), Epple et al. (2008) and Inkelas (2008) showed the need for affirmative action measures in college enrollment policies. Not only does affirmative action increase minority students’ ability to be accepted, but also influences the ability for these students to find a “home” community, which is an essential part to their success and satisfaction at their school (Carroll et al. 2001). Smith (2006) further explained why opposition of affirmative action exists in higher education, which raises the question of what colleges and universities can do to lessen this opposition. Both formal and informal diversity experiences affect each other and students during and after their college experience.
Formal and Informal Diversity Experiences

With the loss of racial “quotas” and at some institutions affirmative action measures in enrollment policies, how can colleges and universities stimulate an environment that supports diversity initiatives and stimulates conversations inside and outside the classroom? Bowman (2012) argued there are less opportunities prior to college for students to experience diversity. Therefore, college is the prime time for encountering diversity and shaping perspectives. Bowman (2012) supported this by finding diversity experiences in the first year of college increased other types of diversity experiences in the senior year. Most interesting about Bowman’s findings, they were consistent regardless of a student’s openness to diversity. Bowman (2012) also found informal interactions with diverse students predicted increases in curricular diversity involvement and formal experience in the classroom. However, Bowman argued increase in diversity coursework lead to increased negative diversity interactions. Bowman claimed this may occur because coursework led to an increase in student awareness of negative interpersonal dynamics and tensions. Inkelas’ (2003) findings supported this by finding students who major in the humanities or social science division have less positive views of the racial climate. These students are more likely to take coursework with topics including diversity. Villalpando (2002) found individual involvement where the student decided to attend workshops about diversity and socialize with other groups impacted student satisfaction with college the most. The only group Villalpando (2002) found that did not have increased levels of satisfaction with their college experiences was African American students. Villalpando (2002) argued this may be due to most African American students’ interactions are with White students, whom are not always the most welcoming or understanding group. This would support Bowman’s (2012) findings of more reported negative informal interactions possibly because of increased awareness of negative interpersonal interactions.

Furthering the importance of informal interactions and experiences, Inkelas (2003) argued a relationship existed between attending formal diversity experiences, such as university held programs, with increases in the likelihood of informal conversations about diversity with friends. These informal experiences increased student support of affirmative action measures. Villalpando (2004) looked specifically at the Latino population and found experiential learning and experiential knowledge of people of color is essential to eliminating racial inequality. Allowing minority students to speak about their experience not only helped students feel they had more support on campus, but also helped to end dominant ideology stereotypes among other students. This supported Carrol et al. (2001) argument of the importance of a “home” community on campuses. Villalpando (2002) found faculty members, who were dedicated to promoting multiculturalism and diversity in the classroom and in their research led to increased student satisfaction with their college experience. These studies found both formal and informal diversity experiences were important for shaping students’ college experience and thoughts about diversity (Bowman 2012; Inkelas 2003; Villalpando 2002; Villalpando 2004). However, there is still a lack of agreement among these authors on what is more significant for shaping students’ perspectives on diversity. There is little agreement on whether formal interactions lead to informal interactions or the reverse relationship. Other than offering and possibly requiring students to attend programs and/or classes that address diversity, it is difficult for institutions to force informal interactions. This may be why it is difficult to understand the order in which formal and informal interactions occur. However, both are an integral part of developing students through their college years, which Bowman (2012) stated is an influential time in young adults lives. This is especially true when it is understood the lack of diversity experiences the pre-college years can offer.

Pre-college Experiences with Diversity

Though college is an essential time for young adults to develop their thoughts and perspective on diversity, examining pre-college experiences gives a more in-depth review of development of support for diversity initiatives during the college years. Park and Change (2015) argued, “Racial segregation in various spheres of American life (i.e. education) has real ramifications for how students are primed and prepared to deal with diversity in college.” (359). Park and Chang (2015) found most students coming out of high school had few experiences with diversity or for those that did, these experiences did not lead to acknowledgment or deeper thinking about race and diversity. Bowman’s (2012) findings supported this; typically there were less opportunities and experiences both formal and informal in pre-college education. Park and Change (2015) argued this lack of experience and understanding is due in part to the lack of education educators in high school receive, which leads them to be less equipped to dealing with and encouraging discussion around issues of race and diversity. Thus, Bowman (2012), and Park and Change (2012) argued college is in the prime development years to deal with these issues.

Park and Change (2015) found three settings in which high school students experienced or did not expe-
rience diversity, and in each setting, they found little to no impact on student understanding of diversity. The first setting consisted of schools where the majority of students were of one race/ethnicity. Therefore, these high schools lacked any kind of diversity. This caused extra need to engage students in conversations about issues of race and diversity, due to a lack of experience. This also led to issues of students being able to acknowledge race as a concept. This was especially an issue for minority students being in the majority group prior to college. Transitioning to a minority status was extremely different for these individuals. The second setting included diverse groups, but little engagement between these groups ever occurred. Park and Change (2015) found “academic divisions divided students along ethnic lines.” This caused many students to assume this was just how the world worked. The finally setting Park and Chang (2015) found dealt with students who had a multitude of experiences with diversity, yet these students did not have meaningful discussion or thought about the meaning and significance of this diversity. This reinforced Park and Chang’s (2015) finding that high school educators are not prepared to stimulate discussion about diversity, nor are the students capable of engaging in conversations about race and diversity.

Though Park and Chang (2015) found high school students’ experience with diversity lacked significant meaning, Goldstein (2013) found a correlation between high school friendship circles and college friendships. Goldstein (2013) argued, not only did high school friendships affect college friendships across interracial/ethnic dimensions, but also across religious denominations, social class and sexual orientation. Goldstein (2013) examined college organizations as well and found no confirmation that Greek participation reduces the likelihood of intergroup friendships, but argued “with modification of the structure and recruitment strategies for college extracurricular activities it may be possible to increase the likelihood of intergroup contact in these settings.” Goldstein’s findings stress an important aspect of diversity that colleges and universities must also consider, not only race and ethnicity, but other diversity variables. This thesis analyzes beyond race/ethnicity as means to understand all dimensions of diversity and the impact on college and university campuses.

Theory

For a theoretical framework, several theories can be employed to describe prejudice and its continuation especially in student rejection of affirmative action and race-targeted programs at institutions of higher education. Conflict theory focuses on the use of prejudices by the ruling class in order to limit the power of competing groups. In context of colleges and universities, holding onto prejudices hinders the support and success of minority groups. As a theory of social inequality it is essential for the ruling class to maintain control of the intellectual centers of society. Prejudice in institutions of higher education would therefore be essential to the ruling class to dominate the intellectual centers of today’s society. Cultural theory or cultural transmission theory argues prejudice is a part of a society, rooted in culture and individuals simply learn prejudices through society. Though conflict theory offers a clearer beginning to prejudice in society, two cultural theory concepts will be examined to explain the continuation of prejudices in generations and through generations. First, for the purpose of this research a few words will be defined specific to this thesis. Prejudice will be defined as negative thoughts or attitudes against an individual by another based on race/ethnicity or any dimension of diversity. Discrimination will be defined as action taken based on a prejudice with or without the intent to harm. Finally, affirmative action will be defined as measures taken by any group or organization to increase minority group participation.

