Monterey Bay Aquarium Research Institute

Ocean technology and the public: inspiring engagement via online platforms

Madison Heard, Catalina Island Marine Institute – Toyon Bay

Mentor: Susan von Thun

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ABSTRACT

Since MBARI's foundation in 1987, our scientists and engineers have pushed the boundaries of deep-sea exploration to become a leader in the ocean research community, and MBARI's mission has guided this trajectory. While research is at the core of MBARI's mission, education plays a key role in MBARI's success as a world-renowned research institution. As MBARI's outreach strategies evolve, social media has become a key component to reach the public where they are and ultimately gather interest and understanding in the work of MBARI Scientists and Engineers. MBARI operates on many platforms and has a stable understanding of the audience's engagement in the content that is posted, Instagram is relatively new and the audience we reach on Instagram has had varied engagement with our content – with deep-sea animal posts performing better than MBARI technology. The goal of this summer project was to test parameters to learn what may boost ocean technology content engagement on MBARI's Instagram.

INTRODUCTION

As MBARI's mission statement upholds the values of conducting cutting-edge research as well as communicating this work to the public. The need for science is inextricably linked with the need to communicate it, and the responsibility to communicate these results weighs heavily on those who are pushing the boundaries of science. As Rebecca Wild (2017) discusses in her post on *Naturejobs.com*, there is a serious disconnect between the truth and misconceptions in the medical field that has led people to trust alternative therapies for ailments rather than proven treatments. While this example refers to the need for medical information to be communicated more effectively via online platforms, the need to bridge the gap between researchers and the general public via science communication exists in all fields. Isaac Asimov supports this transparency as he believes science communication to be "essential to preventing growing public hostility toward, and suspicion of, scientists and their works" (Gregory and Miller 1998).

While the push for scientists to communicate has existed since the 1950s through the dedication of the American Association for the Advancement of Science (AAAS), science communication to a larger audience has become simultaneously easier and more difficult to manage thanks to the introduction of online social networking sites (Wild 2017). In this age of the rapid exchange of information it makes sense to turn to the seekers of truth, or scientists, to guide our society towards what is right. However, there is a paradox that exists where "scientists are both mad and the only sane and rational people on the planet; they are loved by the public as saviors and hated as designers of weapons of mass destruction" (Gregory and Miller 1998). This logical fallacy is evident on conventional media outlets, as well as online. This miscommunication only further calls for scientists to rise to the challenge of creating an air of transparency and trust between their work and the public (Pavlov *et al.* 2018).

In recent decades, scientists have used the internet to more easily disseminate their work in the fashion of blog posts and websites, and more informally through social media sites such as Twitter, Instagram and Facebook (Brossard 2013). Each of these platforms carries a different purpose and tone which in turn caters to a different audience. Facebook, for example, was created in 2004 and reached popularity much earlier than Twitter

(launched in 2006) or Instagram (launched in 2010). Describing the audiences for each of these popular platforms is relatively subjective, and recent worries of cybersecurity and compromised privacy only further make this comparison challenging. Based on the 2018 report from the GlobalWebIndex, Facebook reigns supreme in popularity with 85% of global social media users (excluding China) active on this site, and Instagram and Twitter follow closely behind with 63% and 56% of global members, respectively. Because these three sites have a consistently high global reach, the Monterey Bay Aquarium Research Institute (MBARI) has been using these three platforms to communicate the interdisciplinary work that takes place within the institute, while accomplish their mission of educating the public on the findings of the deep ocean.

To effectively communicate the work of MBARI Scientists and Engineers to the general public via the online platforms which MBARI operates on, it is crucial that we understand the audience for each of these social media sites, or SMSs. One parameter to understand MBARI's followers is by using age as a factor. The majority of MBARI's followers fall between 25–34 years old for Instagram and Facebook. While Twitter doesn't publish age data for their users, we can use occupation for a glimpse into the type of followers MBARI has gathered, with the largest portions being 29% technical/professional, 14% retired and 7% student.

