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Exploring How Public Libraries Can Build Situational Interest in Science

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Exploring How Public Libraries Can Build Situational Interest in Science

This project aimed to cultivate library patrons' interest in earth and space science, using research on how situations can trigger and support interest to deepen across time. The project featured a dynamic but low-tech library display that showcased thematic content to help patrons realize and develop their interest in earth and space science topics.

Patrons engaged with and returned regularly to the display, which predicted their participation in additional activities outside of viewing the display, indicating deepening interest. This approach uses a passive program to help libraries build patrons' interest in accessing science resources and programs.

Keywords: public interest in science, engagement, learning, passive program

Exploring How Public Libraries Can Build Situational Interest in Science

Although interest in science is seen as a key way to expand the public's knowledge of science, opportunities for developing interest may be hindered by limited formal education, limited media coverage of scientific discoveries, and a reluctance by scientists themselves to communicate their results to the larger public (Pew Research Center, 2015). Libraries already have a strong record of offering public programs and resources that support interests in science, and they may have even greater impact if targeted strategies can expand the number and diversity of patrons who access these resources (Horrigan, 2015). As a gateway to lifelong learning for community members from diverse backgrounds, libraries may be able to help patrons realize their interest in science (Baek, 2013; Dusenbery, 2014; Dusenbery et al., 2020; Shtivelband et al., 2017).

The current project, known as the Patron Experience Pilot (PEP), aimed to use research-based strategies to trigger and support library patrons' interest in earth and space science. The approach described here was developed by Northern Illinois University researchers, Cornerstones of Science, and the National Center for Interactive Learning (NCIL) at the Space Science Institute, as part of the NASA@ My Library project, which was funded through the Science Mission Directorate branch of the National Aeronautics Space Administration (NASA).

Interest Development

This project is rooted in psychological research on how interests develop. Although interests are typically thought of as residing within individuals (e.g., people are often described as "having interest in a topic"), interests actually begin outside of the person, in a situation (Deci, 1992; Hidi & Renninger, 2006; Krapp, 2002; Prenzel, 1992; Schiefele, 1991; Silvia, 2006). Hidi and Renninger's (2006) Four-Phase Model of Interest Development guided the current project. Their

model lays out how interests transition from being supported by a situation (i.e., situational interest) to being supported by the individual (i.e., individual interest, see Figure 1).

The supporting situation can take any number of forms and is defined more by its features that attract attention and cultivate interest than its boundaries. Some situations are rare, such as a family vacation to the Grand Canyon or the solar eclipse that occurred across the United States in 2017. Even though these situations may be short-lived, their intensity may motivate individuals to explore further after the situation is over. Other situations are less intense but longer lasting. For example, a walking trail may have unusually colorful rocks, which attract people to return with some regularity and wonder about why the rocks are so colorful. Alternatively, a family might notice an eagle's nest in a nearby park and check on the nest during each visit to watch the eaglets grow. These situations may offer experiences that are less intense, but they invite repeat engagement so that interest and understanding can develop over time.

The PEP project featured a situation that was more akin to this second type of situation, which offered slower and repeated engagement. The situation was a large, freestanding display that presented information about earth and space science in a way that was designed to incite the early phases of interest development. In this context, this research examined the first three phases of the four-phase model to test how a library situation could foster interest in earth and space science.

(Figure 1 about here)

The first phase, *triggered situational interest*, occurs when something in a situation catches attention through the senses (e.g., a sight, sound, smell). This phase serves the function of simply causing individuals to orient to the situation and pay attention to it. Features of situations that are novel, complex, or incongruous catch attention and draw people in, provided

that individuals can cope with the stimuli without being overwhelmed (Berlyne, 1963, 1970; Berlyne, et al., 1968; Rotgans & Schmidt, 2014; Silvia, 2005 Silvia, 2006). Although this is a critical entry point for further interest development, as it guides attention in the right direction, it is too short-lived and superficial for much learning or interest development to take place.

If interest is to be held, the situation needs offer a compelling, but manageable, opportunity to explore and learn. This defines the second phase of interest, *maintained situational interest*. Maintained situational interest occurs when individuals remain in the situation for a longer period, or if they choose to return to a similar situation in the future to learn again. A key feature of this phase is that individuals begin to perceive value and meaning in the topic (Brophy, 1999; Feather, 1988; Hidi & Harackiewicz, 2000; Krapp, 2002; Mitchell, 1993; Renninger, 2000; Wigfield & Eccles, 1992). Interest and knowledge develop together such that interest can attract individuals to a topic so that they learn, and knowledge of the topic contributes to a sense of competence, personal identification, and meaning (Alexander et al., 1995; Renninger, 2000). That said, these processes do not happen quickly or in a linear fashion. It takes time and usually repeated exposure, which is why the situation needs to support different kinds of opportunities for learning and engagement over time.

In contrast to the first two phases of interest development, which are supported by the situation, *emerging individual interest* begins when individuals seek out experiences beyond those available in the initial situation. At this point the person's interest starts dissociating from the situation and becomes more supported by their own internal efforts to continue exploring the topic (Hidi & Renninger, 2006). This happens once individuals develop even a simple understanding of the topic, realize its value, and begin setting their own learning goals (Durik et al., 2017; Harackiewicz et al., 2008). Finally, with extensive exposure and continued support,

individuals may transition to a *well-developed individual interest*. In this last phase, individuals generate experiences on their own to continue exploring and learning about the topic (Hidi & Renninger, 2006).