In the 1940s, Gunnar Myrdal examined racism in the United States. He argued racism occurs when the dominant group places the minority group in an inferior position. The minority group remains in an inferior position, through the reinforcement of racist ideologies in a continuous cycle among individuals and encouraged by society. Though Myrdal developed this concept over seventy years ago, the vicious cycle still applies to race relations today. Myrdal argued oppression by one group leads to poor performance of the other, which justifies the original oppression. This can clearly be seen in many social institutions in the United States and will be applied to colleges and universities.

On college campuses when a minority student or group holds an inferior status from the view of the dominant group, a system of racial stratification develops to justify their individual prejudices and ideologies of racism. According to Myrdal, the system then confirms these prejudices and ideologies as acceptable. As the barriers to education for minority groups throughout the United States increases the number of minority students and minority groups decrease on campus. This may cause the initial view of minority students as inferior to white students simply because a lack of numbers and experiences by whites with these groups. This prejudice view is reinforced more by the dominant ideology in United States which furthers opposition to affirmative action measures and race-targeted programs, and the continuation of this
ideology can be explained through Myrdal’s vicious cycle concept. The dominant ideology incorporates “colorblindness” and the long tradition in the United States of the belief that hard work always leads to success. This ideology leads many whites to believe minority groups are lazy individuals and they are in poverty, because they have not worked hard enough to deserve more. Or in terms of higher education, minority groups are not present in colleges and universities, because they have not worked hard enough to get there.

The next step in this self-perpetuating cycle is for individuals to reinforce prejudices through everyday observation of the inferior status of minority groups. This only further motivates discrimination based on race and ethnicity. On campus, the dominant group of students may reinforce their views of minority students when they see these students struggling in the classroom. Though this may be due to the lack of preparation the minority student’s high school could offer them, this experience justifies prejudices toward minority students and reinforces the inferior status. Validating these prejudices and making them apart of everyday life completes Myrdal’s vicious cycle, which starts over at reinforcing the inferior status. These three steps, the system validating the inferior status, the individual justifying this status through everyday observations, and reinforcing these prejudices and racism towards minority groups, helps to evaluate the continuation of prejudice in colleges and universities in the United States. This completes the cyclical pattern of discrimination that will only continue to get worse throughout adult life and continue after college. If the concept of social distance is examined within this context, it may be possible to understand the necessity of colleges and universities to host formal diversity experiences in order to end dominant ideology prominent on many campuses, especially if the school’s student body lacks a diverse student body limiting informal experiences.

The concept of social distance shows prejudice and racism has existed consistently throughout decades of U.S. society. Emory S. Bogardus developed this scale to measure individuals’ willingness to interact with other members of diverse social groups. Though everyone experiences differing personal interactions with different minority groups and cultures, an overall pattern appears through generations. The scale measures individuals’ acceptance of other cultures and races by asking individuals to rank what they would be willing to allow members of different races, cultures and ethnicities to do from marry a family member to be expelled from the country. Through generations there has been little variation in the ranking of different cultures and races among individuals in the United States (Healey 2006). This highlights the continuation of racist ideologies throughout the history of the United States and supports the validity of Myrdal’s concept of the vicious cycle to racism and prejudice in today’s society.

Expanding on prejudice in colleges and universities, Smith (2006) studied the critical dimensions of contemporary racial ideology and found the continuation of opposition to affirmative action and race-targeted programs stems mainly from reactionary racism. Smith’s (2006) findings help expand on the theoretical framework of conflict theorists as reactionary racism is yet another form of prejudice stimulated by the dominant ideology and occurs when one group feels threatened. Reactionary racism is a negative reaction to social change, in which respondents claim minority demands have “gone too far.” An example of how this affects many dominant group perspectives includes views of government aid to the lower class. To many white citizens, government programs to help individuals and families in need are a hand-out operation for undeserving people (Kantz 2013). Many times this view stems from fear as whites view minority groups as threatening, because they absorb too many materials without giving back. These prejudices are generalized to other threatening groups based on attitudes shaped by many dimensions of diversity. As Goldstein (2013) found, race alone does not encompass all diverse variables students have to overcome. Minority students almost always face obstacles based on their race, but also sexual orientation, social class, religion and even their proficiency in English. Prejudices against these qualities can cause just as much tension as issues over race and ethnicity on college campuses. By examining attitudes of students towards race/ethnicity and these other dimensions of student identity on campus, support for diversity initiatives can be explained. This theoretical framework of prejudice by conflict theorists and cultural theory and related concepts expand on why students would be unsupportive of steps taken towards diversity measures on campus.

Figure 1: Path Diagram of Indicators for Support of Diversity Initiatives
The path diagram demonstrates the assumptions this thesis will evaluate in the following sections. The hypotheses total thirteen and are as follows:

H1 - Being male will make one less comfortable with diverse situations.
H2 - Being white will make one less comfortable with diverse situations.
H3 - Being non-affiliated with any particular church or denomination will make one more comfortable with diverse situations.
H4 - Being of senior standing will make one more comfortable with diverse situations.
H5 - Having prior experiences with diversity will make one more comfortable with diverse situations.
H6 - Having a more diverse group of friends will make one more comfortable with diverse situations.
H7 - Being male will make one less comfortable with increase support for diversity initiatives.
H8 - Being white will make one less comfortable with increase support for diversity initiatives.
H9 - Being non-affiliated with any particular church or denomination will increase support for diversity initiatives.
H10 - Being of senior standing will increase support for diversity initiatives.
H11 - Having prior experiences with diversity will increase support for diversity initiatives.
H12 - Having a more diverse group of friends will increase support for diversity initiatives.
H13 - Increased levels of comfort with diverse situations will increase support for diversity initiatives.

Hypotheses 1 – 6 treat comfort levels with diversity as the dependent variable. Hypotheses 7 – 13 treat support for diversity initiatives as the dependent variable.

**Research Methods and Data**

Existing research has expanded knowledge about colleges and universities ability to embrace diversity as a means to enriching their students’ experiences in their post-secondary education. There now exists an in-depth understanding of the importance of diversity on campus and the importance of formal and informal diversity experiences. However, there is a lack of understanding as to what effects student support of initiatives colleges and universities can take to increase formal diversity experiences on campus. Therefore, this research proposal asks the following question, “What factors influence support of diversity initiatives among college students at a small liberal arts college in the Midwest?” To conduct this study, a questionnaire was written and distributed with student employee help throughout a small liberal arts college in 2008. In 2015, the questionnaire was edited to include missing information, such as precollege experiences with diversity and small changes in the demographics section. By using these two questionnaires with a heavier focus on the more recent questionnaire, factors such as gender, race, religion, class standing, prior experience with diversity, and vicarious experiences through friend groups will be examined to determine these variables relationship to attitudes about diversity and support of diversity initiatives among college students. This research proposal is essential to understand what impacts support for incorporating more programs about diversity aimed at increasing college students’ experience with diversity during these formative years.

