Journal of Agromedicine

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/wagr20

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To cite this article: Amanda Wickman, Ellen Duysen, Marsha Cheyney, Whitney Pennington, Joan Mazur & Aaron Yoder (2021) Development of an Educational YouTube Channel: A Collaboration between U.S. Agricultural Safety and Health Centers, Journal of Agromedicine, 26:1, 75-84, DOI: 10.1080/1059924X.2020.1845269

To link to this article: https://doi.org/10.1080/1059924X.2020.1845269

Published online: 11 Apr 2021.

JOURNAL OF AGROMEDICINE
2021, VOL. 26, NO. 1, 75–84
https://doi.org/10.1080/1059924X.2020.1845269

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Development of an Educational YouTube Channel: A Collaboration between U.S. Agricultural Safety and Health Centers

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ABSTRACT

Objectives: The National Institute for Occupational Safety and Health (NIOSH) Agriculture, Forestry, and Fishing Centers (AFF Centers) collaborated to initiate a joint YouTube channel in order to raise awareness of agricultural, forestry, and fishing occupational hazards; provide information to prevent AFF injuries and illnesses; increase the visibility and influence of the AFF Centers; and establish a collaborative model that can be replicated by other organizations.

Methods: The collaborators sought to produce a structured channel with high scientific standards. Policies, procedures, and a standard review process were established. Representatives from the AFF Centers coordinated the review process and the procedures by which videos were uploaded to the site. A marketing plan was created including a press release and ideas to promote new videos. Promotions are targeted to agricultural cooperative extension agents, educators, producers, owners, operators, first responders, families and community organizations. Viewership was tracked using YouTube metrics.

Results: The site was launched in November 2013. Over a 6-year period, the channel grew from 48 videos to 125 videos with over 10,500 cumulative watch time hours. The channel is promoted by the AFF Centers through email, social media, conference presentations and outreach exhibits. The channel is also publicized during coordinated national outreach events.

Conclusion: Each AFF Center benefitted from increased exposure of their content and the collaboration provided an opportunity to achieve labor efficiencies. YouTube metrics demonstrated that coordinated marketing increases views, watch time and subscriptions. In addition, the success of the channel communicates the benefits to collaboration among organizations with common missions.

KEYWORDS
YouTube; social media; collaboration; NIOSH; agricultural safety and health; training

Introduction

The National Institute for Occupational Safety and Health (NIOSH) Agriculture, Forestry and Fishing Centers (AFF Centers) were established as part of the Centers for Disease Control and Prevention (CDC)/NIOSH Agricultural Safety and Health Initiative in 1990. The initiative established a network of centers, funded on a competitive basis every 5 years, to reduce work-related injuries, illnesses and deaths among agricultural workers, as well as farm family members.[1] Farming, fishing and forestry are the most dangerous occupations in the United States. In 2018, the injury and illness rate in the AFF sector was the highest among all occupations. Fatalities among farmers are 7 times higher than in other occupations, 22 times higher among fisherman and 28 times higher among loggers.[2] Estimates of the economic cost of work-related fatalities, injuries and illnesses reached as high as 2.2 USD trillion in the U.S. from 2007 to 2015.[3]

Each AFF Center serves a multi-state region and has its own portfolio of research projects and outreach programs that address emerging and persistent issues.[1] Although worker populations and agriculture commodities vary in different regions of the country, areas of overlap in agricultural safety and health research and outreach exist across the Centers. In 2013, a collaboration between nine AFF Centers and the National Children's Center for Rural and Agricultural

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Health and Safety began with a goal of establishing 21st century outreach and training solutions. The concept of developing an AFF Centers' YouTube Channel was born out of this collaboration.

