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# Assessing an Aviation Out-of-School Time Program: A Collective Case Study

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Recent hiring trends fueled by a growing shortage of qualified pilots and aircraft mechanics serve to increase the pressure on the aviation community to attract young people to the profession. Given the historical reality that the industry is predominantly white and male, this dynamic supports efforts to increase access to underrepresented populations, including women and people of color. This collective instrumental case study sought to contribute insights and outcomes from providing an aviation module during an Out-of-School Time (OST) program in an underserved, primarily African American neighborhood. Thirty-one youth campers and 12 adult camp counselors participated. Thematic analysis and descriptive statistics were conducted to explore data collected via surveys, worksheets, reflections, and observations. The perspectives and attitudes of the youth and counselors who participated in the program were decidedly positive. The results suggested that the campers were connected, engaged, and motivated, even as they seemed at times to be distracted in the program. Games, worksheets, age-appropriate challenges, and one-on-one supervision were effective in supporting lecture and simulator activities. The outcomes recommend the development of aviation programs with activities closely tailored to age-appropriate academic objectives. Additionally, studies to further understand their value may provide insight into the long-term benefits of youth engaged in such programs.

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Recent hiring trends fueled by a growing shortage of qualified pilots and aircraft mechanics serve to increase the pressure on the aviation community to attract young people to the profession (Boeing, 2019; Brinkmann, 2019). Given the historical reality that the industry is predominantly white and male (Hansen, Oster, & National Research Council, 1997; Ison, Herron, & Weiland, 2016), this dynamic supports efforts to increase access to underrepresented populations, including women and people of color. This paper seeks to contribute insights and outcomes from providing an aviation module during an Out-of-School Time (OST) program in an underserved neighborhood to children of color. Specifically, it seeks to better understand the effects of aviation OST programming from the perspective of the participants.

## **Background**

There are several factors that challenge greater diversity in aviation for African American populations, most notably precedent and access. According to Ison et al. (2016), in 2011, 2.9% of employed professional pilots were African American. Furthermore, between 2004 and 2014, while non-White participation in collegiate aviation programs increased from 17.1% to 22.2%, African American participation increased an insignificant .29% (p. 29). The financial and academic requirements of attaining the requisite qualifications for entry into the aviation workforce likely serve to limit access by such underrepresented groups. As of 2017 (Annie E. Casey Foundation, 2019), African American children made up 33% of children in poverty (highest).

Additionally, 41% of children whose parents lacked secure employment (second highest), and 45% of children living in households with a high housing cost burden (highest) were African American. Regarding academic ability, the data is no less stark. African American youth accounted for 81% of fourth-graders not proficient in reading (highest), 87% of eighth-graders not proficient in math (highest), and 22% of high school students who did not graduate on time (second highest). By comparison, for each of these categories, White children were consistently below the average at the lowest or second-lowest rates. The issue is framed by the sheer lack of a legitimate idea of becoming a pilot or aircraft mechanic (Turner & Lapan, 2003).

In contrast, there is a long-standing tradition to share one's passion for flight with the younger generations that goes back to the very beginning of the aviation community, and outreach programs remain a popular means for attempting to generate interest (Lutte, 2018). There are a myriad of initiatives designed to introduce young people to the world of aviation and a multitude of lesson plans and programs available for those who wish to provide encounters within the field. Such efforts are supported by research related to OST programs in general and STEM disciplines in particular (Carrick, Miller, Hagedorn, Smith-Konter, & Velasco, 2016; McCombs, Whitaker, & Yoo, 2017; Molina, Borrer, & Desir, 2016; National Commission on Mathematics and Science Teaching for the 21st Century, 2000).

OST interventions are shown to address academic performance as well as social behavior (Jenson et al., 2018). For example, Carrick et al. (2016), concluded that a summer high school geoscience program was “a very effective strategy for inspiring interest in and recruitment into the geosciences among Hispanic American high school students” (p. 95). Durlak, Pachan, and Weissberg (2010) explained that in the U.S., the focus on OSTs had increased in recent years and that such interventions were implemented with an expectation of increased personal and social growth.

## **Methodology**

Consistent with the goal of understanding the effects of an aviation OST program from the perspective of underserved African American youth, the researchers adopted a qualitative collective instrumental case study approach (Yin, 2003). An aviation module conducted as part of a month-long summer camp within a neighborhood plagued by low income and high crime was purposefully selected (Creswell & Poth, 2018). Data was collected from two sessions of the camp, offered in July of 2018 and 2019. Six of the initial 11 participants returned for the second year. The age of the campers ranged from 7 to 16 years old, all of whom were African American. The ratio between female and male participants was roughly balanced, with 17 females and 14 males. Twelve camp counselors participated in the camps. The counselors’ age ranged from 16 to 23 years old, with seven female counselors and five male counselors. Two counselors were collegiate aviation (flight) students. Participation rates fluctuated weekly for each group as not all campers or counselors were able to participate every week.