Each set of questionnaires’ sample technique, distribution and collection techniques were consistent with each other with the greatest difference in the receptiveness of professors at the college to allow the questionnaires to be distributed in class. To ensure a random sample with all classes and giving equal opportunity to all students to be chosen for questionnaire distribution, a class list was created and classes were stratified by class size. However, to increase student participation, classes with 5 or less students were taken out of the sample size. Classes were then selected at random within each of the three stratified by size. For classes that were selected, an email was sent to the professor requesting ten minutes of class time either at the beginning or end of class for their students to participate in this diversity survey on campus. Specific to the 2015 survey, of the professors that received an email there was a 74.2% response rate indicating they would be willing to allow their students to participate in a survey during a class period. Data collection occurred in April 2015 with a total of 373 student completed questionnaires. In comparison to the 2008 survey, in 2015 faculty were more willing to respond and agree to allow their students to participate in the questionnaire at a higher response rate with more ease.

In order to compare the changes that had occurred between 2008 and 2015 among the student body and their attitudes toward diversity initiatives and experiences there were only a few select changes made in 2015. Both questionnaires included demographic information including gender, age, race, and class standing. Questions about friendship circles remained the same, students were asked to report how many of their ten closest friends differed from them in race/ethnicity, gender, sexual orientation, political/social views, age, religion, physical disability and income. Students were asked to report if they felt they had ever been treated differently based on
the diversity variables mentioned for the question above and if they had seen others treated poorly for any of the above reasons. Lastly, students were asked to rank how high of a priority thirteen different diversity initiatives should be on campus and how comfortable students were in twenty-one different diverse experiences. What differed between the surveys included the exclusion of a section asking if enough was being done at the college about diversity and encouraging a diverse atmosphere on campus. This was taken out for 2015 due to the additional questions added to the questionnaire and to avoid testing fatigue due to the repetition in questions. To the 2015 questionnaires, a section was added about prior experiences to college with diversity and two new variables were added to the demographics section, those being affiliation in Greek life and if the student was a transfer to the college. For more detail information about questions in each survey see Appendix C1 for the 2008 questionnaire and Appendix C2 for the 2015 questionnaire.

Due to the extensive material in both of the questionnaires indices were built in order to evaluate and utilize as much data as possible. An index was built and labelled as vicarious experiences through friend groups and built from the matrix-type questions about their closest friends. This new variable was recoded into low experience, medium experience and high experience creating a Likert scale for how many diverse friends exist in a student’s friend group. Another variable extracted from the data included an index built to understand the impact of pre-college experiences on students. Indices were also built for student support of diversity initiatives on campus. The first index focused on faculty, student and courses development, and the second focused on steps the college could take such as programs and supporting student organizations. For more detailed information on these indices see Appendix A.

Data and indices analysis will include the use of frequency distributions, contingency tables and multiple regression. The data will be analyzed in two parts. First the comfortable levels will be analyzed to understand the impact demographics, prior experience and friend groups have on comfortable levels and to see if there is a significant relationship between any of these variables. Then, the priority levels will be examined to see the impact of the variables mentioned above and their impact on how students rank diversity initiatives on campus. Multiple regression will be used here. See Figure 1 above for specific hypotheses this thesis will examine to see what impacts support of diversity initiatives among college students.

The purpose of this study is to expand knowledge on student support of diversity initiatives on colleges and universities. Therefore, the questions in the questionnaires are focused on student support not directly on prejudice on college and university campuses. The questions were developed based on previous research that stated informal diversity experiences and formal diversity experiences are important aspects to developing positive views of diversity among college students. Though the focus of the survey may lower the validity of this research in understanding prejudices among students, the questionnaires enable a deeper understanding of best policies and practices to eliminate opposition to diversity initiatives to expand on students learning. However, the questionnaire does contain questions about students’ comfort level with differing diverse situations similar to Bogardus’ social distance scale. This allows for a comparison between the 2008 data and the 2015 data to see if the student body has made any changes. For this particular research and the questions it attempts to answer, it would be helpful to understand how much this research can be generalized. Based on previous research, this data should be able to be generalized to other small liberal arts school, but also predominantly white colleges or universities across the United States, especially at historically white colleges. Therefore, this research offers a unique insight into understanding student support of diversity initiatives and how colleges and universities can stimulate formal diversity experiences among the student body.

Results and Findings

For the purpose of this thesis, the 2015 wave of the diversity survey is analyzed here. The survey totaled 373 respondents, 93% of respondents were of standard college (up to 22 years of age). The other 7% included from 23 years to over 50 years of age. Fifty-five percent of respondents reported female and 44% reported male. Eighty-two percent of respondents reported white, 18% reported other for race/ethnicity, in which 6% reported bi-racial or multi-racial. Nineteen percent of respondents reported their religious identity as Lutheran, 30% Catholic, 23% as other and 28% reported no religious affiliation. Sixteen percent of respondents reported freshman standing, 33% reported sophomore, 28% reported junior and 23% reported senior standing. As class standing will be used as an independent variable it is important to note class standing is based on self-reported number of credits and because students may bring in credits their freshman year, sophomore class standing may be reported at a higher rate than actual second year students. Therefore, there may be more first-year students in the sample than it appears based on the data.
Predicting Comfort Levels with Diversity

This section examines results using comfort levels as the dependent variable (H1-H6). In order to understand the relationship between student comfort levels and student support of diversity initiatives, comfort levels will be evaluated as a dependent variable with gender, race, religious identity, pre-college experiences with diversity and vicarious experiences through friend groups will serve as the independent variables. This is done to examine if comfort levels are an intervening independent variable for student support of diversity initiatives.

The following questions were used to evaluate student comfort levels with diverse situations: “How comfortable would you personally feel with dating somebody of a different race or ethnic group from you?” and “How comfortable would you personally feel with seeing persons of the same sex holding hands on campus?” These variables will be labelled Dating Outside Race and Same Sex Couples, respectively. For the two questions on comfort levels, the following percentages are for those that reported “very comfortable”. Gender was not significantly associated with Dating Outside Race (p=0.446), but significantly associated with Same Sex Couples (p=0.001). Women reported “very comfortable” (72.5%) more than men (51.9%). Due to small sample size, for race only white, black, and bi- and multi-racial students are reported. Race was significantly associated with Dating Outside Race (p=0.035). White students reported “very comfortable” (72.5%) more than bi- and multi-racial students (84.2%). Race was not significant for Same Sex Couples (p=0.416). Religion was significantly associated with Dating Outside Race (p=0.003) and Same Sex Couples (p=0.000). Students non-affiliated with a religious identity reported “very comfortable” with Date Outside Race (71.0%) more than Lutheran students (38.8%), Roman Catholics (52.8%), and students that reported other (58.5%). Student friend groups were not significantly associated with Dating Outside Race (p=0.664), but significantly associated with Same Sex Couples (p=0.004). Students with more diverse friend groups (74.8%) were more comfortable than students with less diverse friend groups (49.1%). Class standing and previous experiences with diversity were not significantly associated with either diverse situation. See Table 2 in Appendix B for further detail on data.

Predicting Support for Diversity Initiatives

This section examines results using support of diversity initiatives as the dependent variable (H7-H13). The reported percentages are students that reported “high priority” for indices used for measuring support of diversity initiatives. The first index measured support of diversity initiatives focused on people (students and faculty) and courses, and will be referred to as People and Courses. The second index measured support of diversity initiatives focused on institutional changes, and will be referred to as institutional support. See Appendix A for the indices construction. Only two background variables were significantly associated, gender and race, and both diverse situations, Dating Outside Race and Same Sex Couples.

