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EYE TRACKING TECHNOLOGY IN THE MARKETING CLASSROOM: AN EXPERIENTIAL LEARNING METHOD

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ABSTRACT
Employers and students are increasingly demanding applied, relevant skills. Eye tracking technology is used extensively by companies to test consumer attention and awareness of advertisements, packaging, and websites, but the marketing education literature lacks a pedagogy for teaching it in a marketing classroom. An experiential learning activity is presented where students conduct their own eye tracking studies in the classroom to test the effectiveness of marketing materials. A study is presented that shows students effectively gained knowledge, experience, and confidence in eye tracking through the activity. Results also demonstrate the effectiveness of experiential learning compared to observing the same activity.

Employers are increasingly asking for students to have applicable skills and experience; however, there is a perceived gap between the skills taught in college courses and the skills needed for industry (Aistrich, Saghafi, & Sciglimpaglia, 2006; Finch, Nadeau, & O'Reilly, 2013). Students also believe it is important to learn applicable skills for industry. A survey of college students found that 79% of college students believe that it is important that they apply knowledge and skills to the real world (Hart Research Associates, 2015). The need for applicable skills is particularly relevant with the advancement of new technology used in industry (Duffy & Ney, 2015).

Eye Tracking technology is a growing aspect of marketing research. 58% of marketing research firms reported that they were either currently using eye tracking technology or considering using the technology within the year (Greenbook, 2018). Eye tracking technology is used by almost all of the top global advertising spenders including Microsoft, Proctor & Gamble, Toyota, Ipsos, Unilever, Kraft, Pfizer, and PepsiCo to test the effectiveness of advertisements, packaging, store layouts, and websites (Tobbi, 2015; Malhotra, 2007; Wedel, & Pieters, 2008). Google, Apple, and Facebook have all recently acquired eye tracking companies to further embed eye tracking into their products (Dickson, 2017; Hackett, 2017). Eye tracking systems record the fixation points and movement of eyes when users view visual stimuli such as advertisements, websites, product packaging, or store shelves (Farnsworth, 2017). There has been rapid growth in the use of eye tracking systems in business as eye tracking technology has become easier to use, more mobile, and less expensive in recent years.

With the increasing use of eye tracking in industry, it is important that students learn this skillset in marketing and marketing research courses so that they can test the effectiveness of advertisements and marketing materials. The marketing education literature has yet to propose a methodology for teaching students how to conduct an eye tracking study through experiential learning. To solve this problem, an experiential learning eye tracking activity was created to give students experience and knowledge in conducting an eye tracking study for a marketing research course; however, this activity can also be applied to a range of marketing courses to test advertisements, promotions, packaging, product design, and store layouts. The learning objective of this experiential learning activity is to provide students with the first-hand experience using eye tracking so that they have the knowledge to confidently use eye tracking to test the effectiveness of advertisements and other marketing productions.

Eye tracking technology

Eye tracking is a technology that allows marketers to track the eye-movement of a customer as they look at advertisements, websites, or even in-store displays (Farnsworth, 2017). Most eye trackers work by reflecting a non-visible infrared light off a participant's eyes.

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The angles at which the light is reflected back are measured to determine which parts of a visual stimuli are being viewed by the user. Eye tracking software can then create scan paths and heat maps which show the specific fixation points of a participant's gaze path while viewing stimuli.

Eye tracker hardware is available in two main forms: screen-based eye trackers and eye tracking glasses. The screen-based eye trackers are placed beneath a computer monitor and visual stimuli are displayed on the computer screen. Eye tracking glasses are worn by the user making eye tracking experiments in-stores and other locations outside of a lab possible (Horsley, Eliot, Knight, & Reilly, 2013). The screen-based eye trackers tend to be less expensive than eye tracking glasses (Mahler, 2017). Falling prices of eye tracking equipment have now made the technology affordable to implement into marketing education with screen-based eye tracking units now available for under 500 USD (Sibley, Foroughi, Olson, Moclaire, & Coyne, 2017).