YouTube was developed by three PayPal employees in May 2005. This social media platform immediately became popular with over 1 million views by November 2005.[4] In 2006, Google acquired YouTube and has managed the tools and resources since that time. Over 500 videos are uploaded to YouTube every minute and the site logs approximately 1 billion viewers each day.[5] Statistica also reports that in 2019, 58% of adults over age 56, and 81% of those aged 15–25 used YouTube over a quarterly reporting period that year, outstripping Facebook as the social media platform of choice. The videos were primarily used to acquire informative content.[6] Four features that have led to the popularity of YouTube include: 1) It is free–no payment for any content is required; 2) The platform easily uploads user-generated content; 3) As a social network of users and content, the platform creates opportunities for Communities of Practice to evolve; and 4) It has structures that support branding such as channels that customize and index content to developers and users.[7]

Providing educational opportunities and training to AFF workers and their stakeholders, who often live in rural and remote locations, can be problematic due to factors including distance and time constraints. Research in the United Stated found that YouTube is accessed by 79% of those in rural regions, [8] making YouTube an effective means of reaching this target population.

As a social media platform, YouTube can be considered useful for both formal and informal learning.[9] Formal learning is characterized through location and form of instruction and is generally defined as that instruction that occurs in more institutionalized educational settings such as schools, universities, training centers or industrial programs. Informal learning typically occurs as a learner explores a need independently, seeking out resources and considering information on an "as needed" basis. Farmers often seek out resources in informal settings as well as attending formal trainings provided by cooperative extension or insurance companies.[10] Providing resources that can be used in both settings extends reach and engages audiences in communities of practice and dialogue.

Research on the effectiveness of learning using video content is extensive.[11–15] It has been found that multi-modal content is engaging, memorable and can build background knowledge on a topic and often improves learning regardless of education or literacy level and improves outcomes for those for whom English is not their first language. Importantly, research from DeKoning et al.[16] noted that video and animation improve learners' ability to retain and transfer new knowledge to novel situations.[17–18]

The rationale for the AFF Centers' collaborative to create a YouTube channel, targeting agriculture, forestry, and fishing workers and stakeholders, was that it would provide a convenient and cost-effective online environment to disseminate quality health and safety video content with the likelihood of widespread dissemination. Many of the AFF Centers had already created safety and health videos and were hosting them on their websites or a YouTube channel. This collaborative project offered the opportunity to house all these videos on one site and support an aggregated dataset to track the cross-center use of their AFF health and safety resources. This paper discusses the collaborative process of building a unified YouTube channel to address the ongoing need to provide safety information and training to agricultural populations throughout the regions served by the AFF Centers.

Methods

The committee

In 2013, a committee was formed with representation from the AFF Centers and from the National Children's Center for Rural and Agricultural Health and Safety, with the intent of establishing a joint NIOSH AFF Centers' YouTube channel. This working group sought to produce a structured channel with high scientific standards. November 2013 was set as the launch date and monthly conference calls were held to monitor progress. The committee employed a design and development process aligned with best practices