Gender was significantly associated with People and Courses (p=0.000), and Institutional Support (p=0.000). Women were more supportive of diversity measurers relating to People and Courses (40.1%) than men (19.3%). Women were more supportive of diversity measurers relating to Institutional Support (36.7%) than men (21.3%). Race was significantly associated with People and Courses (p=0.031) and was not significantly associated with Institutional Support (p=0.093). White students were less supportive of diversity measurers relating to people and Courses (26.9%) than black students (52.4%) and bi- and multi-racial students (42.9%). Student comfort with diverse situations, Dating Outside Race, was significantly associated with People and Courses (p=0.000) and Institutional Support (p=0.000). Students who reported “very comfortable” with dating outside their race were more supportive of People and Courses (31.5%) than students who reported “very uncomfortable” (0.0%). Students who reported “very comfortable” with dating outside their race were more supportive of Institutional Support (35.9%) than students who reported “very comfortable” (8.3%). Student comfort with diverse situations, Same Sex Couples, was significantly associated with People and Courses (p=0.000), and Institutional Support (p=0.000). Students who reported “very comfortable” with seeing same sex couples holding hands were more supportive of Institutional Support (40.1%) than students who reported “very uncomfortable” (8.3%). Students who reported “very comfortable” with seeing same sex couples holding hands were more supportive of Institutional Support (34.9%) than students who reported “very uncomfortable” (16.7%). See Table 3 in Appendix B for further detail on the data.

Based on these results, comfort levels appear to be an intervening variable for support of diversity initiatives. The multiple regression for support of diversity initiatives People and Courses only gender (p=0.000), race (p=0.015) and Dating Outside Race (p=0.026) were significant. Gender (p=0.253) had the most impact almost twice as important as race (p=0.152) and Dating Outside Race (p=0.148). The multiple regression for support
of diversity initiatives Institutional Support only gender (p=0.003) and Dating Outside Race (p=0.003) were significant. Dating Race (p=0.201) was more important than gender (p=-0.194). See Table 4 and 5 in Appendix B for further detail on the data. This study found among students at a small liberal arts college a student’s gender, race and comfort levels with diverse situations impacts student support for diversity initiatives on campus. Gender, race, religion and vicarious experience through diverse friend groups impacted student comfort levels. This research supports comfort levels as an intervening variable for background variables and student support of diversity initiatives. See Figure 2 below for the modified path diagram with significantly associated variables.

Figure 2. Path Diagram of Significantly Associated Variables

*Gender was not significantly associated with Dating Race
**Race was not significantly associated with Same Sex Couple and Institutional Support
***Vicarious Experience through Diverse Friend Group was not significantly associated with Same Sex Couple

**Discussion**

Research has shown dominant ideology is still persistent in the United States, and reactionary racism is the most prominent and impactful opposition to diversity in higher education. This has been seen in the objection to racial “quotas” in college and universities selection process and some groups’ objections to affirmative action methods in higher education. Research has found though experiences with diversity do not have an impact on students during their time in high school, formal and informal experiences with diversity during the college years is important to forming opinions and attitudes towards diversity. The issue of diversity is multidimensional encompassing more than race and ethnicity, but also gender, sexual orientation, religious identity, social class and other diversity variables. Prior research has focused most on race and ethnicity limiting understanding of prejudice. Therefore, as the benefits to having a diverse student body are numerous, this thesis considers the multi-layered concept of diversity and the factors that encourage student support of diversity initiatives.

This study examined diversity and support through gender, race, ethnicity, religious identity, sexual orientation, and comfort levels. By doing so it is seen that increased comfort with diversity in relation to race, but also sexual orientation increases support of initiatives on campus. Previous studies were conducted at medium/large universities, while this study focused on a small liberal arts college. It was found in this setting, as in others, gender and race play a significant role in attitudes (measured here as comfort levels) and pre-college experiences do not impact attitudes. This study shows the important role colleges and universities play in the development of students’ attitudes towards diversity. Form a theoretical perspective this is important to Myrdal’s vicious cycle. If colleges and universities can intervene in this cycle, change in prejudices may occur. Though Myrdal’s cycle focuses exclusively on race, it can be applied to other dimensions of diversity. In this study, the cycle could be applied to prejudice toward sexual orientation. As this study has attempted to expand this theoretical concept, future research should examine more closely Myrdal’s cycle on other diversity initiatives.

This study focused on the aspects that influenced student support of diversity initiatives and therefore does not focus solely on the idea of prejudice in institutions of higher education. Therefore, one limitation of this study is the ability to evaluate prejudice of students in higher education. This study does not focus directly on informal diversity experiences nor does it examine in detail the difference in formal diversity experiences. Therefore, future research should examine the impact of both formal and informal experiences with diversity. When studying formal diversity experiences, research should focus on the types of programs, events, and coursework that make the most impact on student comfort levels or attitudes towards diversity. There are generally two categories for formal experiences. One focuses on celebrating diversity, the other includes race-targeted programs. The dominant group typically tends to favor the first approach, but research may find the later to make a more impactful impression on attitudes towards diversity. This would be the logical next step in research to take in order to further understanding of impacting student understanding and appreciation for diversity in their classrooms.
References


### Table 2: Comfort Levels

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<th>X² Probability</th>
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### Table 3: Priority Levels

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If you wish to view larger images shown in this research, please contact pmyers1@carthage.edu.
A Comparative Analysis of Cluster P and Cluster I Mycobacteriophages

Department of Natural Sciences
Carthage College

By: Megan J. Fallert

Abstract

Clusters serve as a framework for studying the evolutionary dynamics of mycobacteriophages. The purpose of this study was to use bioinformatics tools to study the relationship between Cluster I and Cluster P mycobacteriophages. Cluster I and Cluster P were hypothesized to have a high degree of nucleotide sequence similarity at the right end of their genome and to share many non-core genes of unknown functions. Additionally, it was expected that Cluster P would be more closely related to Subcluster I1 than I2. Results supported these hypotheses and showed that despite obvious morphological differences, Cluster P and Cluster I are closely related. An exploration of the possible functions to the two cluster's shared genes suggest that the majority of their common genes play minor enzymatic and regulatory roles. Results of this study could have implications in further understanding the dynamic relationship between Cluster P and Cluster I and how bacteriophages promote the exchange and development of non-core genes.

KEYWORDS:
Mycobacteriophage, clusters, gene nurseries, evolutionary dynamics, gene exchange

Introduction

The mycobacteriophage population is large, genetically diverse and dynamic. Every second, 10^25 phage are initiating infection, providing an opportunity for phage DNA to recombine and introduce new genes (Pedulla, et al., 2003). Consequently, the phage population is constantly evolving. A common mechanism for phage evolution is illegitimate recombination. During illegitimate recombination, DNA sequences are exchanged at random points between two genomes (Hatfull, et al., 2010). The product of this exchange is either a functional gene or genomic trash. Each phage genome serves as a testament to this evolutionary process and is a mosaic comprised of unique combinations of genetic modules (Hatfull, et al., 2010). These evolutionary dynamics are key to understanding genetic flux in bacteriophages.