MBARI's social media team has observed trends that the online audience consistently engages more with content related to deep-sea animals instead of the technology. As MBARI upholds the value of blending science and technology by hiring both scientists and engineers, it is important that our social media content reflects that balance by posting content of deep-sea animals as well as innovative ocean technology. The main objective of this research project is to investigate trends in technology content engagement on the three social media sites (Facebook, Twitter and Instagram) to understand what content creation and posting techniques increase engagement. In addition to increasing interest within our online audiences for all aspects of MBARI, inspiring engagement in MBARI technology via social media can help grow public support for future ocean exploration and inspire young people to work in ocean science and technology fields.

METHODS

There are a few reasons suggesting why there may be challenges in engaging online audiences with marine life and the technology that allows us to study these organisms. To better reach our audience, I tested parameters for online content using a five-week technology campaign, as there has been variability in the engagement we see for posts regarding MBARI technology. This report serves as a preliminary analysis of what parameters may influence deep-sea technology content engagement on social media sites.

FIVE-WEEK TECHNOLOGY CAMPAIGN

MBARI is an interdisciplinary institution that combines both science and engineering to answer questions about the deep sea, which is reflected on MBARI's social media by posting both biology and engineering-related content. Across the 3 social media sites (Facebook, Twitter and Instagram) we have seen a varied response in engagement for our biology vs technology posts. This five-week technology campaign – which ran from July 5th, 2019 – August 10th, 2019 – was aimed towards understanding the tech-savvy members of our audience across these platforms, while also testing how to reach the portion of our audience that responds more to dazzling deep-sea animal content. Among these three sites, Instagram is the most nascent, and so much of this summer's work focused on identifying what our current Instagram audience engages with most and how we may incorporate these findings in future posts.

Content for weeks 1 and 2 were created using videos and images that were stored on MBARI's storage network. I created 3 posts each week for Instagram, Twitter and Facebook. The first parameter I tested focused on the engagement between videos and photos. Each post I created alternated between type of media I used for each post (i.e. video vs photo) to investigate the relationship that exists between engagement and media type. Because each social media platform represents a different atmosphere and caters to different demographics and engagement styles, my hypotheses for this first test vary. For Instagram, I hypothesized that videos would be more engaging than photos, while on Twitter and Facebook I hypothesized there would not be a noticeable difference in engagement between photos and videos.

Week 3 was devoted to the campaign I created titled "Tech Takeover" where I spent each day highlighting one of the technologies MBARI has created. This campaign was available to our Twitter audience via a string of tweets each day that began around noon, while our Instagram audience participated in Tech Takeover via a separate facet of the application known as Instagram Stories. This campaign was also available to our Facebook via a separate feature called Facebook Stories. In this "stories" feature, content isn't posted in the traditional method and is not published to a feed where users can scroll through, but rather they are posted in a more immersive setting where the content expands to fill the entire screen and can be adapted to include short text pieces, stickers and moving GIFs (graphics interchange format). On Stories, accounts can post multiple panels of related content and traditionally disappear after 24 hours, but account owners can opt to save selected content for long-term in the "Highlights" section the account's profile for visiting users to view beyond the 24-hour time frame.

Week 4 coincided with the nationally-observed Shark Week so I decreased the amount I was posting as the engagement I would have observed from this week wouldn't be comparable with the rest of my data. Rather, I took this week of my campaign to organize and prepare the data from previous postings for analysis. I also organized, filmed and edited (using Final Cut Pro) seven interviews from MBARI interns that are working on a plethora of projects. These interviews would be posted the following week.

The fifth and final week of my technology campaign concluded with posts on all sites of an MBARI Intern interview each day, along with the previous posting frequency I had used in weeks 1 and 2 (three posts on all sites). As this week in my campaign was the second to last week of the summer internship, I drafted this paper and prepared a final presentation rather than creating new content.

RESULTS

INSTAGRAM POST ENGAGEMENT

By analyzing post statistics from the past 3 months (May – August) (Figure 1) we can begin to investigate trends that develop during the 5-week (Figure 2). Over 3 months

the average engagement rate for all posts is 3.8%. We can split this total into the two categories MBARI caters to (deep-sea animals and technology). The average engagement rate for animal posts is 4.4%, while the average for technology posts is noticeably lower at 2.3%. During this 3-month timeframe when these numbers were calculated, MBARI had posted a total of 91 times, with 67 of those posts being about animals.

Diving into the 5-week timeframe, we find that the average engagement rate for Instagram posts is 3%. When separating the content into either a biology or technology category, we find that the animal posts receive an average engagement rate of 3.87%, while average tech engagement is noticeably lower, with a percentage of 1.65%.