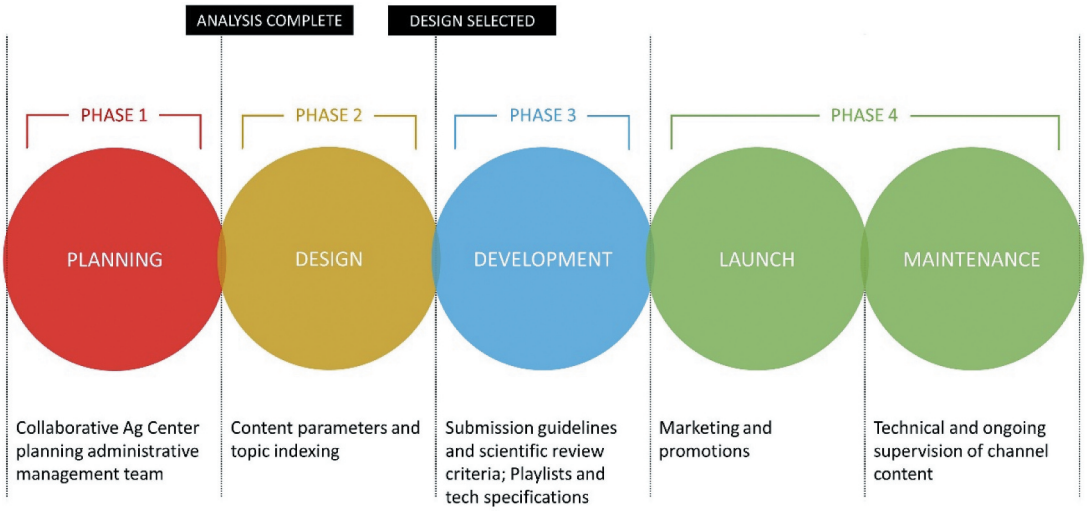

Figure 1. Phases of web product design with indicators from YouTube channel development. (Felke-Morris, 2014[19] and Entero, 2019[20]).

comprising multiple phases of web product design as shown in Figure 1.

Channel objectives

The AFF Centers' YouTube channel was developed with four main objectives: (1) raise awareness of agricultural, forestry and fishing occupational hazards; (2) provide information to prevent AFF injuries and illnesses; (3) increase the visibility and sphere of influence of the AFF Centers nationally and internationally; and (4) establish a model of collaborative work that can be replicated by other organizations. The target audiences for the channel were identified as agriculture, forestry, logging, and commercial fishing producers, educators, and stakeholders.

Guidelines

Guidelines were drafted that outlined the channel's structure, including a policies and procedures document, a video submission form with instructions, video review rubric, and a list of potential reviewers including their areas of expertise. A requirement was set that videos must be produced with funds from a NIOSH AFF Center either directly through Center efforts or through Center-sponsored activities by researchers or community partners.

Submission and review

To ensure high scientific standards and video integrity, a formal submission and review process was established. The process described in Figure 2 was used for videos populated on the channel at the time of launch and for videos submitted after the initial launch.

Uploading and maintaining the channel

The committee found it is essential to have a designated point person to manage video file upload and maintenance. This ensures consistent quality and proper surveillance of the channel.

Once the video file is reviewed and approved for upload, the video is then uploaded to the YouTube channel. Information from the submission form, such as keywords, video description, and affiliations, is transferred to the upload page. Once a video is uploaded, an email is sent to the submitter for final review.

Channel maintenance includes performing updates to videos as requested by the AFF Center that submitted the video, monitoring the comments on videos and sending requests for response to the producer of the video, and updating the channel as required by the YouTube administrators.

A bi-monthly meeting is held with the YouTube AFF collaborative group to discuss concerns with