Not all mycobacteriophage genes have the same degree of genetic mobility. Size, function, and grouping all help determine a gene’s ability to participate in horizontal gene transfer (Hatfull & Hendrix, Bacteriophages and their genomes, 2011). For example, genes involved in the formation of the capsid head of a phage must travel together to maintain their function. Genes encoding for necessary structural proteins like the capsid head are called core genes (Hatfull & Hendrix, Bacteriophages and their genomes, 2011). They tend to be found at the left end of the genome and are highly conserved within clusters (Hatfull & Hendrix, Bacteriophages and their genomes, 2011). Core genes are very static in terms of their evolutionary capacity. Other genes in bacteriophage genomes demonstrate a higher degree of genetic fluidity. Non-core genes are defined as genes that are not found in all the members of a cluster of phage (Hatfull & Hendrix, Bacteriophages and their genomes, 2011). Their small size and auxiliary function enhances their ability to participate in illegitimate recombination (Hatfull & Hendrix, Bacteriophages and their genomes, 2011). They are typically found at the right ends of the genomes of dsDNA tailed phages. While the majority of non-core gene’s functions are unknown, the few gene that have been identified play minor enzymatic or biological roles. It appears that non-core genes optimize a phage’s ability to adapt to a certain biological niche (Hatfull & Hendrix, Bacteriophages and their genomes, 2011). Some researchers hypothesize that the abundance of non-core genes at right end of the genome serves as a “gene nursery” where novel genes can be generated through mutation and recombination (Hatfull & Hendrix, Bacteriophages and their genomes, 2011). Research suggests that phages encode for recombinases to fuel the exchange of protein domains in these gene nurseries and promote the development of new genes (Pope, et al., 2011). Further studying the dynamic exchange of these non-core genes is vital to understanding phage evolution.

The sorting of bacteriophages into different clusters provide a framework for understanding phage evolution. A phage is typically assigned to cluster if it has over a 50% nucleotide similarity with the members of that cluster (Welkin, et al., 2015). Other factors such as amino acid sequence and gene functions are also considered when clustering phage (Welkin, et al., 2015). A cluster provides a simplified representation of the overall architectural features of a given group of phage (Hatfull, et al., 2010). Clustering should not be seen as a form of taxonomic grouping, but rather a framework for under-
standing the exchange of genetic modules by lateral gene transfer (Hatfull, et al., 2010). Study of intercluster relationships provides insight on the complex evolutionary past of mycobacteriophages.

Preliminary research indicates similarities between Cluster I and Cluster P bacteriophages. Expanding on this research could have broader implications in understanding non-core gene’s role in bacteriophage evolution. When using BLAST to assign gene function during the annotation of Bartholomew, a Cluster P phage, there were several matches with genes from Cluster I phage. These matches occurred at the right end of the genome, in a region composed primarily of non-core genes. This suggested the possibility of further synergy between these two clusters, especially in areas that encode for non-core genes.

Other research has also pointed to a strong evolutionary tie between Cluster P and Cluster I. A recent study on intercluster relationships mapped the network phylogeny of 627 mycobacteriophages based on gene content. This map showed Cluster I and P coming from a common ancestor (Welkin, et al., 2015). Dotplots comparing these two clusters suggested a high degree of synteny at the right end of the phage genomes, suggesting nucleotide sequence similarity in regions encoding for non-core genes (Welkin, et al., 2015). Because Cluster P was established in the last five years, there is little additional research published on its relationship with other Clusters. However, there was a study published in 2011 on genome architecture that analyzed the evolution of gene anatomies in Cluster I. The study called into question how recent recombination events occurred in Cluster I phage Brujiita and Babsiella. The genes in question were several matches with genes from Cluster I phage. These matches occurred at the right end of the genome, in a region composed primarily of non-core genes. This suggested the possibility of further synteny between these two clusters, especially in areas that encode for non-core genes.

The purpose of this study is to characterize the relationship between Cluster P and Cluster I phages through a comparative analysis of their morphology and genomic characteristics. It is hypothesized that Subcluster I1 and Cluster P will share the most genomic similarities. Additionally, it is expected that synteny between Cluster P and Cluster I phage will occur at the right end of the genome. Finally, the majority of the shared genes will be non-core genes of unknown functions. Exploring putative functions of these genes will help characterize the relationship between Cluster P and Cluster mycobacteriophages.

Methods

Images were compiled to compare the morphological differences between Cluster P and Cluster I. Phagesdb is a database of sequenced mycobacteriophages (phagesdb, n.d.). Plaque and electron microscope pictures were downloaded from phagesdb and sorted by cluster or subcluster. Figures were made comparing the plaque and virion morphologies of of Cluster P, Subcluster I1, and Subcluster I2.

Using data provided on phagesdb, tables of the defining characteristics of Cluster P and Cluster I Phage were assembled. First, a table compiling the genome length, GC content, number of genes, overhang length, and plaque morphology for of all the verified members of Cluster P was made. Averages were calculated to characterize the defining features of this cluster. A similar table was also made for Cluster I. Because Cluster I has two subclusters, the table also includes which subcluster each member belongs to. Average genome length, GC content, number of genes and overhang length was calculated for each subcluster and for the cluster as a whole.

A table was made to compare the genomic characteristics of Cluster I and Cluster P. The average genome length, GC content, number of genes and overhang length calculated in previous tables was assembled into one table to determine degree of similarity between clusters and subclusters.

The genomes of Cluster P phage Bartholomew and Subcluster I1 phage Babsiella were determined to be similar and were used as models to further characterize the relationship between Cluster P and Cluster. Phamerator, a tool that compares nucleotides sequence similarity and identifies common gene phamilies between mycobacteriophage genomes, was used to compare of Babsiella and Bartholomew (Cresawn, et al., 2011). A map was generated to visualize the synteny between the two genomes. For every common gene identified between the two phage, the percent similarity, phamily, number of phamily members, member clusters of that phamily, and functional domain were recorded.

To further characterize the functions of Babsiella and Bartholomew’s shared genes, a more comprehensive look at gene function was performed. The DNA Master files of Babsiella and Bartholomew were analyzed to identify what the functions the annotators assigned the various genes. A spreadsheet was used to assemble all the possible protein functions for each homologous gene. HHpred matches exceeding 80% probability and BLASTp matches exceeding e-value 10-6 were included as putative functions. A final table was made to suggest the
putative functions of the shared genes. These functions were used to label the Phamerator map of Babsiella and Bartholomew included in this report.

Doplots were made to visualize nucleotides sequence similarity. Fasta files of Babsiella and Bartholomew’s genomes were compared and plotted by Gepard. NCBI’s tblastx program was used to detect translated nucleotides sequence similarity. Cluster P phage Fishburne and Bignuz and Cluster I phage Che9c and Brujita were compared. The tblastx program compares translated nucleotide sequence queries (Altschul, et al., 1997). Six blasts were performed comparing each phage was compared once with the other three phages. The resulting dotplot matrices were compiled into one figure for comparative purposes.

Results

Comparison of micrographs reveal morphological differences between Cluster I and Cluster P mycobacteriophage. Figures 1 and 2 show images of Cluster I phages taken using electron microscopes. Figure 3 shows images of Cluster P phages. The phages of both clusters have long, flexible, non-contractile tails, indicating they are siphoviridae. However, Cluster P phages have isometric heads, while Cluster I phage have prolate heads.