Interest Development Applied to the Library Situation

Libraries are ideal for fostering interests for many reasons. First, libraries have extensive resources to offer when patrons have the motivation to access them (i.e., once they are interested). These include physical resources, such as books, kits, and computers, as well as informational and community resources. Second, libraries attract a wide range of community members, including those from different backgrounds, different ages, different learning abilities, as well as different educational and income levels (Baek, 2013; Dusenbery et al., 2020; Shtivelband et al., 2017). Third, libraries attract patrons who return to the library periodically. In a 2011 Harris poll, 37% of those who had visited a library in the last year had visited over ten times, while almost 20% had visited over 25 times in the last year (Harris Interactive, 2011). This is important because effectively designed library situations can support interest development slowly. Finally, when patrons do want to learn more about a new topic of interest, they have experts on hand (i.e., librarians) to help them find additional information.

The PEP project focused on impacting the initial phases of interest development and tested the idea that a location within the library could be carefully designed to support patrons' interest in earth and space science so that they start seeking out related library and community resources. Key to these impacts was a freestanding display that had a specific layout with features known to help trigger and maintain situational interest (see Figure 2). Also important in the project was the development of the science content for the display; the additional programs, activities, and events that took place in relation to each display topic; the location of the display

in the library; and library staff's dedication to learning how to develop, implement, and maintain these efforts within their library.

(Figure 2 about here)

The features designed to *trigger* situational interest were attractive, high-resolution pictures and graphics relevant to earth and space science that were prominently presented on the display. Several additional features were designed to *maintain* situational interest, including a brief reading about the topic and the associated pictures, as well as an interactive question that allowed patrons to consider the topic in relation to themselves and their lives. The question provided a way for patrons to identify how the topic may be relevant or valuable to them.

Furthermore, a hallmark of maintained situational interest is that people return to the same situation to learn more; therefore, it was important to give patrons a reason to come back. Because patrons typically return to libraries with some regularity, the display content within a theme was presented in a series of segments. A given segment of the thematic series was posted for two weeks, and then replaced by a new segment that continued the learning material within the theme. The changes occurred for a set amount of time that led up to a culminating event related to the theme. Even though the same thematic series was displayed over a couple months, the content unfolded as new segments in the series replaced previous segments. This was critical because patrons whose interest was "caught" could come to expect the display to change, so they could look for something new to continue their learning the next time they were at the library.

Each segment in the thematic series provided a relatively simple and manageable, but authentic, learning opportunity so that patrons were not overwhelmed and could deepen their knowledge slowly. Each segment could stand alone as a learning experience or operate as a step in the thematic series to cultivate burgeoning interest for a returning patron. For situational

interest to transition to emerging individual interest, patrons needed to notice the display, identify features on the display that they liked and from which they could learn, and decide to return to the display across time.

The Patron Experience Pilot (PEP) Project

The overarching goal of the PEP project was to determine whether a carefully curated display in a public library could foster sustained engagement in earth and space content in the immediate situation (i.e., on the display itself) as well as encourage patrons to engage with earth and science content beyond the display.

The first step was to get a large portion of patrons to notice the display. If the display *triggered situational interest* broadly, then the more often patrons went to the library the more likely they would be to notice the display. In other words, access to the situation should lead to noticing the display, independent of patrons' existing levels of interest in earth and space science. Therefore, the frequency with which patrons went to the library should best predict whether they noticed the display, and not only those patrons who already had an interest in earth and space science.

The second step was to test whether the display attracted visitors to return to it, and if so, which features of the display correlated with patrons' tendency to return. Returning to the display reflected *maintained situational interest*. Therefore, patrons who liked the attractive images should be more likely to attend to the display when they returned to the library. Furthermore, patrons who liked engaging in the deeper learning activities (i.e., reading about the images and thinking about the personally relevant questions) should also return to the display more often. The role of the situation in interest development should be evident if these specific features of the display predicted patrons' reports of returning to the display more strongly than

patrons' existing levels of interest. The power of simple but deeper learning opportunities would corroborate past research showing that features that attract attention at a superficial level, but do not open up learning opportunities, can even deter some people from finding material interesting (Durik & Harackiewicz, 2007)

Perhaps most importantly, this project tested what predicts patrons' engagement with related content beyond the display, to explore learning opportunities on their own, without the obvious support of the situation. This type of engagement reflects *emerging individual interest*, and the opportunities for this in a library context are extensive, including circulation materials, other passive programs stationed at the library, and active programming and events. Patrons who had gone beyond looking at the attention-grabbing images to engaging in the deeper learning activities at the display (i.e., reading about the images and thinking about the personally relevant questions) should be more likely to report returning to the display and engaging in earth and space science activities beyond the display. This final step is the point at which library staff can help patrons take their interests further. When a patron asks for help to find information on a topic, then the patron already has an emerging interest. The idea behind the PEP project was to test the phases that lead up to this point, to examine how the library situation could help patrons realize and develop an interest in science.

Method

Data were collected from several sources: survey data from patrons, interviews with library staff, and traces of engagement on the display itself. Each is described below.

Participants

The primary source of data is from a survey conducted with 140 adult patrons of the Stephens Central Branch of the Tom Green County Library System in San Angelo, Texas. In some cases,

participants responded to the survey items on behalf of another patron (e.g., child). Most participants (self- or other-reported) identified as female (58%). Of those who completed the question about race and ethnicity ($n = 128$), patrons identified as White only (56%); Hispanic (32%); Black, African, or African American (6%); American Indian or Alaskan Native (3%); and Asian (2%). A few participants indicated they were of another race (3%) or preferred not to say (2%). Participants were given the option to report multiple categories for race and ethnicity such that a few participants were counted in more than one category.