Marketing researchers use eye tracking as an objective measure of customer attention. Eye fixations demonstrate deeper levels of cognition and memory. Eye tracking fixations have been used to successfully measure ad effectiveness (Malhotra, 2007), and in-store shelf research has used eye fixations to predict brand consideration probability (Chandon, Hutchinson, Bradlow, & Young, 2006). The data collected through eye tracking is particularly valuable because it often is not obtainable through interviews due to the rapid speed, lack of conscious memory, and amount of information obtained during the visual communication process (Wedel & Pieters, 2008). Eye tracking measures have been found to be more accurate measure of which brands are evaluated compared with recall survey questions (Chandon, Hutchinson, & Young, 2002).

Eye tracking experiential learning activity

Experiential learning allows students to gain direct experience with real-world application of knowledge (Kolb, 2014). This focus on application helps to better prepare students for careers as professional marketers (Schibrowsky, Peltier, & Boyt, 2002). Through this activity, students gain the skills in using eye tracking to test advertisements in the same method that many companies test advertisements and marketing.

This activity was implemented in multiple sections of an undergraduate marketing research course with approximately 40 students per section. Students in the course work in small groups to first choose an advertisement from a company they are studying as part of a larger course project. A real eye tracking study is then conducted on the ads. The results of the eye tracking study provide a heatmap which visually shows which parts of the ad customers viewed. This information can highlight if a logo, slogan, or product was not seen or read by most customers. In addition, students can access the scan path data which shows the path each customer's eyes followed as they viewed the images. This information can be used to analyze customer understanding of an ad and opportunities for improved layouts. Following the study, students interpret the data and use these results to design a new, more effective version of the advertisement.

The eye tracking experiment itself is conducted by the students. Having students conduct the eye tracking experiment is important for meeting the learning objective of preparing students with the actual experience and knowledge to conduct an eye tracking experiment. In this unique activity design, students take the role of both a participant and a researcher to fully experience the implementation of an eye tracking. Students have the opportunity to be a participant where they will be calibrated with the eye tracking software and have their eye movement recorded as they view ads. After being a participant, that student can then take the role of the researcher and recruit the next participant, lead them through the calibration and eye tracking experiment instructions.

Classroom implementation details

Prior to conducting the eye tracking experiment, students are taught a brief 10-minute lesson on the basic concepts of eye tracking including how the eye tracker works using infrared light, how eye movements are measured, and how that information is used to analyze the effectiveness of marketing materials. The eye tracking device along with a laptop running the eye tracking software is set up at a table near the front of the classroom along with a chair for the participant. Prior to class, the professor uploads the ads chosen by the student groups into the eye tracking software. The ads are all static marketing images – primarily print or web ads. Some student groups choose to test a static image of a webpage if that is a better fit for their specific project. In a class of 40 students, this is approximately 10– 15 ads and each ad will be shown to each participant. A tutorial on conducting the eye tracking experiment with a participant is first demonstrated in front of the class by the professor. A volunteer participant is recruited for the study and instructed how to align themselves in front of the laptop and eye tracking device. A visual on the screen indicates if the participant needs to adjust their seating location to best align with the eye tracking hardware. The professor who is taking the role of the researcher for this tutorial then instructs the participant that they will be calibrating the device – a process where the participant views a dot that moves around to the edges of the screen while the device records the angles that the participants eyes are moving. This calibration which takes 20 – 30 seconds allows the software to determine which part of the screen a participant is viewing at each moment. After calibrating, the researcher instructs the participant that they will be viewing approximately two minutes worth of ads. The researcher clicks the button to begin the experiment and the ads begin to show to the participant. After the last ad is shown, the experiment is done, and the data is saved in the software. Through this tutorial, all students see how an eye tracking study is conducted.