Cluster P and Cluster I Phage have different plaque morphologies. The plaque morphologies of all thirteen verified members of Cluster P are described in Table 1. Cluster P phages have two common plaque morphologies. Five of the thirteen members of Cluster P have small, clear plaques approximately 1mm in size, as seen in Bunnies in Figure 6. Six other cluster members had plaques around 1-2 mm in size with clear centers and turbid halos, as seen in BigNuz in Figure 6. The plaque morphologies of all five verified Cluster I phage are found in Table 2. The majority of the plaque of Cluster I phages that had tiny pinprick plaques, as seen in Brujita’s in Figure 4. Island3 is unique, as it has turbid plaques 4 mm in size with very tiny clear centers and a large opaque halo, also visualized in Figure 4.

The genomic characteristics of Cluster P were analyzed. Table 1 describes the characteristics of Cluster P phage. There are thirteen verified and two provisional members of Cluster P (phagesdb, n.d.). Only the genomes of verified members were used in this study. Genome length ranges from 45580-50515bp, with the average genome length being 47780 bp. GC Content ranges from 64.4-67.3%, with the average GC content being 67.0%. Of the phage whose genomes have been characterized, the average phage has 78.6 genes and the number of genes ranges from 77-82. Cluster P phage have defined physical ends and have 3’ sticky overhangs. The majority of their 3’ overhangs are 12 bp long, although Bruscarum has an overhang length of 13bp and Purky has an overhang length of 11 bp.

The genomic characteristics of Cluster I were also analyzed. There are five verified and two provisional members of Cluster I phage. Only verified cluster members were used in this study. The results of this analysis are displayed in Table 2. The genome length of Cluster I phages ranges from 47057-57050 bp, with the average genome length being 51129 bp in size. The GC content ranges from 65.4-67.1%, with the average GC content being 66.3%. Cluster I phages can have anywhere from 74-89 genes, with an average of 80.2 genes. They have defined physical ends and 3’ sticky overhangs that are either 10 or 11 bp in length.

Cluster I has two subclusters with differing genomic characteristics. Subcluster I1 has three verified members. The average genome is 47588 bp long and contains 76 genes. The average GC content is 66.9% and all members had a 3’ overhang length of 11 bp. Subcluster I2 has two verified members. The average genome is 546411 bp long and has 86.5 genes. The average GC content is 65.5%, and both members had a 3’ sticky overhang that was 10 bp long. Subcluster I1 phage have shorter genome lengths, higher GC contents, fewer genes, and a 3’ sticky overhang that is 1b longer.

A comparison was made of the defining genomic characteristics of Cluster P and Cluster I phage. This contrast is visualized in Table 3. Compared to the average Cluster I genome, the average Cluster P genome is 3349 bp shorter, has 1.6 fewer genes, and has a GC content that is .7% higher. Compared to the average Subcluster I1 genome, the average Cluster P genome is 192 bp longer, has one fewer genes, and has a .1% difference in GC content.

The genomes of Cluster P phage Bartholomew and Cluster I phage Babsiella were chosen for additional comparison in order to further characterize the relationships between the two clusters. Both phage determined to be similar using the data in Table 1 and Table 2. Babsiella has a GC content of 67.2% and 78 genes, while Bartholomew had a GC content of 67% and 77 genes. There was a 1936 bp difference in their genome lengths and a 1bp difference in the length of their 3’ overhang.

Bartholomew and Babsiella were compared using Phamerator. Figure 7 visualizes the map of the two phage generated by Phamerator. There was no notable synteny in the first 20 genes of their genome. From genes 21-78 of Babsiella, there were 33 genes that shared a high degree of similarity and came from the same phamily as genes from Bartholomew. The relationship between
these genes is further characterized in Table 4. The similarity ranged from 83.82-100%, with the average degree of similarity being 94.5%. Only six functional domains were found in these common genes: integrase, prophage antirepressor, exonuclease VIII, RecT, RusA, and a nickel ion transcriptional regulator. The remaining 27 genes have no known functional domain listed on Phamerator.

In order to further characterize the functions of the genes shared by Bartholomew and Babsiella, a more comprehensive analysis was performed. Table 5 shows the putative functions assigned to the shared genes using data from DNA Master files. Through this analysis, 22 possible gene functions were identified. Some of those putative functions include Lysin B, holin, Ftsk, RusA, and DNA methylase.

A dotplot was made comparing the genomes of Babsiella and Bartholomew as shown in Figure 8. There was little similarity at the left end of the genome but a high degree of similarity at the right end of the genome.

Dotplots comparing translated nucleotide sequences between two Cluster P phages and two Cluster I phage revealed similarity between the two clusters. Cluster P phages BigNuz and Fishburne had more translated nucleotide sequence similarities with Subcluster I1 phage Brujita than Subcluster I2 phage Che9c.

Discussion

Cluster P and Cluster I phages differ drastically in virion morphology. As seen in Figure 1, Figure 2, and Figure 3, both clusters are siphoviridae, but the structure of their capsid head is very different. While Cluster I phage have prolate heads, Cluster P phage have isometric heads. Additionally, the two clusters have no obvious correlations in plaque morphologies, as seen in Figure 4, Figure 5 Figure 6. While Cluster P phage typically have either small clear plaques or turbid plaques, the majority of Cluster I phage have pinprick plaques.

Differences in virion morphology are not representative of the genetic similarity between Cluster P and I Mycobacteriophages. Based solely off morphological structure, one would have little reason to believe Cluster I and P mycobacteriophages are related. However, analysis of their genomes reveals intercluster similarity. As seen in Table 3, both clusters have defined physical ends with a 3’ sticky overhang. They also have similar genome lengths, GC content, and number of genes. Factors such as genome size and GC content influence what genes a phage has access to in the common gene pool (Welkin, et al., 2015). The genomic similarities between Cluster P and Cluster I suggest that these phages had access to a similar part of the gene pool and evolved from a common ancestor (Welkin, et al., 2015). Nucleotide sequence comparison further confirms the close relationship between Cluster I and Cluster P. Figure 9 shows the high degree of nucleotide sequence similarity between Cluster P and Cluster I phages, particularly between Fishburne and Brujita. This supports other research that suggests Cluster I and P share recognizable DNA sequence similarity (Welkin, et al., 2015). This leads to the conclusion that despite their morphological differences, Cluster I and Cluster P are related. Other research has shown that viral morphology does not necessarily reflect genomic similarity between mycobacteriophages (Welkin, et al., 2015). Although it is a well-developed method of classification, it does not accurately represent DNA sequence similarity (Welkin, et al., 2015). Cluster P and Cluster I are examples of mycobacteriophages that have similar genome characteristics and sequences despite their morphological differences.

Comparison of the genomic characteristics reveals that Cluster P mycobacteriophages are more similar to members of Subcluster I1. Cluster P phages have an average genome length of 47780 bp, an average GC content of 67.0%, and an average of 78.6 genes per genome, as seen in Table 3. Compared with the average Cluster P phage, the average Subcluster I1 phage has a 192 bp difference in genome length, a .1% difference in GC content, and one extra gene in its genome. In contrast, the average Subcluster I2 phage has a genome that is 6661 bp longer, a 1.5% lower GC content, and 7.9 more genes than the average Cluster P phage. This comparison suggests that Cluster P is more closely related to Subcluster I1 and Subcluster I2. The dotplots in Figure 1 also support this conclusion. The blast of Fishburne's translated nucleotide sequence with Brujita's produced more hits than the blast of Fishburne and Che9c. This high degree of nucleotide sequence similarity indicates a close evolutionary relationship between Cluster I1 and Cluster P.