These percentages are fairly similar to the race and ethnicity composition of the city, revealing 50% White and non-Hispanic, 43% Hispanic/Latinx, and 5% Black or African American (U.S. Census Bureau, 2020). Most respondents reported attending the library without a child or grandchild (70%, $n = 90$). Participants completed the survey on a voluntary basis and were offered a reusable shopping bag in exchange for their participation.

Nine members of the library staff were asked about their observations of patrons interacting with the display, including the primary librarian on this project who also co-developed display content, maintained the display, and collected data from the display.

Materials

The freestanding, four-sided display was designed to attract attention. It was 6'10" high, situated next to the circulation desk, visible from the main entrance of the library, and prominently announced that it was part of the *NASA@ My Library* project through its signage. The content posted on the display was geared toward patrons of a wide age range (e.g., late-elementary school children through adults) to attract the most patrons.

The theme of the display varied across time and corresponded with an upcoming library event associated with the *NASA@ My Library* project, with the intent of cultivating patron

interest prior to the event. Each thematic series was comprised of segments, which were replaced every two weeks. From March to April 2019 the display focused on earth science in anticipation of an upcoming Earth Day event at the library. For example, the theme announced, “Explore Earth—Our Home Planet” and featured images of Earth from space. From May to August 2019 the display focused on technology used for space exploration in anticipation of an upcoming celebration of the 50th anniversary of the Apollo 11 moon landing, and as part of the library’s summer reading theme, *Universe of Stories*, through the Collaborative Summer Library Program (CSLP). As part of its Summer of Space event, the NASA@ My Library team partnered with CSLP (Vierow-Fields et al., 2020). A final theme was featured from August to October in anticipation of International Observe the Moon Night (InOMN). Although survey data were collected before this final theme, data continued to be recorded on the display during this time.

The display had four panels (*home*, *look*, *read*, and *do*; see Figure 3). Three of the panels were 4’ wide and the *read* panel was 2’ wide. The *home* panel faced the entrance of the library, introduced the series topic, and displayed a very large eye-catching image of Earth. When segments within a series changed, the display contained new information on all panels except for the *home* panel, which consistently announced the theme topic.

(Figure 3 about here)

The *look* panel, which was located to the right and perpendicular to the *home* panel, was designed to trigger situational interest. It displayed one large fully visible image (e.g., a view of the Grand Canyon taken from space) and one partially obscured image (e.g., a close-up view of a mineral-rich stream within the Grand Canyon). This second image was covered partially by a moveable flap that could be raised to reveal the full image. The flap was attached to an electronic counter hidden inside of the display that tracked the number of times the flap was raised.

The *read* panel, which was to the right and perpendicular to the *look* panel, offered patrons an opportunity to stay and learn a little more, consistent with maintained situational interest. It provided a short reading passage about the images on the *look* panel (e.g., how the Grand Canyon was formed). The reading was also partially obscured such that patrons needed to raise a flap in order to read the passage. This flap was attached to a hidden counter to track the number of times it was raised.

Last, the *do* panel, which was to the right and perpendicular to the *read* panel, was designed to help patrons connect the content to themselves, consistent with maintained situational interest. This panel presented a question that prompted patrons to think about how the content related to their lives (e.g., “What comes to mind when you think of the Grand Canyon?”) and give their answer to by moving a “dot” sticker to one of the choices (e.g., “Wide open spaces,” “Colorful rocks,” “Vacation” or “Something else”). The *do* panel also showcased ways for patrons to continue their exploration of the topic beyond the display, consistent with emerging individual interest. The display listed associated activities in the library and community for patrons to do, circulation materials on the theme, and upcoming library events and programs to attend including the culminating event on the theme (e. g. Earth Day or InOMN).

The display content was intentionally not geared toward young children so that it would attract (and not “turn off”) older children and adults. However, the lower half of the *look* and *do* panels also offered an interactive area for young children, approximately younger than ten years old. This section was designed to simply occupy young children whose older siblings and parents may want to explore the display. The interactive content was loosely related to the display theme but did not reliably offer specific content germane to the theme.

Procedure

The *NASA@ My Library* display was first installed on March 13, 2019. At that time members of the library staff were trained on interest development, the design features of the display intended to support situational interest, content development, and the timing and method of data collection. Moreover, one librarian served as the point person to collect data, change the segments every two weeks, troubleshoot, and help develop display content. Whereas the display content for the first thematic series leading up to Earth Day was largely designed by the researchers, the display content for the second series on the CSLP *Universe of Stories* and Apollo 11 anniversary, was co-designed by the librarian and the research project staff, and the content for the third series (InOMN) was designed almost exclusively by the librarian.

After the display was installed but before survey data were collected, the librarian curated the display through two thematic series (Earth Day and Universe of Stories as mentioned above) and collected engagement data directly from the display every week. At the conclusion of the second thematic series, survey data were collected from patrons by two researchers (August 8-10, 2019). During survey data collection, any adult patron who entered the library and passed by the researchers was approached and invited to complete the survey, unless both researchers were already occupied by other patrons. Each patron was asked to complete a three-minute paper-and-pencil survey at the entrance of the library. Of all the patrons invited, approximately 85% agreed to participate. Patrons generally responded to the survey items for themselves unless the patron who interacted with the display was a child, in which case the adult patron would respond to the survey for the child.

Measures

The primary measure took the form of a paper survey (described below) on which patrons reported their interest and interactions with the display. Researchers asked patrons whether they would be willing to complete the survey upon entering the library. If willing, patrons were given a clipboard containing the survey and a writing utensil. To corroborate patrons' reports on the survey, data were collected directly from the display and library staff were briefly interviewed about their anecdotal experiences watching patrons respond to the display.

