Eye Can See Clearly Now: Applications of Eye-Tracking Technology in Agricultural Communications Research

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Introduction/Need for Innovation

Visual attention is a powerful indicator for understanding how individuals consume media sources (Wedel & Pieters, 2008). Through the use of eye-tracking technology, researchers can collect information on a viewer's attentive behavior (Duchowski, 2017). Eye-tracking in agricultural communications can be used to measure attention, recall, and information retention related to agricultural messages in different forms of media (Leggette, Rice, Carraway, Baker, & Conner, 2018). Leggette et al. (2018) found a lack of published eye-tracking research in agricultural communications, recommending the discipline explore how the technology can be used in research designs. As agricultural communicators rely on a variety of media inputs to connect with the public, it is important to understand how the public interacts with those sources. Nearly any type of visual media can be used in eye-tracking research, a feature which will benefit the design of engaging messages that capture consumers' attention.

How It Works/Methodology/Steps

To conduct the eye-tracking experiment, participants are instructed to sit in front of a computer monitor. Participants should have normal or corrected-to-normal vision and can wear glasses throughout the process. Once seated, the eye-tracking hardware and software must be calibrated, a process typically achieved by having the participant follow a moving dot with their eyes, which enables the eye-tracker to measure the precise path of eye movement. After calibration, participants view the stimuli according to the study's design. Eye-tracking allows for a variety of media to be used including pictures, videos, text, and websites. The participant can be given a set amount of time to view the stimuli or may be allowed to click through content at their own pace. External to the eye-tracking solution, survey instruments can be incorporated into the study design before and/or after viewing the stimuli to provide researchers an even deeper understanding of the data. Traditional metrics include fixation, number of fixations, scanpath, and areas of interests (Duchowski, 2017). Fixations are a metric tabulated by the software when the eye briefly pauses and lingers on an object. Number of fixations, which describe the quantity of fixations allocated toward a specific object, is a measurement generally understood to reflect the level of cognitive processing (Duchowski, 2017). Areas of interest are specific zones the researcher delineates to characterize a construct within the provided stimuli, and the eye movements between these targeted regions are regarded as scanpaths (Duchowski, 2017).

Results to Date/Implications

While there is a documented gap of eye-tracking research in agricultural communications, the methodology is gaining ground across the discipline. Recently several universities have conducted studies using the technology (including the current authors). Eye-tracking has been used several times to measure how agricultural magazine advertisements are received by the public. The technology has been used to determine how consumers interact with non-GMO labels in magazine advertisements (Metzger, 2018). One study measured motivational salience on pre-existing characteristics toward genetic modification and antibiotic use in livestock (Fischer, 2017). Another study examined how agricultural communications students viewed print advertisements before and after an introductory graphic design course (Lierle, 2017). Each of these studies focused on how people perceive and interact with agricultural messages, providing valuable insight for communicators. Eye-tracking has also been used in the classroom to analyze how students are learning. A study about visual literacy found students who had completed an agricultural photography class had observably different gaze behaviors than those who had not

completed the course (Redwine et al., 2018). At [University], researchers have conducted a study assessing how consumers navigate the Maschoff's pork production website. Current research is using eye-tracking to analyze visual attention toward clean labels on food products.

Future Plans/Advice to Others

As agricultural communication practitioners seek to connect with a diverse audience, eye-tracking can lend unparalleled insight into the specific aspects of media different groups deem salient. Such data can enable researchers to explore how varying demographics and psychographics of audiences influence viewing patterns, illuminating the linkage between cognitive interpretation of information and purchasing behaviors. Eye-tracking may emerge as a key tool to aid professionals in tailoring messages and designing elements to most effectively resonate with segmented audience groups.

One barrier to the adoption of this methodology is the expense of the hardware. Establishing partnerships with other units on campus that have this technology may serve as an opportunity for researchers to gain access while mitigating costs. The significance of interdisciplinary partnerships extend beyond the financial incentives, as conducting an eye-tracking study is a technically intensive endeavor. Professionals with expertise in the programming of the hardware are invaluable resources of knowledge for those new to the methodology. The research stemming from such collaborations may also afford the field with fresh perspectives and novel approaches to communication-based empirical inquiries.

Experiments should be conducted with a limited amount of media stimuli as eye-tracking produces a large amount of data after each collection. Labs should be free of distractions, and researchers should take care to shield computers from direct sunlight. Additionally, as eye-tracking is a relatively new methodology in agricultural communications, researchers should invest time surveying the literature to learn the relevant applications of eye-tracking for their purposes and expend effort to receive proper training for operating the technology. Depending on the study design, each data collection may require a great deal of time to complete. As such, researchers should design their study to avoid participant fatigue and schedule such participants to avoid researcher fatigue in the lab. In order to avoid collecting data from participants not part of the population of interest, a careful entry questionnaire should be completed by the potential participant before scheduling the eye-tracking session.

Cost/Resources Needed

Eye-tracking equipment is a significant investment, ranging from $20,000 to $35,000. Several companies offer different models to meet research needs, from wearable glasses to hardware mounted on a computer screen. A computer-mounted device is typically found in the lab, while head-mounted devices can be used for field experiments (Duchowski, 2017). A dedicated lab room and computer, as well as training for those conducting eye-tracking research, are also necessary. In addition, eye-tracking research takes a large amount of time and resources to develop and conduct studies. Researchers should utilize calendar scheduling to arrange participants in line with lab and researcher availability.

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