Babsiella and Bartholomew have synteny at the right end of their genomes. The map comparing the genomes of Babsiella and Bartholomew in Figure 7 shows no nucleotide sequence similarity in the first 20 genes of their genomes. This part genome is composed of core genes that typically encode for structural and virion assembly proteins (Hatfull, et al., 2010). It is expected that these genes would lack synteny, as Bartholomew and Babsiella differ in their structural morphology. The genomic similarity between these phages starts at gene 21 and continues through the right end of the genome. Of the 33 genes shared by Babsiella and Bartholomew, only 6 have functional domains listed on Phamerator. The majority are small, non-core genes and with unknown functions. Table 5 summarizes attempts to assign putative functions...
to Babsiella and Bartholomew’s shared genes. The genes appear to play roles in formation of prophage, cell lysis, DNA recombination and transcriptional regulation. Some possible putative functions include DNA methylase, peptidase, and a nickel ion transcriptional regulator. This data suggests that the majority of the genes shared between Bartholomew and Babsiella play minor enzymatic and biological roles. Future research could work to identify all the shared genes between Cluster I and Cluster P mycobacteriophages and work to assign functions to uncharacterized gene products.

The similarity between non-core genes in Cluster P and Cluster I mycobacteriophages suggests that recombination events occurred recently in their evolutionary history. A defining characteristic of non-core genes is that they are unique and typically are not conserved from cluster to cluster (Hatfull & Hendrix, Bacteriophages and their genomes, 2011). The prevalent similarity between non-core genes regions in Cluster P and I is unusual and indicative of a high degree of genetic exchange between the two clusters. This supports recent research suggesting that Cluster I phage have undergone recent recombination events with mycobacteriophages from other clusters (Pope, et al., 2011). Additionally, it agrees with research suggesting that some phages use the right end of their genome as a “gene nursery” to promote the exchange of small protein domains in order to generate novel genes (Hatfull & Hendrix, Bacteriophages and their genomes, 2011). As seen in Figure 7 Genome map comparing Cluster I1 phage Babsiella and Cluster P phage Bartholomew. Phamerator was used to compare the genomes and shading between the genomes represents a high degree of nucleotide sequence similarity (Cresawn, et al., 2011). Labels for shared genes were attained from the data in Table 5. As seen in the table, the genes at the right end of Babsiella and Bartholomew’s are small and many had no known function. This region could fit the characteristics of a gene nursery. The synteny between these genes suggests extensive genetic exchange between the ancestors of these phages. Additionally, the presence of recombinase-like enzymes suggests that these mycobacteriophages could be actively promoting the exchange of their genomes. Studies have shown that some mycobacteriophages encode for enzymes to actively promote recombination (Pope, et al., 2011). One of the first studied examples of this was Cluster I1 phage Brujita. Gp42 of Brujita is believed to be an enzyme that catalyzes recombination events between short DNA sequences (Hatfull, et al., 2010). Cluster P phages possess enzymes from this same phamily. For example, gp44 of Bartholomew is in the same phamily as gp42 of Brujita (Cresawn, et al., 2011). Although it has no functional domains listed on Phamerator, Bartholomew’s DNA Master file indicated similarity with the protein structure of a DNA-repair break of recombinase. Perhaps enzymes such as this have promoted the exchange of genetic modules between Cluster P and Cluster I mycobacteriophages and fostered the development of novel genes in their gene nurseries. Future research could explore this concept by identifying more recombinase-like enzymes in Cluster P and Cluster I and determining what role they play in genetic exchange. Additionally, research on gene nurseries could help improve understanding of their evolutionary dynamics.

Reflection:

This independent research project was completed during a year-long research based biology course designed to expose underclassman undergraduate students to biological research. In the first semester of the course, we isolated and characterized a novel phage in wet lab. During second semester, we worked to characterize the genomes of the phage using bioinformatics software. To bring together our work over the course of the year, we worked on an independent research project on a phage-related topic of our choosing. My interest in the relationship between Cluster's P and I was piqued during the characterization of phage Bartholomew's genome. As we worked to assign putative functions to Bartholomew's genes, I noticed that a lot of similarities were occurring between Bartholomew’s genome and the genomes of Cluster I phage. This seemed unusual, as morphologically the two phage look completely different. A desire to explain this unusual occurrence motivated me to pursue this project. Working on this research project was a great experience. I thoroughly enjoyed the process and am very grateful to my professors for providing me with this incredible experience during my freshman year of college. This has definitely contributed to my aspirations of going to medical school or graduate school.

References:


Figure 6: Plaque morphologies of Cluster P mycobacteriophage. BigNuz, Bunnies and Jebsks were chosen to represent the diverse plaque morphologies present in Cluster P. BigNuz had larger plaques with a clear center and a turbid halo, while Bunnies has small plaques. Jebsks’ plaques were described as being small and clear with defined edges (phagesdb, n.d.).

Table 1: Genomics of Cluster P Phage (phagesdb, n.d.).

<table>
<thead>
<tr>
<th>Name</th>
<th>Genome Length (bp)</th>
<th>G+C%</th>
<th># of Genes</th>
<th>Longest ORF (bp)</th>
<th>Plaque Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bartholomew</td>
<td>46481</td>
<td>67.2</td>
<td>77</td>
<td>12</td>
<td>Clear center with turbid halo</td>
</tr>
<tr>
<td>BigNuz</td>
<td>48584</td>
<td>66.7</td>
<td>82</td>
<td>12</td>
<td>Clear center with turbid halo</td>
</tr>
<tr>
<td>Brusacom</td>
<td>47618</td>
<td>67.1</td>
<td>83</td>
<td>13</td>
<td>Small clear plaques</td>
</tr>
<tr>
<td>Bunnies</td>
<td>48822</td>
<td>67.1</td>
<td>82</td>
<td>12</td>
<td>Small clear plaques</td>
</tr>
<tr>
<td>Donovan</td>
<td>47162</td>
<td>67.2</td>
<td>78</td>
<td>12</td>
<td>Small clear plaques</td>
</tr>
<tr>
<td>Fisherune</td>
<td>47109</td>
<td>67.3</td>
<td>77</td>
<td>12</td>
<td>Small clear plaques</td>
</tr>
<tr>
<td>HLUHittop</td>
<td>48869</td>
<td>67.2</td>
<td>78</td>
<td>12</td>
<td>Not available</td>
</tr>
<tr>
<td>Jebsks</td>
<td>45580</td>
<td>67.3</td>
<td>77</td>
<td>12</td>
<td>Small clear plaques</td>
</tr>
<tr>
<td>Malithi</td>
<td>46870</td>
<td>67.1</td>
<td>80</td>
<td>12</td>
<td>Turbid plaques</td>
</tr>
<tr>
<td>Phanyonce</td>
<td>49203</td>
<td>66.7</td>
<td>12</td>
<td>6</td>
<td>Clear center with turbid halo</td>
</tr>
<tr>
<td>Phineasee</td>
<td>47229</td>
<td>67.2</td>
<td>77</td>
<td>12</td>
<td>Clear center with turbid halo</td>
</tr>
<tr>
<td>Piku</td>
<td>50513</td>
<td>66.4</td>
<td>5</td>
<td>11</td>
<td>Not available</td>
</tr>
<tr>
<td>Shiverpeck</td>
<td>46860</td>
<td>67.0</td>
<td>81</td>
<td>12</td>
<td>Clear center with turbid halo</td>
</tr>
<tr>
<td>Average</td>
<td>47780</td>
<td>67.0</td>
<td>78.6</td>
<td>12</td>
<td>Small clear plaques or clear center with turbid halo</td>
</tr>
</tbody>
</table>

Table 2: Genomics of Cluster I Phage (phagesdb, n.d.).