Survey

Individual Interest. Participants reported their existing individual interest in earth science, space science, and/or engineering by rating their agreement with 6 statements adapted from prior research (Frenzel et al., 2012), using a 5-point scale (1 = *Disagree a lot*, 2 = *Disagree a little*, 3 = *Unsure*, 4 = *Agree a little*, 5 = *Agree a lot*). Sample items include, "At least **one of my favorite activities** involves earth science, space science, and/or engineering." and, "I would **like to find out much more** about earth science, space science, and/or engineering." Cronbach's alpha for this sample equaled .92.

Frequency of Library Patronage. Participants reported how frequently they went to the library via one item using a 6-point scale (1 = *Never or almost never*, 2 = *1-5 times a year*, 3 = *Once every 2 months*, 4 = *Once a month*, 5 = *2-3 times a month*, 6 = *Once a week or more*).

Triggered Situational Interest. Participants reported if they had seen the display (0 = *No*, 1 = *Yes*), which served as an initial measure of triggered situational interest. Those who had not seen the display were not asked additional questions. Those who had seen the display were then given a list of features of the display and asked to indicate which (if any) they liked. The list included "looking at the images," "reading about the images," "voting with 'dot' stickers" (in reference to responding to the personally relevant questions), "finding out about related events

and activities,” “activities on lower panels for young children,” and “none of these.” Whether or not participants indicated that they liked “looking at the images” served as an additional indicator of triggered situational interest.

Maintained Situational Interest. Indicators of maintained situational interest included patrons’ reports of liking features of the display that allowed for deeper engagement with content, namely reading about the images and responding to the personal relevance questions by voting with dot stickers. These activities involved interaction with content on the display beyond a brief glance.

A second measure of maintained situational interest was how often patrons reported returning to the display. Patrons were asked how often they noticed the display when they visited the library using a 4-point scale (1 = *Not often (fewer than half the times I’m there)*, 2 = *Somewhat often (half the times I’m there)*, 3 = *Very often (most times I’m there)*, 4 = *I am not at [the library] enough to say*). Participants’ data were excluded from analyses involving this question if they reported the last option.

Emerging Individual Interest. The next part of the survey asked participants to indicate whether they had engaged in various activities after having seen the display. These activities required patrons to exert effort beyond the display (i.e., situation), and included behaviors like completing a self-guided activity in the library, attending an event or program listed on the display, having a conversation with someone about something on the display, or searching for related information about a topic listed on the display. The affirmative responses to these different activities were summed to assess level of emerging individual interest.

Additional Measures

Traces of Patron Engagement on the Display. Although not directly used to test the hypotheses, several behavioral measures of engagement were part of the display itself so that the researchers could corroborate the survey data regarding patrons' reports of engagement with various features on the display. These data were not linked to individual responses on the patron survey. Specifically, the flaps (one that partially obscured an image and the other that partially obscured the reading) were connected to digital magnetic counters (Tally Counter Store, 2019), which advanced one integer each time the flap was raised. The counter was not visible to patrons. Library staff recorded data from these counters on a weekly basis and reset the counters. The data from the counter on the look panel revealed an unusually large value one week, which was omitted because the value seemed errant. In addition, patrons had the option to place a sticker on part of the display to convey their answer to a question that connected the topic to themselves. The number of stickers was counted for each segment in the theme series.

Interviews with Library Staff. Library staff were briefly interviewed to corroborate reports from patrons on the survey. Specifically, because the display was located near the circulation desk the circulation staff were asked what pattern of interaction with the display they had observed and if these patterns changed over time, if anything on the display specifically attracted or kept patrons at the display, if any patrons regularly visited the display, if they noticed patrons having conversations about materials on the display, and if they had any other comments or suggestions.

Results

Survey

Table 1 provides the bivariate correlations and descriptive statistics among the survey variables to illustrate relationships between them. The primary analyses aimed to test what predicted

patrons noticing the display (triggered situational interest), returning to the display (maintained situational interest), and ultimately, engagement in behaviors that went beyond the display/situation (emerging individual interest). For this, logistic and hierarchical regression techniques, which are based on correlations, were used. Both types of regression can provide evidence about whether an outcome (e.g., noticing the display) is related to a set of variables theorized to precede the outcome (e.g., existing interest, frequency of going to the library), while statistically accounting for the other variables in the model. These techniques make it possible to test how and whether each variable uniquely predicts an outcome, isolating it from other variables. Whereas logistic regression is appropriate for dichotomous outcome variables (e.g., whether people noticed the display) hierarchical regression is appropriate for continuous outcome variables.

(Table 1 about here)

First, the proportion of patrons who noticed the display was calculated. Of the library patrons surveyed, 48% indicated they had seen the display before being surveyed. Next, whether patrons' frequency of library visitation predicted whether they noticed the display above and beyond their existing level of individual interest was examined. A logistic regression was conducted to predict whether people noticed the display, using individual interest and frequency of library visitation as predictors. The model was statistically significant, $\chi^2(2) = 25.774, p < .001$, explained 22% of the variance, and correctly classified 52% of cases. Most importantly, and offering evidence to the power of the situation, frequency of library visitation was a significant positive predictor, $Wald \chi^2(1) = 18.79, p < .01$. Patrons who visited the library more often were more likely to notice the display, controlling for their existing level of interest.

Specifically, with each one-unit increase in frequency of library visitation, patrons were 1.7 times more likely to notice the display.

The next question was how regularly patrons returned to the display when they returned to the library, consistent with a pattern of maintained situational interest. Of the people who were at the library often enough to provide an estimate, 37% said they noticed the display most times they were there, 47% said about half the times they were there, and 16% said they noticed the display fewer than half the times they were there. Overall, these data suggest that a majority of patrons paid attention to the display over time.