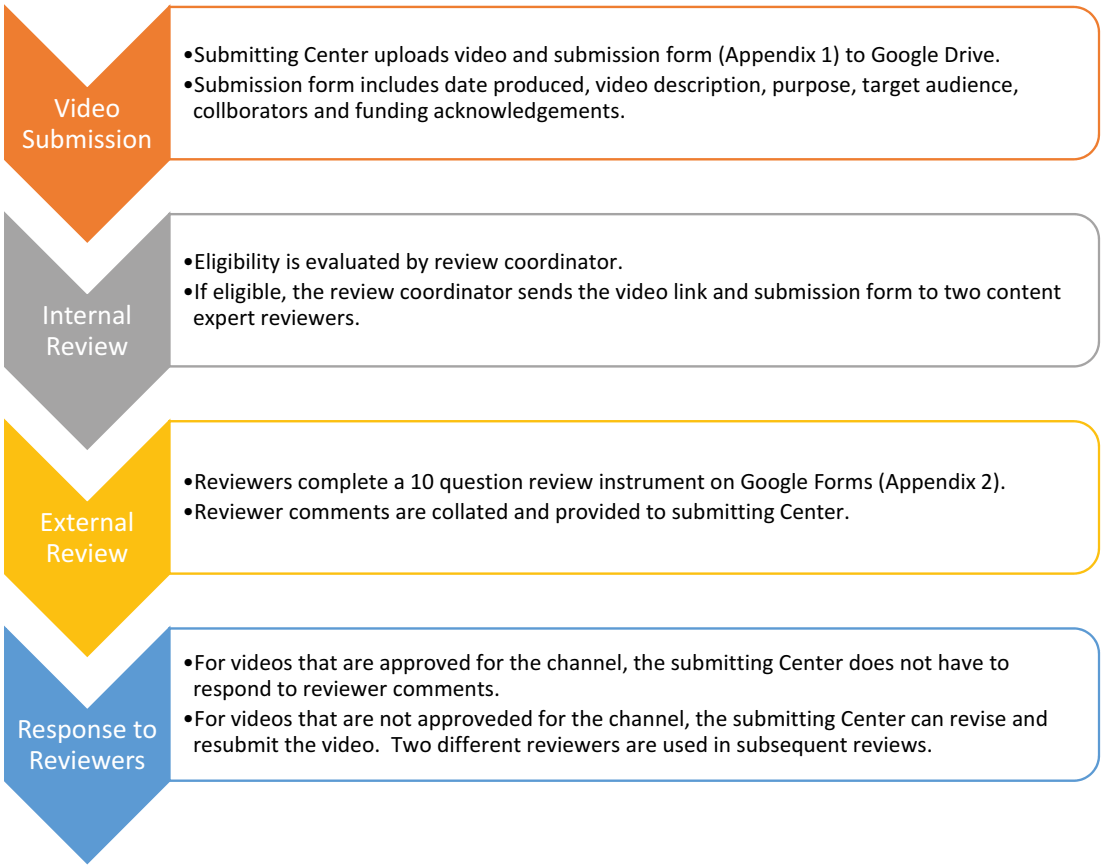

Figure 2. YouTube video submission and review process.

the channel, upcoming promotional events, and methods of improving marketing and video dissemination.

Playlists were created by the site administrator to assist viewers with locating all the AFF Center videos on a specific topic. Playlist topics, as of August 2019, included: injury prevention, 4 H, ergonomics, AFF Centers' promotional videos, zoonotic disease, roadway safety, ATVs, agritourism, dairy safety, forestry and logging, needlestick prevention, Right from the Start safety series, fluorescent tracer video series, hearing protection, ladder safety, heat illness, pesticide safety, grain safety, tractor and machinery safety, child development, livestock safety, and respiratory protection.

YouTube channel metrics

The YouTube platform provides analytic tools that gather a variety of metrics that channel administrators use to track viewer activity. Metrics include watch time reports including number of views, audience retention, demographics, playback location, traffic sources, and devices used for access. In addition, interactive metrics are reported including the number of subscribers, likes and dislikes, comments, and number of shares.

Administrators can customize the time frame to evaluate views during an event or assess use over the lifetime of the channel. A committee member is charged with reporting channel metrics to AFF Center colleagues during the bi-monthly meeting. YouTube channel metrics, drawn from the platform's analytics section, are reported below in the Results section.

Promotion of the channel and individual videos

Following the official launch of the channel in November 2013, the appearance of the channel

was enhanced through the addition of images and a custom logo. As the channel was developed, a marketing plan was created including a standardized press release and ideas to promote new videos. The channel is promoted by the AFF Centers through email, social media, conference presentations and outreach exhibits. Promotions are targeted to agricultural cooperative extension agents, educators, producers, owners, operators, first responders, families, and community organizations. The channel is also publicized during coordinated national outreach events such as Ag Safety Awareness Program Week and National Farm Safety and Health Week. During each of these events, the NIOSH AFF Centers work with stakeholder organizations to develop promotional tool kits. The tool kits include links to the U.S. Ag Centers' YouTube videos with appropriate messaging.

Evaluation of end-user and satisfaction

A satisfaction survey was placed as a pop-up poll on the channel's main page from January 2017 through February 2020. Viewers coming directly to the channel were invited to take a four-question survey. Questions asked about the participant's occupation, satisfaction with accessed videos, whether the respondent would recommend the channel and an open field question that asked if they had recommendations for improvements to the channel.