The researchers were engaged in the summer camp activities as camp counselors and functioned as participant observers (Ravitch & Carl, 2016). Given their presence as additional counselors, the researchers were able to move from the roles of complete participant, participant as an observer, and nonparticipant observer as needed (Creswell & Poth, 2018). The researchers sought to limit observation bias and disruptions of the activities by collecting observation data by way of hand-written field notes. As circumstances allowed, they would quietly withdraw from activity to make notes. During times when they were in a more active role, they would wait until the end of the activity to collect their observations. Permission to conduct the study was obtained from the Saint Louis University Institutional Review Board (IRB #29032). The applicable consent was obtained from all participants prior to collecting data.

The aviation program occurred twice weekly during each of the four weeks of the camp. Data was collected via surveys, worksheets, reflections, and observations. Weekly satisfaction surveys were conducted at the end of each week for both campers and counselors. Campers also completed an end of the camp survey while the aviation counselors were asked to provide a final reflection. The questions in the surveys were developed based on a number of out of the school time research studies (Harvard Family Research Project, 2004; Kittur, Shaw, & Herrera, 2017; Rudd, Aguilera, Elliott, & Chambers, 2017). Questions for the youth attempted to elicit their attitudes regarding the activities within the aviation module of the camp, while questions for the counselors were developed to understand their perspectives towards youth participation. The surveys included a Likert scale, open-ended, and dichotomous questions. Worksheets included short answer and fill in the blank questions related to the session material. Observations were collected using field notes and included informal assessments and discussions with the campers and counselors.

The following research questions were addressed in the study:

- How did youth participants perceive and assess the aviation portions of the summer camp?
- How did camp counselors perceive youth engagement and participation?
- What were the researcher's observations regarding youth engagement and participation?

Thematic analysis and descriptive statistics were conducted to explore the data. Magnitude, frequency, and in vivo coding were used to develop the themes from the data attained in the open-ended questions and observations (Saldaña, 2009). Frequency distributions were conducted using Microsoft Excel. A data analysis spiral was employed to interpret and refine the findings (Creswell & Poth, 2018).

## Results

### Camper Perspectives and Attitudes

Eighteen dichotomous questions were developed and randomly distributed during the four weeks of camp. During week 1, there were 26 participants. Of the 26, 24 campers responded that camp counselors helped them when needed and felt comfortable in the program. Twenty-three made new friends (Figure 1).

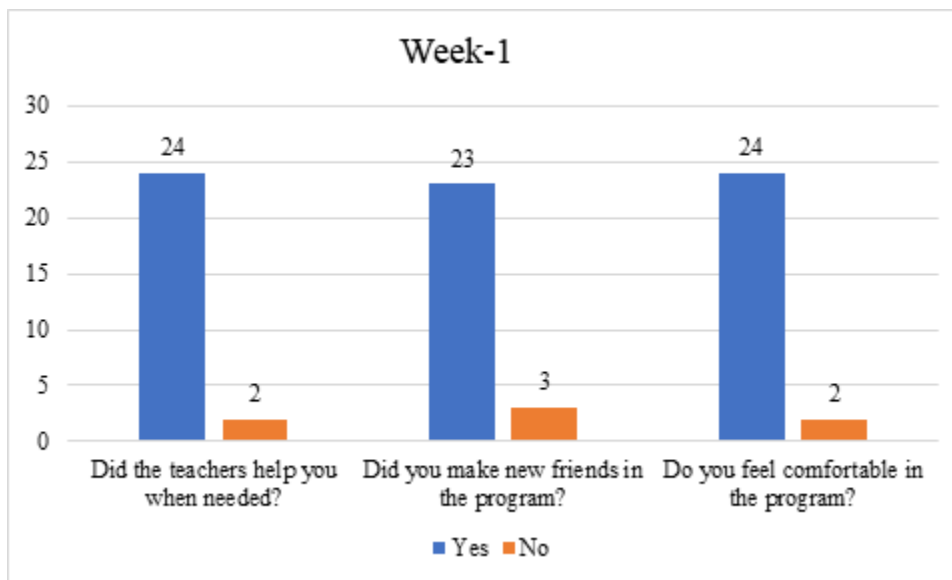


Figure 1. Campers Perspective and Attitudes Data of Week-1.

During the second week, there were 19 participants, of which 16 received answers from camp counselors to their questions, and 17 participants indicated that they trusted the camp counselors. Fourteen responded that they were not bored in the second week. Seventeen believed the program was a great place to be and 13 liked the other kids in the program (Figure 2).