Library patrons who had seen the display were asked about specific display features that they liked. Consistent with the idea that the attractive images were most likely to trigger situational interest, more people reported liking the images than any other feature, although many patrons also reported liking activities posited to maintain situational interest (see Table 2).

(Table 2 about here)

The next set of analyses examined whether existing interest or situational features correlated more strongly with patrons' return to the display. The three predictors (existing interest, liking the images, and liking the readings and answering the questions) were each correlated with return to the display at the bivariate level (see Table 1). In other words, participants who either reported higher existing interest, or those that liked the images, or those that liked reading and answering the questions reported repeatedly engaging with the display. Using multiple regression, it was possible to test which of these uniquely predicted return to the display. Figure 4 depicts the relationships that were observed in the set analyses. When the three variables were tested together, only patrons' liking for the readings and questions predicted return to the display. Reading about the images and answering personally relevant questions

uniquely predicted returning to the display, above patrons' existing interest in science and whether they liked looking at the images. Although the significant bivariate correlation between liking the images (triggered situational interest) and return to the display was present, this relationship was overshadowed by the deeper engagement opportunities involved in reading and answering personally relevant questions.

(Figure 4 about here)

The final question was whether patrons engaged in opportunities beyond the display itself, reflecting emerging individual interest, and whether this was related to their frequency of returning to the situation. Of the patrons who noticed the display, 61% went on to participate in some other activity beyond the display. Critical to the current project was whether patrons who evidenced maintained situational interest were also those who engaged in activities beyond the display (emerging individual interest). A final multiple regression analysis predicting patrons' reports of engaging in behaviors that went beyond the display was conducted. When all four predictors (existing interest, liking the images, liking the reading and questions, and frequency of returning to the display) were included in the analysis, only returning to the display was a significant predictor (see Figure 4). In other words, consistent with the theoretical process of how people move toward emerging individual interest through exposure to situations, patrons who returned to the display more regularly were also those who evidenced emerging individual interest.

An additional note about this final analysis is warranted. The residuals (i.e., unexplained variability in the outcome) were somewhat non-normally distributed, owing to the fact that the outcome variable (engagement beyond the display) was positively skewed. Knowing that this can bias significance tests, the same analysis was redone, correcting for the skewness by

recoding more extreme values to be within two standard deviations of the mean (Ratcliff, 1993). The conclusions from this analysis were the same, such that the frequency with which patrons returned to the display remained the strongest predictor of engagement beyond the display.

Traces of Patron Engagement with the Display

The data that were recorded directly on the display (e.g., the number of times the flaps were raised, or votes were placed in response to a personal relevance question) could not help test the specific hypotheses about individual patrons, but they could help inform patrons' reports. The counts were averaged across two-week intervals and presented in terms of the number of interactions per day (see Figure 5).

(Figure 5 about here)

The number of times the flap obscuring one of the images was raised (triggered situational interest) peaked initially and then declined sharply within the first month of the project. This relatively lower engagement pattern continued throughout the project, consistent with the idea that triggered situational interest may wear off quickly. In contrast, the number of times the flap was lifted to access the reading (maintained situational interest) was more constant across time. Finally, the number of dots used by patrons to respond to a question that asked them to connect the theme to their lives (maintained situational interest) also showed consistency across time, with some decrease. Overall, these data suggest that library patrons did engage with the display, consistent with the survey results.

Interviews with Library Staff

Interviews with library staff revealed that they saw patrons interacting with the display. In particular, they mentioned that the display was in a good location to attract attention and that patrons interacted with it. When staff who worked near the display were asked about parts of the

display that appeared to attract patrons the most, several mentioned that the images and personal relevance questions were popular among patrons. In addition, staff were asked whether they noticed patrons having conversations with each other regarding elements of the display, and almost all reported having noticed conversations and that the conversations often involved parents and children. Finally, almost all staff who were interviewed recalled that the activities for young children on the lower portions of the *look* and *do* panels attracted patrons to the display.

Discussion

The results of the PEP project suggest that a library display designed to foster interest development can catch and hold patrons' interest in science. Consistent with the idea that the situation can impact interest, patrons who visited the library more frequently were more likely to notice the display, even after accounting for patrons' existing levels of individual interest in earth and space science. Moreover, those who liked the images also tended to like the deeper engagement activities (reading and answering personally relevant questions), consistent with the idea that the images may have attracted patrons to the display so that they could engage more deeply. Ultimately the deeper engagement activities of reading and answering questions predicted greater frequency of returning to the display most strongly, which then predicted patrons' engagement in activities that were not directly on the display (emerging individual interest). This sequence is consistent with the phases of interest development whereby the features of the situation foster a more internal desire to seek out opportunities beyond the situation.

The data recorded directly on the display largely corroborated the results from the survey, with a couple exceptions. The count data directly recorded on the display corroborated patrons' reports that they engaged in activities on the display, but also revealed a paradox. Whereas the

survey data suggested that the images were liked by the most patrons, the count data revealed a lower amount of engagement for the images relative to the readings. One explanation is that patrons responding to the survey may have been reporting about all the images on the display (both unobscured and obscured) whereas the counter on the display tracked engagement on only the partially obscured image. In other words, it was very possible to look at one or two of the images on the display without lifting a flap that would trigger a counter. A final discrepancy between the survey and display counts concerns responding to the personal relevance questions. Although relatively few patrons reported responding to the personal relevance questions, many responses were recorded on the display. This discrepancy may have arisen because adults completed the survey whereas children may have been particularly drawn to using the stickers. Taken together, although the display counts reveal some inconsistencies with the survey responses, the counts reveal that patrons engaged with the available materials.