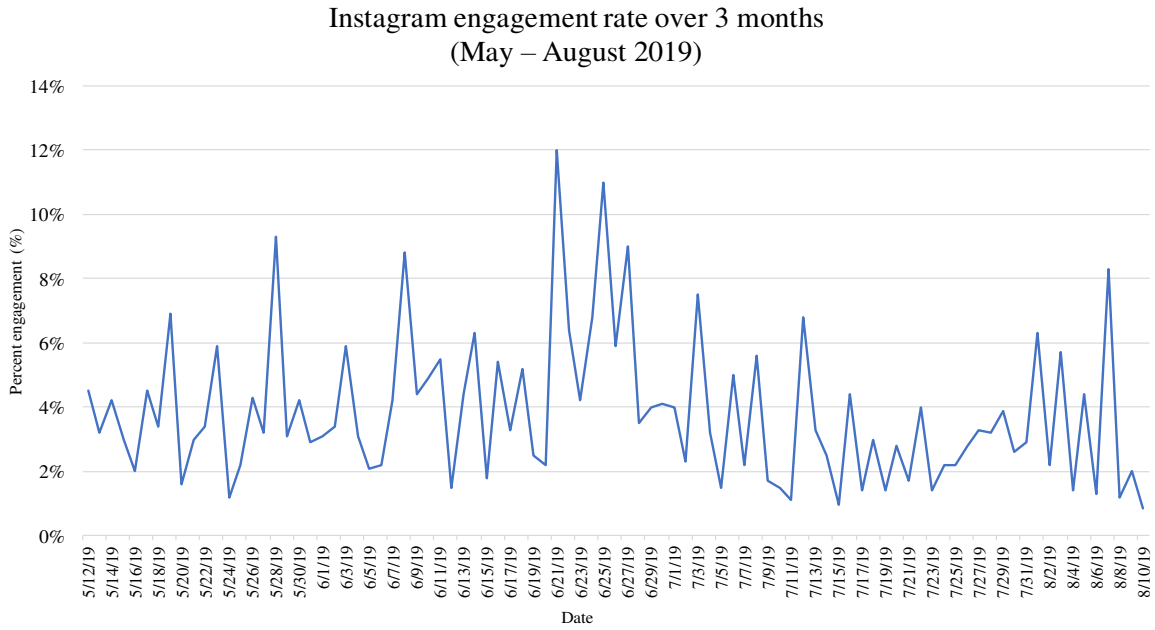

Figure 1. Trends of engagement rate from May 11th – August 11th, 2019 for posts on Instagram. The total average engagement rate for this time-period was 3.8%. Within this period MBARI has posted content either related to deep-sea animals or deep-sea technology. Animal content received an average engagement rate of 4.4%, while technology content received an average engagement rate of 2.3%.