<table>
<thead>
<tr>
<th>Phage Name</th>
<th>Subcluster</th>
<th>Genome Length (bp)</th>
<th>GC%</th>
<th># of Genes</th>
<th>Longest ORF (bp)</th>
<th>Plaque Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Babisella</td>
<td>I5</td>
<td>48420</td>
<td>67</td>
<td>78</td>
<td>11</td>
<td>Not available</td>
</tr>
<tr>
<td>Brujita</td>
<td>I5</td>
<td>47057</td>
<td>66</td>
<td>74</td>
<td>11</td>
<td>Tiny pinpricks</td>
</tr>
<tr>
<td>Chelec</td>
<td>I5</td>
<td>57050</td>
<td>65</td>
<td>84</td>
<td>10</td>
<td>Tiny pinpricks</td>
</tr>
<tr>
<td>Island3</td>
<td>I5</td>
<td>47287</td>
<td>46</td>
<td>76</td>
<td>11</td>
<td>4mm plaques with tiny clear center with large turbid halo</td>
</tr>
<tr>
<td>Slaax</td>
<td>I5</td>
<td>55832</td>
<td>65</td>
<td>89</td>
<td>10</td>
<td>Tiny pinpricks</td>
</tr>
<tr>
<td>Subcluster I Average</td>
<td></td>
<td>47548</td>
<td>66</td>
<td>76</td>
<td>11</td>
<td>Pinpricks or turbid</td>
</tr>
<tr>
<td>Subcluster I Average</td>
<td></td>
<td>65441</td>
<td>65</td>
<td>86.5</td>
<td>10</td>
<td>Pinpricks</td>
</tr>
<tr>
<td>Cluster I Average</td>
<td></td>
<td>51229</td>
<td>66</td>
<td>80.2</td>
<td>10.6</td>
<td>Pinpricks or turbid</td>
</tr>
</tbody>
</table>

Table 4: Homologous Genes of Babisella and Bartholomew. Genes listed on a high degree of nucleotide sequence similarity on the program Phamerator were compiled into a spreadsheet. Percent similarity, phamy, number of phamy members, phamy cluster members, and phamy functional domain were recorded for each gene (Cresawn, et al., 2011).

<table>
<thead>
<tr>
<th>Babisella Genes</th>
<th>Bartholomew Genes</th>
<th>Similarity</th>
<th>Phamy</th>
<th># of Members</th>
<th>Cluster Members</th>
<th>Phamy Functional Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>21</td>
<td>98.80%</td>
<td>178</td>
<td>22</td>
<td>A1a, F1, I1, N, P</td>
<td>Unknown</td>
</tr>
<tr>
<td>22</td>
<td>22</td>
<td>98.80%</td>
<td>9117</td>
<td>41</td>
<td>I1, I2, P, ModmMn_Draft</td>
<td>Unknown</td>
</tr>
<tr>
<td>23</td>
<td>23</td>
<td>98.80%</td>
<td>7945</td>
<td>25</td>
<td>I2, I4, N, P</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Table 5: Putative Gene Functions of the homologous genes of Bartholomew and Babisella. Genes determined to have a high degree of nucleotide sequence similarity on Phamerator were put into a spreadsheet. Bacteriophage and Babisella’s DNA-Madhead files were used to assemble putative protein functions assigned during the annotation process using BLASTp. Handed hits with an identity over 85% and BLASTp hits with e-values of 1e-4 were considered valid as putative protein functions. All positive functions are:

<table>
<thead>
<tr>
<th>Babisella</th>
<th>Bartholomew</th>
<th>Similarity</th>
<th>Phamy</th>
<th># of Members</th>
<th>Cluster Members</th>
<th>Phamy Functional Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>24</td>
<td>98.80%</td>
<td>3354</td>
<td>38</td>
<td>I1, I2, F1, I5, N, P,</td>
<td>Unknown</td>
</tr>
<tr>
<td>25</td>
<td>25</td>
<td>98.80%</td>
<td>5580</td>
<td>37</td>
<td>F1, I1, I2, I4, N, P</td>
<td>Unknown</td>
</tr>
<tr>
<td>27</td>
<td>27</td>
<td>90.41%</td>
<td>1231</td>
<td>32</td>
<td>B2, I2, G, I, I2, N, P,</td>
<td>Unknown</td>
</tr>
<tr>
<td>28</td>
<td>28</td>
<td>90.41%</td>
<td>5331</td>
<td>17</td>
<td>I1, N, P</td>
<td>Unknown</td>
</tr>
<tr>
<td>29</td>
<td>29</td>
<td>90.41%</td>
<td>5001</td>
<td>111</td>
<td>A5, A1a1, F3, I1, N, P</td>
<td>Unknown</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
<td>90.41%</td>
<td>999</td>
<td>9</td>
<td>F2, I4, N, P</td>
<td>Unknown</td>
</tr>
<tr>
<td>31</td>
<td>31</td>
<td>97.41%</td>
<td>1175</td>
<td>54</td>
<td>C4, I1, P</td>
<td>Unknown</td>
</tr>
<tr>
<td>35</td>
<td>35</td>
<td>97.41%</td>
<td>10011</td>
<td>54</td>
<td>I1, N, P</td>
<td>Unknown</td>
</tr>
<tr>
<td>36</td>
<td>36</td>
<td>97.41%</td>
<td>1902</td>
<td>43</td>
<td>I1, N, P</td>
<td>Unknown</td>
</tr>
<tr>
<td>37</td>
<td>37</td>
<td>97.41%</td>
<td>1902</td>
<td>43</td>
<td>I1, N, P</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Figure 7: Genome map comparing Cluster II mycobacteriophage Babisella and Cluster P mycobacteriophage Bartholomew. Phamerator was used to compare the genomes and shading between the genomes represents a high degree of nucleotide sequence similarity (Cresawn, et al., 2011). Labels for shared genes were obtained from the data in Table 6.
Figure 8: Nucleotide sequence comparison of Cluster 13 mycobacteriophage Babieffe and Cluster P mycobacteriophage Bartholemew displayed as a dotplot. Complete genome sequences of Babieffe and Bartholemew were compared using Gepard and displayed as a dotplot using default parameters (Krummel, amond, & Retzel, 2007). Nucleotide similarity indicates relatedness between clusters (Welkin, et al., 2015).

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