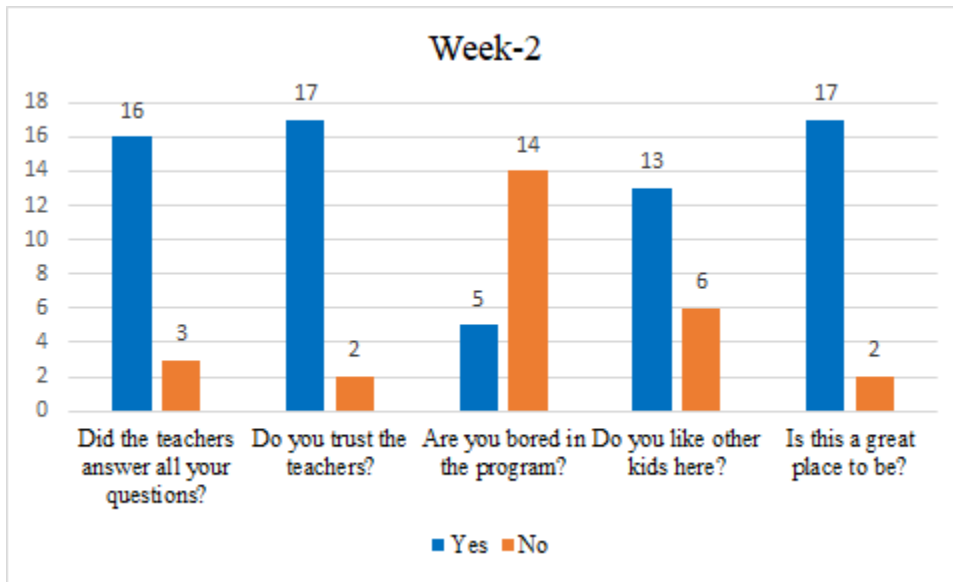


Figure 2. Campers Perspective and Attitudes Data of Week-2.

In the third week, there were a total of 22 campers. All 22 believed that camp counselors cared for them, and 19 talked about the program at home. Sixteen were not bored, and 19 observed that camp counselors understood their feelings. Twenty-one liked coming to the program (Figure 3).

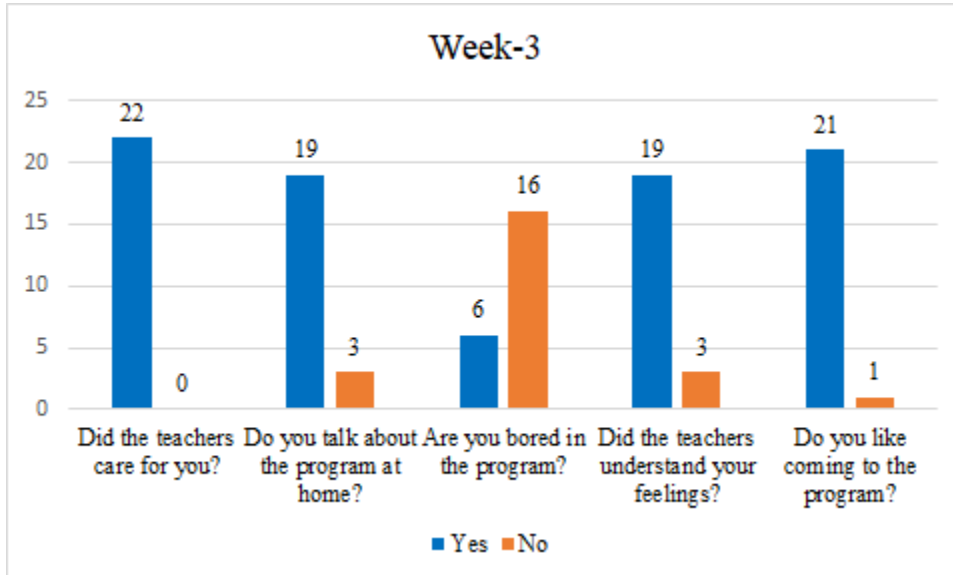


Figure 3. Campers Perspective and Attitudes Data of Week-3.

Out of 25 campers in the fourth week, 21 talked about the program at home, and one participant even mentioned that they discussed the program, “In a good way” at home. Twenty were not bored and liked other kids in the program. Twenty-two developed a good relationship with counselors, remembered the names of the counselors. Twenty-four campers enjoyed the activities (Figure 4).