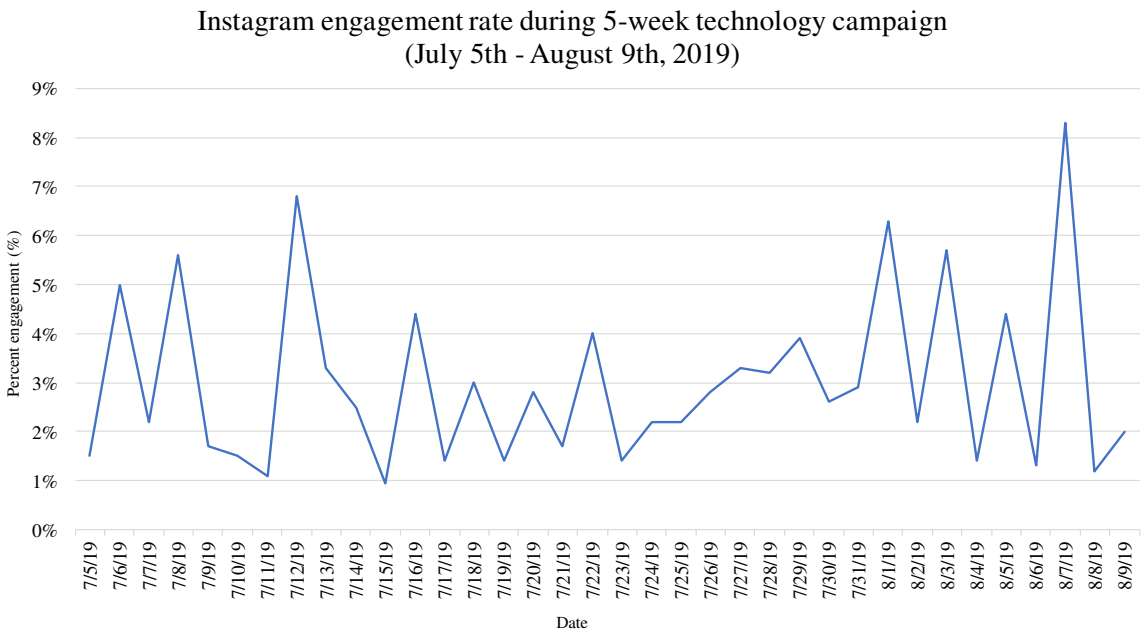

Figure 2. This graph refers to the engagement rate during the 5-week technology campaign (July 5th – August 9th, 2019) for posts on Instagram. The total average engagement rate for this time-period was 3%. Animal content that was posted during this tech campaign received an average engagement rate of 3.8%, while technology content received an average engagement rate of 1.6%.

CONTENT TYPE ON INSTAGRAM

As Instagram is a more visual platform, analyzing post performance for photos and videos is a good way to gauge total audience engagement. In Figure 3 we see percent engagement of photos vs. videos, with the average percent engagement for photos being 1.7% (stdev: 0.007071) and average percent engagement for videos being 1.3% (stdev: 0.005164).

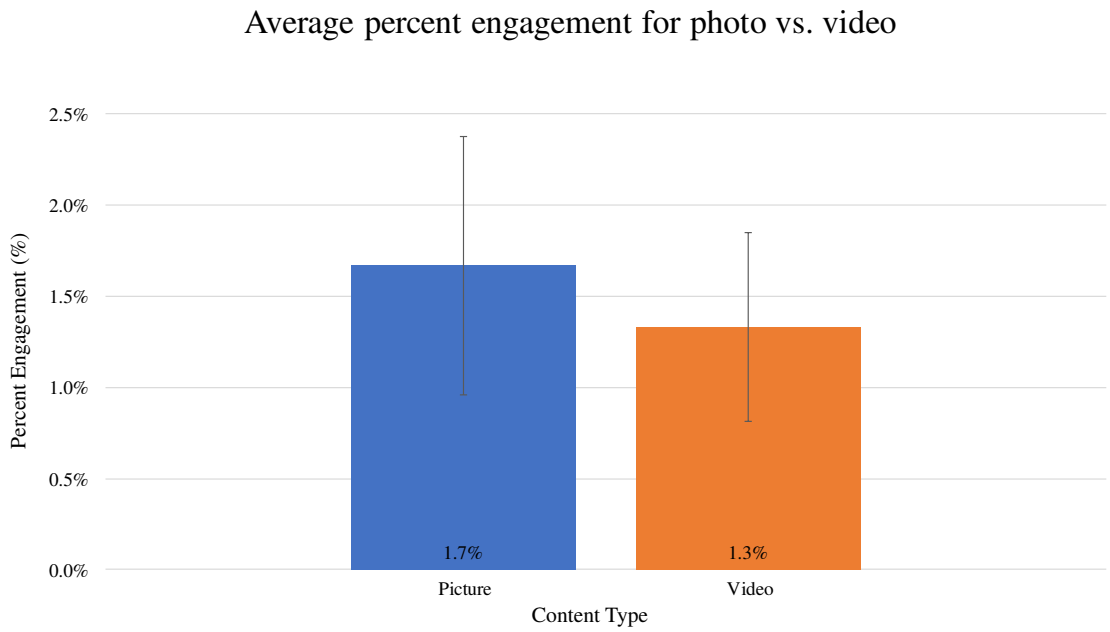

Figure 3. Images of technology received marginally higher engagement than photos of technology.