Following the completion of the first participant in the experiment which was led by the professor, the student who was the participant now takes the roll of the researcher and becomes responsible for recruiting the next participant and conducting the experiment with that participant. After each trial of the experiment, the current participant switches to the researcher role and recruits and trains the next participant creating a chain effect. The student in the role of researcher recruits the participant, gives the participant the instructions on the study, and then leads the participant through the eye tracking study. A printed sheet of instructions is provided to the researcher. These instructions remind the researcher of each step in positioning the participant, providing them instructions, completing the calibration, and beginning the experiment. At the end of each experiment trial, the student who was in the role of research participant now takes the role of the researcher and recruits the next participant and leads them through the experiment. During this time, the professor sits off to the side observing the interaction and stepping in to advise if any mistakes are made by the student in the researcher role. In this implementation, each student gains the real experience of being both a researcher and a participant in an eye tracking experiment. The hands-on element for each student is important as the highest levels of learning and memory happen when a student participates as part of the learning (Kolb, 2014). Students training their classmates is a form of peer learning which can help students develop higher order thinking (Blumenfeld, Marx, Soloway, & Krajcik, 1996; Boud, Cohen, & Sampson, 2014).

About one hour is allocated for conducting the eye tracking study during class time. Each participant takes about 3 minutes to recruit, calibrate, and complete the study, so approximately half of the students in a class of 40 will be able to participate in the eye tracking activity in a class period using a single eye tracking device. Multiple eye tracking devices and laptops could be set up in larger classes to give all students the opportunity to participate. Alternatively, additional time can be scheduled outside of class or a second day of eye tracking can be used to test redesigned ads. With multiple sections of students, the advertisements that are shown during the study can be rotated between class sections to avoid biasing the results with students viewing the advertisements that they selected. During the time that the eye tracking experiment is being conducted in class, the rest of the students get into their groups and pair up with another group of students to conduct a focus group about the brand they are studying. The focus group is used to learn more about how customers feel about the advertisement and the brand. The focus groups work well because it keeps the rest of the class engaged in another experiential learning project and it is easy for students to step away from the focus group briefly to participate in the eye tracking study.

At the conclusion of the class session, the experiment results are downloaded from the eye tracking software by the professor and shared with students through the class's learning management website. The data includes a heat map, which shows the parts of the image that customers looked at most and a scan path, which shows the fixation track of participants. As part of a graded assignment, students analyze the results to determine which aspects of the ad are effective and which are not being noticed. Following the analysis of the advertisement, students redesign the ads to improve upon the deficiencies in the ad that they identified through their eye tracking research. Students use basic software such as PowerPoint to add new text, change the placement of different images, remove distracting elements, and add in improved images. The redesigned ads can then be assessed through another round of the student led eye tracking experiments in the next class period or during time outside of class. This second day of eye tracking is not necessary, but it can be useful with larger classes because it allows time for more students to participate in the eye tracking study. The redesigned ads typically show a meaningful improvement over the original in terms of attention paid to key details such as the brand name or product. Students enjoy redesigning the ads because it is an experiential application in which they apply their creativity and insights. Student work is graded based on the use of course concepts to correctly analyze the eye-tracking results and implement those interpretations into an improved ad design.

Assessment measures

A study was conducted to test the effectiveness of the activity through a pretest/posttest survey that was administered at the beginning of class prior to the eye tracking lesson and at the end of the class following the eye tracking activity. The survey consisted of five Likert questions on a 7-point scale which were adopted and modified from the Familiarity, Comprehension, and Practical Application scale (Bennett, Matos, & Andonova, 2019). This scale was chosen to measure whether the students had obtained the knowledge of eye tracking that they could confidently apply in industry. In addition, 5 multiple choice quiz questions about eye tracking were included to objectively measure learning of eye tracking concepts (see Appendix).

Students were given the link to complete the survey at the beginning and the end of the class period and asked to voluntarily complete the survey. Participants were told that the survey was optional and anonymous. The survey was administered in four separate sections of the course. 78 complete survey responses were recorded. Because not all of the students had participated in the eye tracking activity after day one, the survey asked students whether they had participated in the eye tracking experiment (n = 45) or whether they had just observed the eye tracking experiments but had not yet participated (n = 33). We classified these two distinct groups as “participants” and “observers.”