The data from interviews with library staff supported and provided additional context for interpreting these results. Most of the circulation staff indicated that conversations among parents and children would take place at the display. They also noted that the area for young children on the lower portion of the display did attract children, and then encouraged parents over to investigate. Interestingly, this pattern was different from the anticipated process. Instead of the children's area being a way to free up adults who wanted to explore the display, the children seemed to actively draw parents over to the display, who then stayed to read and explore the earth and space science content.

The approach aimed to address some of the challenges highlighted by library staff related to fostering interest in science. Before the project started, library staff noted that although patrons expressed a desire for science programming, it was difficult to schedule and sometimes great

programs had poor attendance. The display helps to address these challenges because patrons can participate during times that fit their own schedules (also known as passive programming).

Library staff also mentioned that, even though they were extremely comfortable and felt expert at helping patrons find information about science, they were less comfortable conducting active science programs, especially for adults (Laconte, Mitchell, & Ratcliffe, 2020). This approach allows library staff to spend time researching a topic (possibly working with a subject matter expert), plan it in advance, and make it available to patrons, but without feeling like they need to be expert on the topic.

This preliminary test is the first known of its kind, which leaves many questions unanswered. For example, one challenge is knowing how much content to put on the display for a given segment. On the one hand, more information provides more opportunities for learning, but on the other hand, it is critical not to turn away patrons who might be overwhelmed with too much information and decide that the display is not for them. Of note is the possible tendency to put too much rather than too little on the display at once. The project team developed the display using tested interest development strategies as a guide such as not using items and images that were child-like or had off-putting colors. The team used known strategies for displays and marketing such as having readable text, easy content (e.g., third- to fifth-grade level), and white space. One recommendation would be to start simple, pay careful attention to how patrons react, and adjust accordingly. The result should be that patrons have just enough information to prompt the pursuit of additional information on the content.

Finally, this type of passive program could be implemented in many library settings, even in libraries that do not have space for a large, freestanding display. What is critical is that the display is noticeable and in a convenient location that is frequented by a wide array of patrons.

Once people know that it is there, and that it is updated regularly with new information, patrons will gravitate to it and follow it. In fact, this concept could be applied more widely, even outside of the library, where there are regular and repeat visitors. This approach could be used in communities to develop interest in science as well as many other topics or disciplines.

Future Directions and COVID-19 Pivots

The second year of this project was underway and launched in two additional libraries (Show Low Public Library in Show Low, Arizona, and Gwinnett County Public Library System in Lawrenceville, Georgia) and again at Tom Green County Library in San Angelo, Texas in March 2020 just as COVID-19 appeared. A few design changes had been made in response to data collected during the first year of the project, but the changes still remain largely untested.

Specifically, the *home* panel provided a way for the topic to allow for anticipation of changes by providing information and dates for when the next segment would be posted. On the *look* panel, given the relatively lower counts on the obscured image, the obscured image was replaced with a trivia question (with an obscured answer) which would then be elaborated on the reading panel. Pilot tests of this concept revealed that patrons were willing to lift the flap to get an answer to a trivia question, especially if the trivia question was accessible to patrons (i.e., not too hard). One of the three libraries also had all the text in both English and Spanish on the display to engage a more diverse audience. It is unfortunate that these changes could not be tested fully before the libraries closed to the public in response to COVID-19.

After closing, the three libraries first pivoted to an online PEP display that paralleled the information on the display, with attractive images, manageable science content to read, and activities to engage with including the associated activity provide in the. When the online version revealed low rates of engagement, the libraries pivoted again and provided Take & Make bags

that also paralleled the concepts on the display. Each library gave out 600 bags associated with this project during the summer of 2020 and offered online missions and badging activities associated with the Take & Make bags. All three libraries had good responses to the Take & Make bags and worked to get them to patrons through curbside service and by partnering with other community organizations such as local food pantries. Although these pivots were the only options at the time, they were less situational. In other words, patrons with existing interest in science were probably more likely to decide to take a bag or to log into an online badging activity. The power of the display in the current project is that it did not require a deliberate decision. The images and available learning opportunities in the physical library situation had greater potential to draw patrons in, regardless of their existing interest in the topic.

Conclusion

Overall, these data are promising for libraries that want to stimulate situational interest with a passive program to spur deeper interest in other resources, passive activities, and active programs that are available in their libraries and community. This dynamic, but low-tech, display is designed to offer learning activities along a theme across time that slowly builds patrons' interest. Over time, patrons appeared to deepen their engagement in the topic, and some patrons even started to engage in activities that went beyond the situation, consistent with emerging individual interest.

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Declaration of Interest Statement

The authors have no conflict of interest to disclose.

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Table 1.

Zero-order Correlations and Descriptive Statistics of Variables

	Library freq.	Display freq.	Liked images	Liked readings/ questions	Activities beyond display	Existing interest
Library frequency						
Display frequency	.19					
Liked images	.08	.33*				
Liked readings/questions	.22	.35*	.28*			
Activities beyond display	.12	.42*	.09	.30*		
Existing interest	.03	.30*	.34*	.24*	.16	
<i>Mean</i>	4.28	2.21	0.78	0.66	0.97	3.99
<i>Standard deviation</i>	1.68	0.70	0.42	0.62	1.01	0.91

Note. Variables are coded such that higher numbers reflect greater interest and engagement.

* $p < .05$

Table 2.