INSTAGRAM STORIES

A relatively new opportunity to increase MBARI's online engagement exists in Instagram's feature: Stories. Through this feature, images are posted in a queue at the top of the main feed and are only available to view for 24 hours after being posted. After this period, the stories are deleted unless the account owner chooses to save their story on their profile in a section called "Highlights." Stories also offers users the option to include stickers, hashtags and moving images to make their posts more engaging. Throughout the summer the MBARI social media team has been utilizing this feature to communicate longer stories or disseminate their research in a quick, engaging and informal way. The posting platform MBARI's social media team uses (Later.com) does not provide engagement data on stories, but impression and reach data is available to make inferences on story success. Over the past 3 months the average impression was 1,973 people and the average reach was 1,762 people. The 3-month visual comparison of these two metrics is shown in Figure 4.

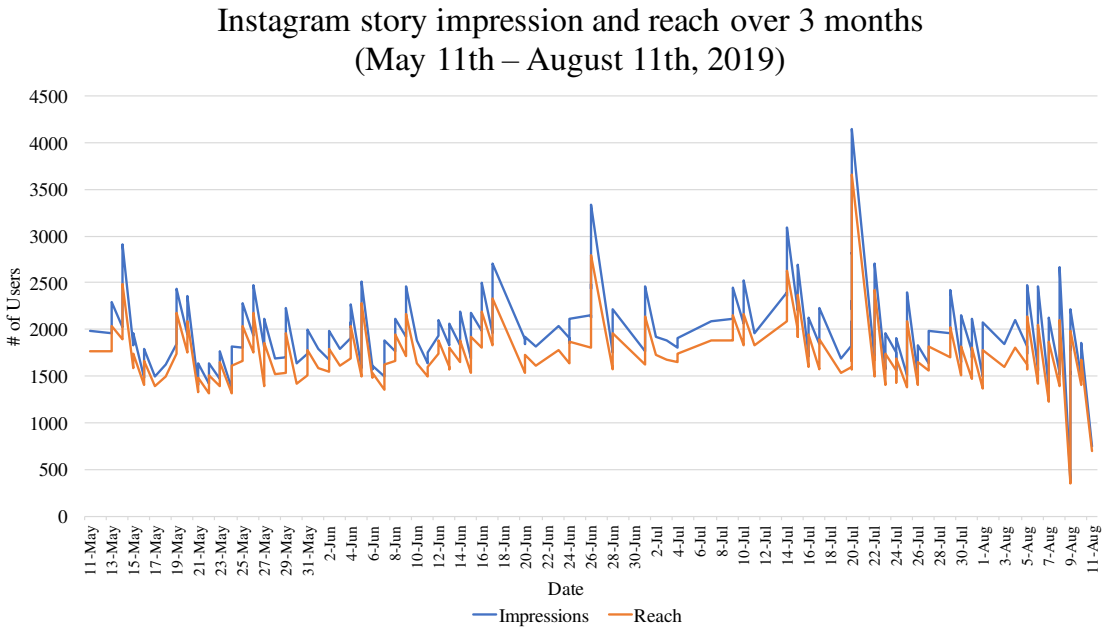

Figure 4. Impressions vs reach on Instagram Stories for May 11th–August 11th, 2019. The highest peak on this graph (July 20th) is caused by the MBARI Open House. There was a considerable increase in the amount of content posted, which boosted the overall reach and impressions for MBARI News.

Multiple campaigns designed to communicate large amounts of information to Instagram's audience in an informal way were done via Stories. The first campaign ("Tech Takeover") occurred during 7/21/2019 – 7/29/2019. During this campaign, the average impression was 1,852 people and the average reach was 1,664 people. These numbers are both lower than the 3-month average, however the difference is around 100 people for each category.

TWITTER ENGAGEMENT

A detailed 3-month analysis was not able to be completed as the posting site MBARI uses for twitter (HootSuite) does not provide a downloadable CSV to further analyze data from tweets posted beyond 1 month from the date the data is downloaded, however there are a few interesting statistics of MBARI's twitter produced by HootSuite, including a total of 3 million impressions—with 33.4k impressions per day—and a gain of 1,865 followers over the past 3 months, as well as an average engagement rate of 1.4%. Statistics produced by HootSuite from my project time frame show a total of 1.4 million

impressions and an average engagement rate of 1.4%, as well as a 611 increase in followers (Figure 5).