A paired sample t-test was conducted to compare the ratings of eye tracking participants before and after the eye tracking activity (Table 1). Participants increased their ratings significantly ($p < .001$) for each of the 5 questions. Participants felt more confident that they could talk about eye tracking in an interview, that they could talk about eye tracking to a group of students without using notes, that they could lead an eye tracking campaign for a marketing research company, and that they completely understand how to conduct an eye tracking study. These results indicate that the eye tracking class successfully meets the learning objective of first-hand experience and knowledge to confidently conduct an eye tracking experiment.

Students who were observers also reported statistically significant increases ($p < .001$) for each of the five scale questions (Table 2). This indicates that students who observed other students participating in the also had significant improvements in their knowledge and confidence in their ability conduct an eye tracking study.

An ANOVA was used to compare the post activity ratings between participants and observers to measure whether participating in the activity was significantly more beneficial than observing the activity. Participants were significantly more confident in their ability to talk about eye tracking in a job interview ($F(1,76) = 7.36$, $p = .008$) compared to observers. Participants were also more confident in their ability to talk about eye tracking to a group of students without using notes ($F(1,75) = 6.71$, $p = .011$) compared to observers. There was not a statistically significant difference in how they felt about whether they could lead an eye tracking campaign or whether they feel completely familiar with what goes into an eye tracking study. There was a marginal, but not statistically significant improvement ($F(1,74) = .2.04$, $p = .157$) in their perceived understanding of how to conduct an eye tracking experiment. This result demonstrates the additional benefit of participating in experiential learning. Students who participated in the activity had a statistically significant increase in their confidence talking about eye tracking in an interview and with others.

The scores from the 5-question quiz were also analyzed and summed (Table 3). These questions asked students

Table 1. Eye tracking activity participants survey responses.

	Pre-Activity	Post-Activity	t-value	P-value
1. I feel confident talking about eye tracking in a job interview	M = 3.38 (1.48)	M = 5.71 (0.83)	−9.99	<.001
2. I could talk about eye tracking to a group of students right now without notes or help	M = 3.32 (1.68)	M = 5.80 (0.91)	−10.51	<.001
3. I feel like I could lead an eye tracking campaign for a marketing research company	M = 2.09 (1.20)	M = 4.67 (1.28)	−12.37	<.001
4. I am completely familiar with what goes into conducting an eye tracking study	M = 2.80 (1.47)	M = 5.18 (0.75)	−11.52	<.001
5. I understand how to conduct an eye tracking study	M = 2.65 (1.67)	M = 5.76 (0.70)	−15.35	<.001

Table 2. Observers survey responses.

	Pre-Activity	Post-Activity	t-value	P-value
1. I feel confident talking about eye tracking in a job interview	M = 3.85 (1.28)	M = 5.06 (1.25)	−4.59	<.001
2. I could talk about eye tracking to a group of students right now without notes or help	M = 3.24 (1.28)	M = 5.25 (0.91)	−8.68	<.001
3. I feel like I could lead an eye tracking campaign for a marketing research company	M = 2.36 (1.23)	M = 4.66 (1.19)	−9.64	<.001
4. I am completely familiar with what goes into conducting an eye tracking study	M = 2.79 (1.30)	M = 5.10 (0.96)	−8.98	<.001
5. I understand how to conduct an eye tracking study	M = 2.84 (1.44)	M = 5.52 (0.51)	−10.78	<.001

Table 3. Quiz scores.

	Correct Responses Pre-Activity	Correct Responses Post-Activity	t-value	P-value
Eye Tracking Participants	M = 3.13 (SD = 1.16)	M = 4.49 (SD =.757)	−6.90	<.001
Observers	M = 2.76 (SD = 1.35)	M = 4.03 (SD = 1.16)	−5.15	<.001

about how eye tracking technology works and correct procedures for conducting an eye tracking experiment. The information needed to answer these questions could be learned from just the class lesson and observing the tutorial lead by the professor. The same quiz questions were used pre and post activity, but students were not informed of whether their answers were correct. Both eye tracking participants and observers had a statistically significant increase in quiz scores ($p < .001$). The average score for participants raised from a 3.1 to a 4.5 while observers increased from a 2.8 to a 4.0. These results indicate that most students had little knowledge of eye tracking prior to the class. Following the class period, all students had significantly increased their knowledge of eye tracking.