Frequency and Percentage of Patrons Who Reported Liking Particular Display Features

Display Feature	<i>n</i>	%
Triggered situational interest		
Images	52	77.6
Maintained situational interest		
Readings about the images	38	56.7
Personal relevance questions	6	9.0
Other		
Activities for young children	22	32.8
Upcoming events	24	35.8

Note. Only patrons who had noticed the display were asked these questions

Figure 1

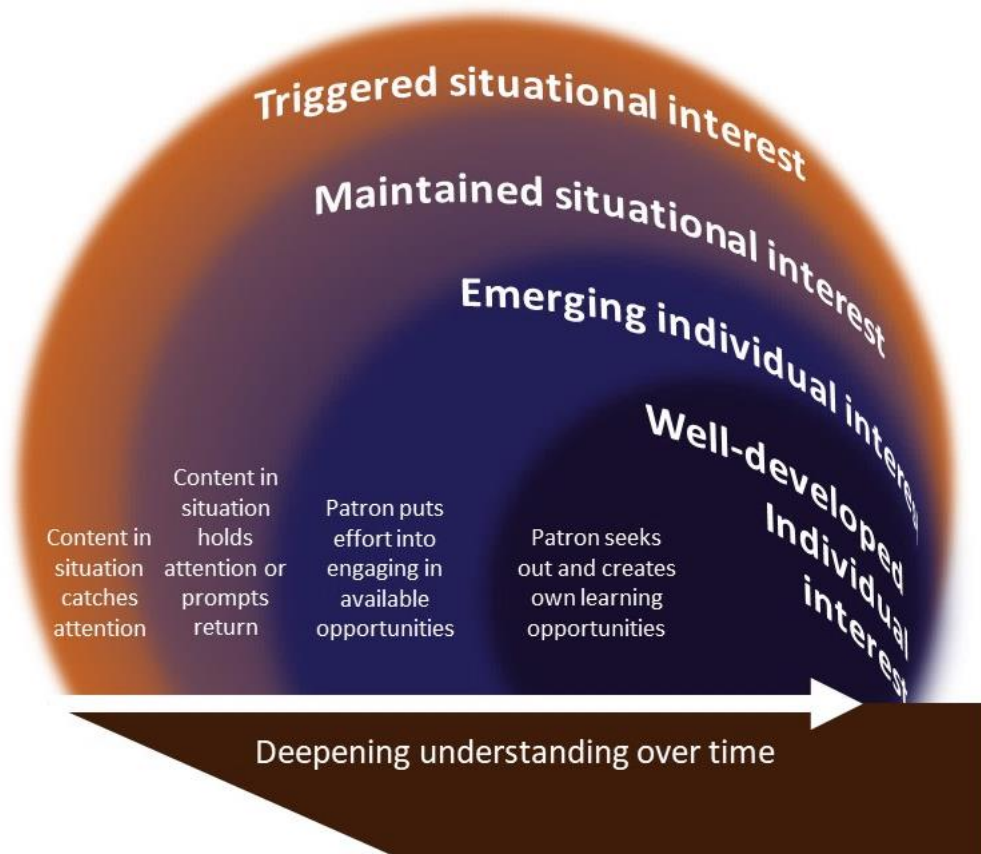


Figure 2.



Figure 3.