Out of the 3 platforms MBARI social media uses most, I chose to use twitter to launch week-long campaigns or events, including events not specifically related to MBARI technology. These events included Tech Takeover and a week of MBARI Intern interviews. The spikes in Figure 4 are largely caused by deep-sea animal content, however, a small yet noticeable bump in engagement during from July 22nd-July 26th was caused by a week-long technology content campaign known as "Tech Takeover", and the bump in engagement between August 5th and August 9th was caused by a series of MBARI Intern interviews.

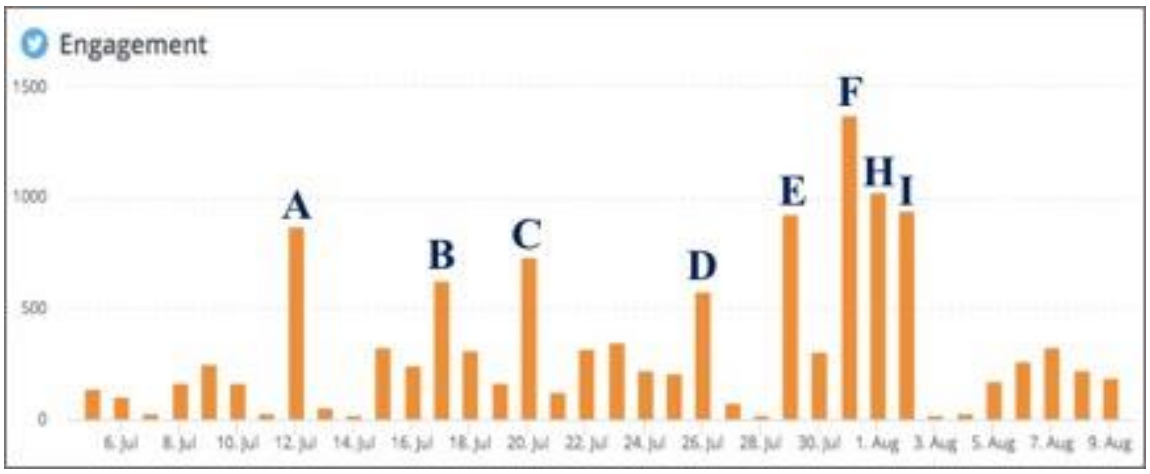

Figure 5. Engagement graph produced by HootSuite for the 5-week period of my internship project. Spike A was caused by high-performing tweets regarding plastic pollution and a video of a Bomber Worm. Spike B was caused by another Bomber Squid video. Spike C was from MBARI's Open House event. Spike D was largely due to a video of Caprellid amphipods. Spikes E-I were caused by the Nationally-recognized "Shark Week."

FACEBOOK ENGAGEMENT

Statistics specific for the MBARI Facebook page over 3 months (May 11th – August 11th, 2019) include the following: 85k engagements, 1.1 million reached and 2 million impressions. Digging further into the data Facebook provides, we can compare these numbers to the 5-week long project timeframe (July 5th—August 9th, 2019): 25k engagements, 350k reach and 673k impressions.

There are some interesting trends over the 3-month timeframe for the Facebook metric "Lifetime Engaged Users", which tallies the number of unique persons who have engaged with a post through either commenting, liking, sharing, or clicking on a link (Figure 6). We see considerable spikes in engagement on May 29th, June 4th, June 8th and June 12th.