Results

U.S. Agricultural Safety and Health Centers YouTube Channel URL: https://www.youtube.com/channel/UCRgk3ryTcY8Wcvvv_ulZgmA

Audience

U.S. Agricultural Centers' YouTube Channel viewers are majority male (82.7%) with most viewers falling in the 25–34-year-old age category. Comparing data in the third quarter of 2019 with data from U.S. overall viewership, YouTube Channel viewership was 88.2% male compared to the overall U.S viewership, which was 50.4% male, with overall U.S. viewership having a more even distribution among the age categories (Table 1).

Videos

From the inception of the U.S. Agricultural Safety and Health Centers' YouTube channel in 2013 through August 26, 2019, there were 125 videos added to the site. These videos were viewed a cumulative 221,384 times with a total watch time hours of 10,509, accruing 1,064 subscribers. Channel analytics, by year, with percent change per year are shown in Table 2.

Spanish language videos make up 23% of the channel's videos (n = 39) and K'iche language dairy safety videos make up 6% (n = 7). The 30 videos with the most watch time hours as of August 2019 are shown in Table 3. Data on the total number of views, average view duration, and length of time that the video has been on the channel are also shown in Table 3.

Promotion of videos

Promotional efforts associated with national awareness events proved to be a successful method for driving traffic to the channel. An increase in hours watched during these events was reflected in the channel metrics (Figure 3).

Table 1. Comparison of U.S. Agricultural center YouTube channel viewership compared to overall U.S. viewership (3rd Quarter 2019).

U.S Ag Center YouTube Channel			U.S YouTube – General Viewership[a]		
	Male %	Female %		Male %	Female %
Total	88.2%	11.8%	Total	50.4	49.7
Age	Male	Female	Age	Male and Female	
18–24	4.4	2.8	15–25	23.3	-
25–34	39.8	7.7	26–35	20.4	-
35–44	29.0	6.5	36–45	19.3	-
45–54	5.5	1.0	46–55	19.0	-
55+	1.3	1.9	56+	17.0	-

[a]Date source – https://www.statista.com/statistics/296227/us-youtube-reach-age-gender/

Table 2. Year to year analytics – U.S. Agricultural center YouTube channel August 2013 – August 2019.

Year	Views	Change*# %	Watch Time Hrs	Change* %	Subscribers Added	Change*# %	Videos Added	Change*# %
2013–2014	12,371	-	432	-	175	-	48	-
2014–2015	18,392	49	708	64	83	(53)	31	(35)
2015–2016	33,544	82	1160	64	139	67	11	(65)
2016–2017	56,677	69	2136	84	196	41	16	33
2017–2018	49,884	(12)	2481	16	273	39	11	(31)
2018–2019	50,516	1	3592	45	198	(27)	8	(27)
Total	221,384	-	10,509	-	1064	-	125	-

*Percent change from previous year. Data collection beginning August 26, 2013 through August 26, 2019.
#Parentheses indicate percent reduction from previous year.

Evaluation of end-user and satisfaction

There were 80 satisfaction surveys collected. Industry groups with the most representation were agribusiness, agriculture production, K-12 education, and cooperative extension. Satisfaction with the YouTube channel was high, with over 96% of users surveyed saying they would recommend the channel to others. Of users, 90% reported being able to find the information they were seeking.

The majority of responders (76%) did not have any suggestions for improvement to the channel. There were a few requests for videos on specific topics including: endotoxin exposure, roadway safety, animal handling, equipment hazards, accident/injury prevention, direct and indirect costs of injuries/illnesses to the farm operation, and safety measures when using old equipment. Several respondents expressed a desire to use videos for training and safety meetings and a need for videos in Spanish language. A final group of suggestions were for audience-specific videos for firefighters and other farm visitors who may not have knowledge of the hazards present on an agricultural operation.