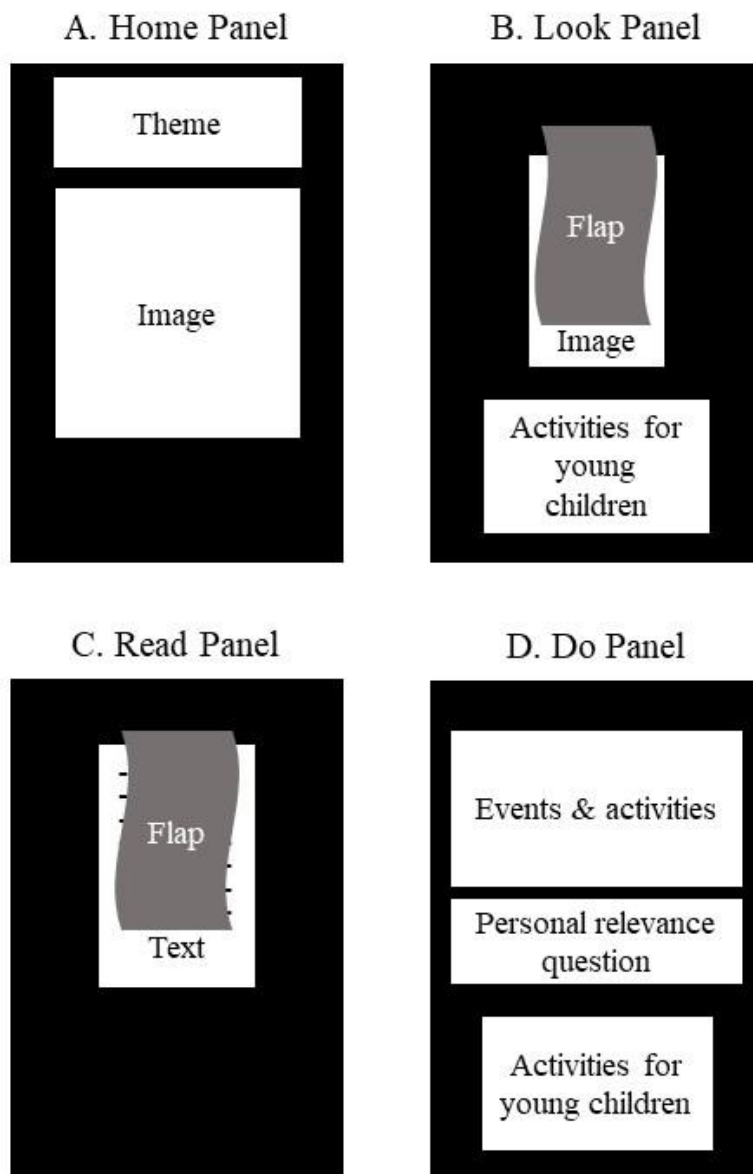


Figure 4

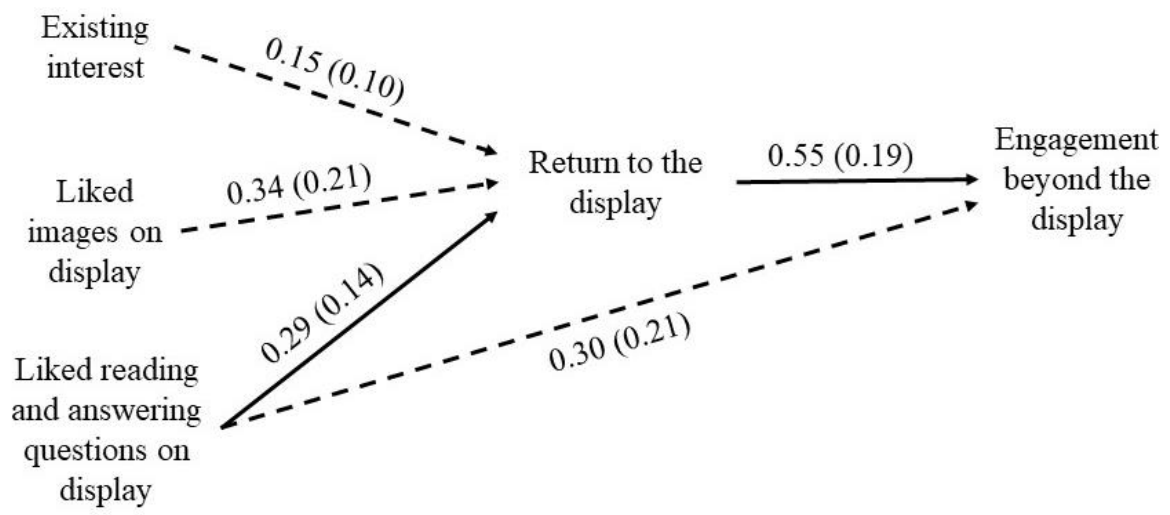


Figure 5.

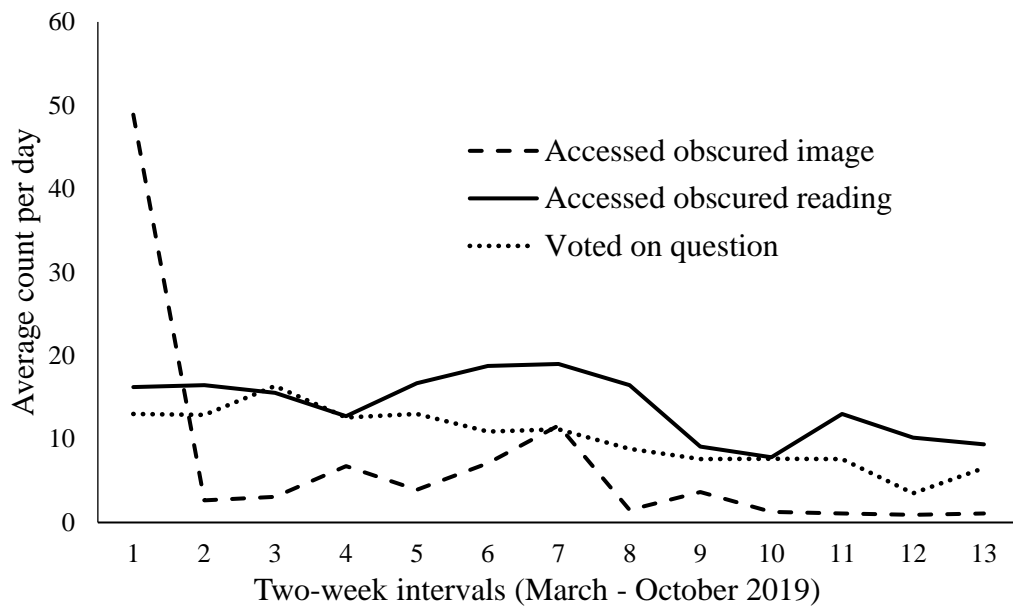


Figure Captions

Figure 1. Phases of interest development (Hidi & Renninger, 2006) as applied to a library context

Figure 2. Image of the display at Tom Green Co. Public Library, March 2019

Figure 3. Diagram of the location of key features on each panel of the four-sided display. Several elements allowed the researchers to collect evidence of patrons' interactions with the display. The flaps on the *look* and *read* panels were connected to digital counters (invisible to patrons) that recorded the number of times a flap was raised. Similarly, the personal relevance questions on the *do* panel were accompanied by a sheet of stickers that patrons could use to vote on their response to each question.

Figure 4. Paths depicting tested relationships from sequential multiple regression analyses. The values are unstandardized regression coefficients with standard errors in parentheses. The paths to the left of a given variable are the resultant effects when all predictors to the left were included in the analysis. Solid paths depict statistically significant effects ($p < .05$) in the regression analysis. Dashed paths represent non-significant effects in the regression even though they were significant bivariate relationships.

Figure 5. Average number of counts recorded on the display per day. The number of times the flap over the obscured image was raised, the flap over the obscured reading was raised, and a dot sticker was placed to vote on a personal relevance question. Counts were averaged across each two-week period, leading to Earth Day (1-3), Universe of Stories (4-11), and International Observe the Moon Night (12-13).