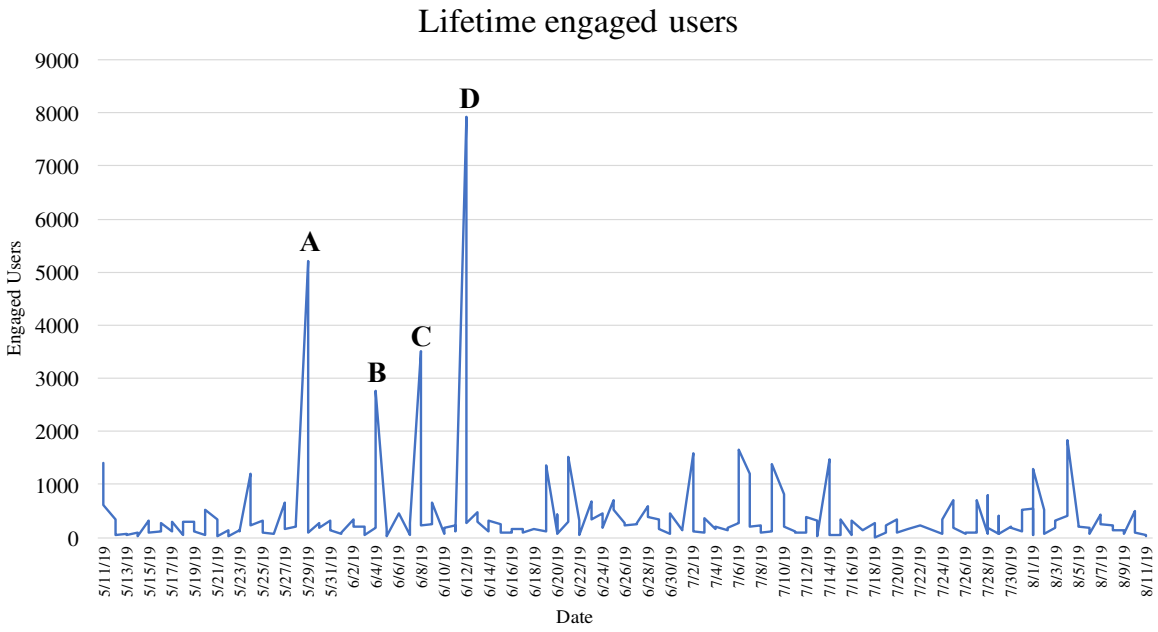

Figure 6. This graph contains all post engagement data from May 11th – August 11th, 2019. Four peaks in engagement occur on May 29th (A), June 4th (B), June 8th (C) and June 12th (D). These spikes in engagement are tied to the following posts topics: A) CANON, B) CANON, C) World Ocean's Day and D) Balloons in the Monterey Bay.

Next, we can dive into the engagement peaks during the 5-week technology campaign from July 5th – August 9th, 2019 (Figure 7). While technology content was posted on Facebook during this campaign period, the main goal of this summer project was to analyze parameters for boosting engagement on Instagram. Thus, there are no specific parameters or post characteristics that were analyzed on Facebook but inferences regarding engagement trends can still be made. Also, as Facebook is a platform where content comes from many different sources, it is difficult to make inferences based solely on MBARI creations and accomplishments.

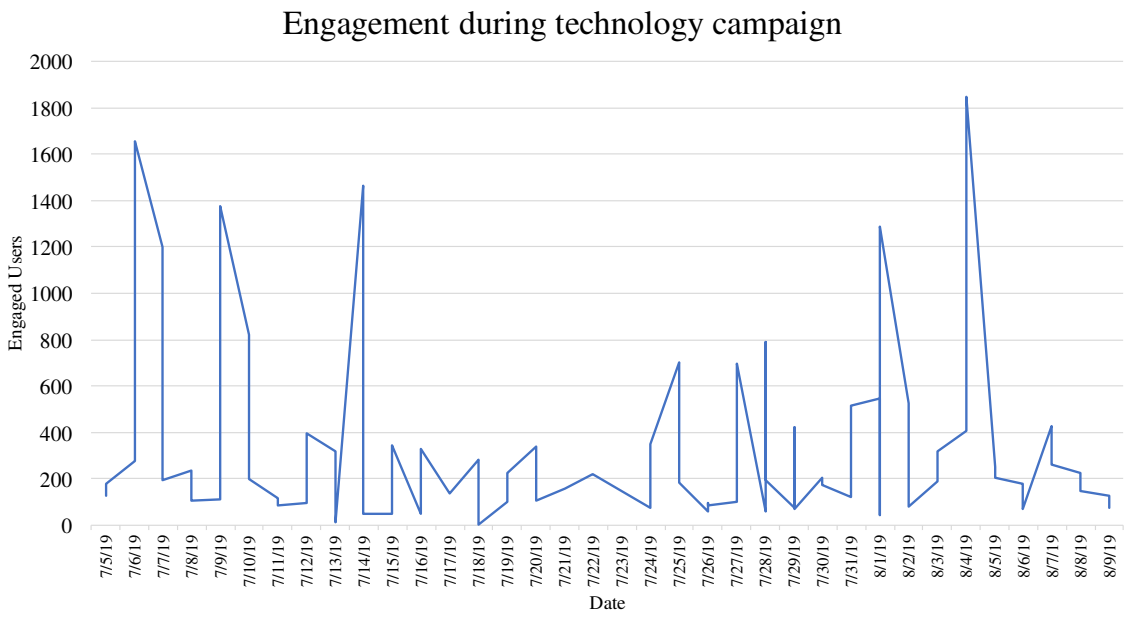

Figure 7. This graph contains data solely from the 5-week technology campaign period. Peaks in above 1200 users on July 6th, 9th, 14th, August 1st and 4th were caused by posts regarding: microplastics, Boaty McBoatface, marine debris, shark week and white sharks, respectively.