Discussion

The development of the U.S. Agricultural Centers' YouTube Channel provided opportunities for collaboration and synergy among the NIOSH AFF Centers across regions serving various agricultural operations and industry sectors. This national collaboration was made easier and more cost-effective in the last decade by advances in availability of remote connections, technology, and social media platforms. Importantly, digital video content provides a much-needed resource to reach at-risk farmers, fishers, and loggers with clear information on safe and healthy farm practices and addresses the burden of high injury and fatality rates in agriculture, fishing, and forestry.

Over a 6-year period, the channel grew from 48 videos to 125 videos with over 10,500 cumulative watch time hours. In depth analysis of the channel's reach, video use, and additional viewer demographics will be reported in upcoming publications.

Males between the ages of 25–34 years are overwhelmingly the largest group of viewers on the AFF Centers' channel. This age-demographic aligns with that reported for the YouTube audience worldwide. The largely male viewership of the AFF Center channel (82.7% male) is in contrast to Pew Research in 2019, [21] which indicated YouTube viewership is equally split between males and females (https://www.pewresearch.org/internet/fact-sheet/social-media/). This discrepancy is likely reflective of the larger number of males working in agriculture.[22]

YouTube video views, as shown in Table 2, reflect how many times a video link has been clicked. Views can be an important measure of a video's overall popularity, but perhaps a more important metric is the watch time hours, as it is reflective of viewer engagement. While the number of views on the AFF Centers' channel year grew substantially from 2014 to 2017, this number leveled off from 2017 to 2019. In contrast, the watch time hours continued to increase when compared to the previous year. These data suggest that the videos on the AFF Centers' channel are engaging viewers longer, but with a static number

Table 3. Top 30 videos with the highest number of watch time hours from August 2013 – August 2019.

Video Title	Watch time (hours)	Views	Average View Duration	Time on Channel (months)
Following Grain Bin Entry Procedures Saves Lives	1894	66,138	1:40	70
EPA Pesticide Safety (Spanish)	1794	11,345	9:29	32
How to Use a Chainsaw Safely – Part 1	1111	8581	7:46	44
EPA Pesticide Safety (English)	659	6153	6:25	32
Gen. & Outside Worker Safety (Dairy Part II, Sec 1)	513	6965	4:25	70
Dairy Animal Care (Safety Training Part I, Sec 1)	474	8794	3:14	68
How to Use a Chainsaw Safely – Part 2	464	3262	8:32	44
Fatal Tractor Rollover	212	6839	1:51	60
Milking Barn Safety (Safety Training Part I, Sec 2)	197	5352	2:12	68
Feeder Safety (Dairy Safety Training Part II, Sect 3)	185	4182	2:38	69
Milker & Calf Care Safety (Training Part II, Sec 2)	172	2555	4:02	60
Livestock Safety for Kids	170	2863	3:34	70
Entrenamiento de Seguridad de Lecheria Seguridad general en la lecheria y la del cuidador de v	166	1380	7:13	56
Entrenamiento de Seguridad de Lecheria 2.3 – Seguridad del alimentador de vacas con creÃÅditos	164	2168	4:31	54
Entrenamiento de Seguridad de Lecheria 1.1 – El Cuidado de los Animales en los corrales	156	1941	4:49	54
Right from the Start – Safety Basics	122	3222	2:16	67
Right from the Start – Dairy Cows Part 1	104	2591	2:23	66
ROPS Program for Wisconsin Tractors	99	3383	1:44	67
Entrenamiento de Seguridad de Lecheria 1.2 – Seguridad en la Sala de OrdenÃÉo	91	1718	3:10	54
Feeding and Safety (Dairy Training Part I, Sec 3)	77	2334	1:59	69
Ag Respiratory Protection – Choosing the right mask	74	1850	2:24	69
Segunda Parte: CoÃÅmo la Vaca Utiliza sus Sentidos	62	1891	1:58	42
Right from the Start – Beef Cattle	59	1127	3:09	61
Heat Illness 4 of 6: Fainting and Heat Stroke. Desmayo y golpe por calor.	58	1573	2:13	59
Riding Uphill, Downhill, Traversing, and Other Advanced Techniques on your ATV	54	1115	2:53	24
Control of Hazardous Energy for lockout/tag out	54	1894	1:41	32
Lawn Mower Fatality – Economic and Social Costs	49	1167	2:31	70
Cuarta Parte: CoÃÅmo Mover las Vaca con MaÃÅs Eficacia	45	1819	1:29	42
Right from the Start-Horses Part 1	45	736	3:40	68
Right from the Start-Dairy Cows Part 2	44	1142	2:17	66

of views. Improvements in marketing the channel and promoting new videos could improve both of these metrics.