An ANOVA was conducted to compare the means of participants and observers. There was not a significant difference between participants and observers in the pretest ($F(1,76) = 1.74$, $p = .191$). There was statistically significant different between participants and observers in the posttest ($F(1,76) = 4.46$, $p = .038$) indicating that although all students increased their learning, students who participated in the eye tracking experiment learned more than students who were merely observing the activity. This result further reinforces the benefit of experiential learning compared to observing the same lesson and activity.

Discussion

The study results indicate that the eye tracking activity successfully increases student familiarity, confidence, and knowledge with eye tracking in both the opinion of the student and the objective quiz scores. Eye tracking is a growing tool used in marketing research and marketing, so this activity is important because it successfully prepares students to use eye tracking and talk about their experience in an interview.

The data also provide evidence that taking part in even a short experiential learning activity can have a significant positive impact beyond merely observing the same material. Students who experienced eye tracking did better on the test and were more confident in their abilities than students who observed the activity. This is an important contribution because it demonstrates the increased memory and confidence from experiential learning. Therefore, it is best if students have experiential learning, but significant benefit can still be derived from observing other students in experiential learning.

The survey and quiz results collected prior to the activity indicate that students initially had relatively little knowledge of eye tracking prior to the lesson which further validates that there is a real need for an activity to teach students these skills. This innovation is novel in that to date there have been no published articles instructing marketing educators how to teach eye tracking through experiential learning. The method of having students take the role of both participant and researcher in the study is also a novel approach to experiential learning and utilizes the increased learning that comes with students teaching a concept to other students. The experiential learning method used in this activity where each student takes the role of participant and then takes the role of researcher is also an important contribution. This method can be beneficial for implementing in other experiential learning activities where students learn by teaching and leading other students.

Implementation challenges

The main implementation challenge is obtaining eye tracking hardware and software. Falling prices have made this easier for professors. For the course described in this article, an Eye Tribe Eye Tracker originally costing 200 USD was used. Other eye tracking devices range from 500 USD and up with higher prices for models with higher accuracy. Since eye tracking can be used for academic research in the areas of marketing, and information systems, faculty may be able to share some of the costs with research budgets or other departments. Free open source Ogama eye tracking software was used for creating the eye tracking experiment and conducting the study in this article. Paid eye tracking software will have better interfaces and more advanced capabilities, but even the open-source Ogama software has an easy to use graphical interface and does not require any programming or advanced technical knowledge.

The eye tracking experiment can be incorporated into a variety of marketing and business courses using the same pedagogy. Websites, store shelves, product packaging, product promotions, search advertising, and pricing variations can all be used as the visual stimuli in the eye tracking experiment. A branding or new product development class could have students change product packaging to study how those changes impact customer attention. An introduction to marketing course may use the same experimental setup to demonstrate the 4 Ps of marketing by showing the impact on customer attention by changing pricing, promotion, placement, or product on a picture of a store shelf. Regardless of the class application, the same goal remains: have students experience an important tool used in industry to apply course topics.

Conclusion

Students and businesses have noted the importance of preparing students with experience using marketing research tools used in industry. This eye tracking activity helps to address this need by providing students hands-on experience using eye tracking technology to test the effectiveness of marketing. The activity successfully meets the learning objective of using experiential learning to make students more confident and knowledgeable in eye tracking technology and their ability to implement it to test advertisements and other marketing productions. This activity contributes a novel way to provide an experiential learning approach to teaching eye tracking. The valuable hands-on experience enhances a student's understanding of marketing and the skills they can use in their careers. Furthermore, this manuscript provides evidence for the effectiveness of experiential learning.

Disclosure statement

No potential conflict of interest was reported by the author.

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Appendix

Quiz Questions Used

1. How long does it take to calibrate a participant in an eye tracking study?
2. What type of light is used in an eye tracking study?
3. How should participants sit when using a screen-based eye tracker?
4. How do human eyes move when viewing an advertisement?
5. I understand how to conduct an eye tracking study

Instruction Reminder Page for Student in Researcher Roll