DISCUSSION

INSTAGRAM

Content Type

Instagram is a largely-visual platform, and a good question is to investigate whether photos vs videos perform better. While these results are from a sample size of n=9 for photos and n=6 for videos these preliminary statistics hint that photos may inspire more engagement from users, it is still worthwhile to alternate between photos and videos, while continuing to compare engagement between these two content types.

Hashtags

Hashtags exist to connect accounts to posts that may be of interest to users, and by including certain hashtags in MBARI's posts, our team was able to reach other audiences. For example, reach and engagement spiked on a post of an AUV in the artic partially because of the quality of the picture, but largely because this post used the hashtag #NASA.

Continuing to act on the opportunities to hashtag widely-popular and relevant hashtags will continue to drive Instagram users towards the @MBARI_News account and boost the likelihood of our engagement and fan base increasing.

Captions

Length of captions can also influence engagement, however, as a research institution that aims to communicate the science done within our walls we believe our social media accounts should contain a considerable amount of background information. Because MBARI's social media accounts have historically contained lengthy captions, we gather that our fan base follows @MBARI_News because of they are interested in learning more about the content we post. Thus, caption length is not a variable we believe in changing dramatically, however captions have recently incorporated an attention-grabbing tagline that hints to what the post is about and this has performed relatively well. This tagline also breaks up the text so followers so aren't interested in diving further into the caption will just see this tagline and can either choose to engage with the post or keep scrolling.

TWITTER

From Figure 5 we see that MBARI's Twitter audience engages more with content about deep-sea animals, but there is still considerable engagement with the technology content as well. Furthermore, we see a spike in engagement for content related to MBARI's annual Open House, which supports the efforts MBARI's social media team as they create content to raise awareness and by covering the event on MBARI's several social media platforms. Lastly, the final peaks in engagement are related to Shark Week. This spike shows that MBARI's social media team was successful with the content they created for this week-long event, and is reason enough to continue creating the quality content the Twitter audience enjoyed, and is perhaps a reason to begin preparations for other nationally-recognized social media events a few weeks in advance. These events are quite

popular on Twitter, and by utilizing a trending hashtag for a nationally-recognized event, MBARI will reach more users and ultimately gain more followers.

FACEBOOK

Facebook is a collaborative platform where posts of MBARI research is featured along with content from other sites and organizations. The content that is posted on Facebook also contains more information as this site lends itself more to those who are interested in slowing down and reading more, as compared to Instagram and Twitter that specializes in quick communication. From the trends in engagement, we see there is a core interest in plastic pollution and marine debris as two of the peaks were focused on microplastics in larvacean mucus houses and the other post called attention to what should and shouldn't belong in the ocean. Lastly, two of the peaks in engagement were generated by CANON posts. While the CANON content is interesting to MBARI's core audience, the Monterey Bay Aquarium (MBA) featured this event on their page and stirred up excitement and engagement, which also drove a considerable number of users to MBARI's site for these posts. Thus, utilizing this connection that exists between MBARI and MBA, MBARI content will reach more users and will ultimately raise engagement on MBARI's Facebook.

CONCLUSIONS/RECOMMENDATIONS

We see from the evidence above that MBARI's social media presence across Instagram, Twitter and Facebook is relatively successful, and the reflection of techniques by the social media team has shown to be beneficial. With this project, we see that there is an online presence of tech enthusiasts and MBARI has been successful in inspiring this niche's engagement. By continuing to include strategic hashtags, clever captions with attention-grabbing taglines and alternating between videos and photos of technology, MBARI's social media engagement will continue to develop and will evolve to cater to an audience of both deep-sea animal aficionados, as well as the tech enthusiasts.

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