YouTube subscribers are individuals who choose to follow a channel and content so they can stay updated with the latest videos. The addition of new AFF channel subscribers each year has ranged from a high of 273 in 2017–2018 to a low of 83 in 2014–2015. Subscriptions keep the target audience aware of new safety and health videos being added and serve as a reminder to use the resource.

The addition of new videos to the channel has decreased significantly since the initial launch of the channel in 2013–2015. This is indicative of the Centers adding their pre-existing videos at the onset, and then having to produce new videos, which can be a time-consuming and costly endeavor. To continue to have a valuable channel, new subscribers must be recruited, and new videos need to be created and effectively marketed.

To provide agricultural safety and health information to non-English speaking agricultural communities, AFF Centers added Spanish and K'iche language videos to the AFF Centers' channel. Of the top 30 videos, the 8 ranked by watch time hours are Spanish language videos (Table 3), demonstrating the need to provide educational resources and training in Spanish. Additional non-English language videos are continually sought from the AFF Centers.

Many of AFF Centers' YouTube channel videos are used during formal worker trainings including: grain bin entry, EPA pesticide training (English and Spanish), and dairy working training (English and Spanish), likely accounting for these videos having consistently high watch time hours

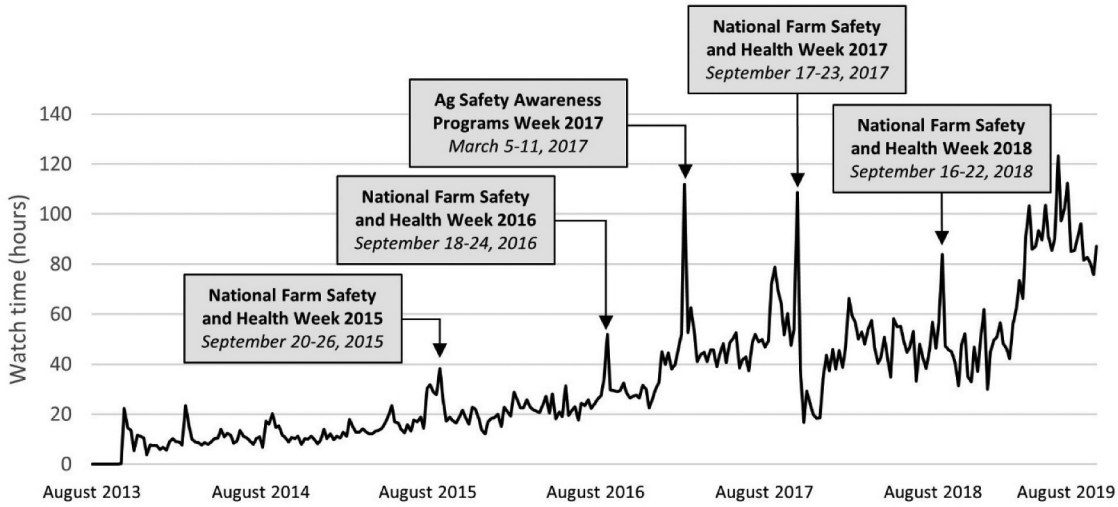

Figure 3. U.S. Agricultural center YouTube videos. Watch time hours by date. arrows correspond to national agricultural safety and health promotions.

(Table 3). When used for trainings it is likely that videos are watched to completion, examples are the Spanish language pesticide safety videos that has an average watch time of 9:29 min, significantly higher than the median watch time of videos (excluding gaming videos) of that length of 5:20 min.[23] On the YouTube platform, success breeds success. YouTube will place videos with high watch time hours into the thumbnail feed that appear as "suggested videos" on a viewer's screen. YouTube users in the United States (81%) said in a 2018 Pew Research survey that they at least occasionally watch the videos suggested by the platform's recommendation algorithm.[24]

Regardless of the popularity of any online social platform, access to the Internet and broadband service, especially in rural areas where agricultural operations and farmers are located, remains a concern. However, while there still exists a digital divide between urban/suburban residents and their rural counterparts, that gap is narrowing. From 2002 to 2018 Internet use in rural communities has grown from 42% to 78%; home broadband has risen from 2% in 2001 to 63% in 2019 [25]. Regardless of on-farm access or type of service, many agencies that provide frequent contact, support, and training for farmers such as agricultural cooperative extension and Departments of Agriculture have high-speed access and are often consumers of YouTube content for training and information that can be used during face to face farm visits or cooperative extension office training. Additionally, YouTube content can be downloaded and re-used as needed.

Promoting and marketing the AFF Centers' YouTube channel is an ongoing process. Using links to the videos on social media and in educational flyers during national agricultural safety and health initiatives has shown to be a successful way of bringing viewers to the channel (Figure 3). Providing educators, trainers, and safety professionals with these resources will further increase viewership and reach of this channel. The pop-up survey that was conducted over a two-year period demonstrated satisfaction with the channel and valuable recommendations for future videos.

Conclusion

Although the development of a YouTube Channel may not be novel, a national systematic collaboration to centralize agricultural health and safety video content proved to be an innovative strategy for disseminating quality educational resources. Each AFF Center benefitted from increased exposure of their content and the collaboration

provided an opportunity to achieve labor efficiencies. The centers also took advantage of the free metrics provided by YouTube to monitor and evaluate usage over time and during targeted activities (e.g., promotional campaigns). The metrics demonstrated that coordinated marketing increases views, watch time, and subscriptions. In addition, the success of the channel communicates the benefits to collaboration among organizations with comparable goals.

Acknowledgments

The U.S. Agricultural Safety and Health Centers YouTube channel is a joint effort between the 10 NIOSH funded AFF Centers and the National Children's Center. These AFF Centers include:

- Northeast Center for Occupational Health and Safety (Bassett Healthcare)
- High Plains Intermountain Center for Agricultural Health and Safety (Colorado State University)
- National Children's Center for Rural and Agricultural Health and Safety (National Farm Medicine Center)
- Western Center for Agricultural Health and Safety (University of California, Davis)
- Southeastern Coastal Center for Agricultural Health and Safety (University of Florida)
- Great Plains Center for Agricultural Health (University of Iowa)
- Southeast Center for Agricultural Health and Injury Prevention (University of Kentucky)
- Upper Midwest Agricultural Safety and Health Center (University of Minnesota)
- Central States Center for Agricultural Safety and Health (University of Nebraska Medical Center)
- Southwest Center for Agricultural Health, Injury Prevention, and Education (University of Texas Health Science Center at Tyler)
- Pacific Northwest Agricultural Safety and Health Center (University of Washington)

In addition to the current staff and leadership at the AFF Centers and the National Children's Center for Rural and Agricultural Health and Safety, we would like to thank Ms. Allison Cassidy for her significant contributions to the development of the collaborative YouTube channel.

The research and manuscript preparation were supported by NIOSH Agriculture, Forestry and Fishing Cooperative Agreements, 2 U54 OH007548, U54 OH010162, 6 U54 OH007547, 6 U54 OH007541, U54 OH008085. The contents are solely the responsibility of the authors and do not necessarily represent the official views of the National Institute of Occupational Safety and Health.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the National Institute of Occupational Safety and Health CDC/NIOSH Cooperative Agreements 2 U54 OH007548, U54 OH010162, 6 U54 OH007547, 6 U54 OH007541, U54 OH008085.

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