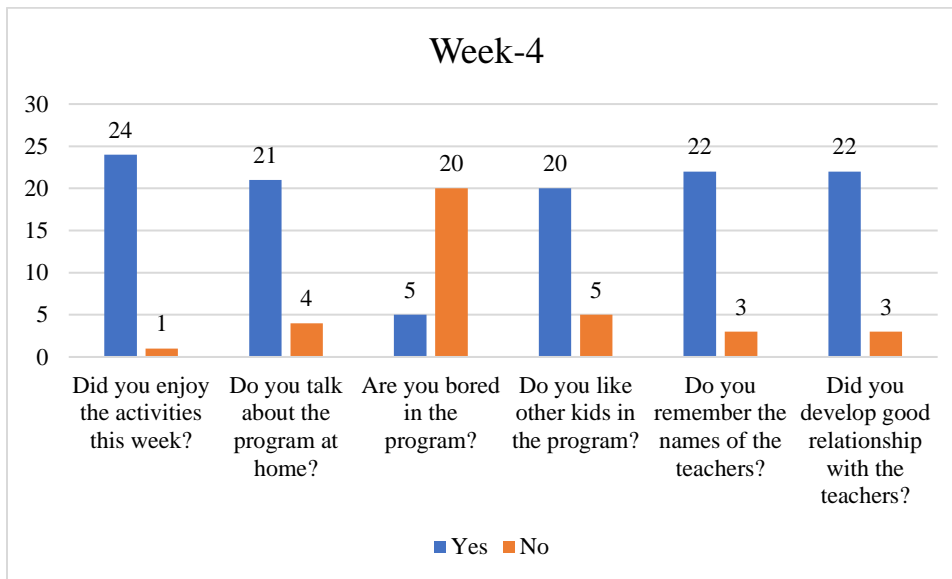


Figure 4. Campers Perspective and Attitudes Data of Week-4.

### Camper Weekly Activities Satisfaction

The activity survey questions were Likert scale questions with five options: Loved it, Liked it, Okay, Do not like it, and Hate it (Table 1). Nearly 59% of the responses loved or liked the activities, 11% did not like or hated the activities, and 14% of the responses were neutral (Table 1). Model rocketry was the most popular activity followed closely by flight simulator and water bottle rockets. Interestingly, only 54% of participants ( $n = 6$ ) indicated strongly favorable toward the airplane discovery flight. However, this number is a bit misleading, as the camp was not able to include a flight experience in the second year. Also, of the eleven participants, one chose not to fly, and one was neutral. The remaining three participants did not respond. Thus, it is unclear what to make of the responses. The ATC communications activity received a slightly higher percentage of favorable responses at 57%. Presentations and lectures were the least popular with 40% favorable, 22% neutral, and 22% negative responses.

Each week the campers were asked four open-ended questions to elicit what they liked, disliked and learned that week, and if they had any suggestions for the program. Responses regarding the various activities were generally consistent with the data noted above. Participants stated they liked activities like model rockets, launching the rockets flight simulator, water bottle rockets, and taxiing. Out of 92 responses for what they liked, 46 included aviation aspects, 22 of which specifically noted flight simulators. Regarding what campers disliked in the program, 46 offered no response. Fourteen responses were about aviation, most of which were about flight simulator. Forty-six respondents stated they learned something about aviation each week, for example: “Do not pull up the yoke too much;” “I learned how to do bottle rockets;” and, “Thrust weight lift yaw.”

None of the campers provided any suggestions for the camp. Instead, most of them expressed appreciation for the camp counselors and the program with comments like: “Thank you;” “Keep it up;” “It was cool;” and, “It is Amazing.”

Table 1  
*Weekly Activities Satisfaction Data*

Activity	Year	Love it (%)	Like it (%)	Okay (%)	Do Not Like it (%)	Hate it (%)	N/A (%)	<i>n</i>
Model Rockets	2018	66.67	20.00	13.33	0.00	0.00	0.00	15
Flight Simulator	Both	60.44	12.09	6.59	1.10	4.40	15.38	91
Water Bottle Rocket	Both	65.00	5.00	15.00	0.00	0.00	15.00	20
ATC Comms.	2019	42.86	14.29	17.86	3.57	7.14	14.29	28
Discovery Flight	2018	54.55	0.00	9.09	0.00	0.00	36.36	11
Four Forces	Both	33.33	22.22	11.11	5.56	11.11	16.67	18
Phonetic Alphabet	2019	30.00	25.00	20.00	0.00	5.00	20.00	20
Presentations & Lecture	Both	29.07	10.47	22.09	6.98	15.12	16.28	86
Total		46.02	12.80	14.53	3.11	7.96	15.92	289

### Camper End of Camp Survey

Twenty-five campers completed the end of the camp survey (Table 2). A 10-point scale was used to evaluate the overall aspects of the program. The responses were mostly positive. Of 25 responses, 20 strongly agreed/agreed that they liked the program overall. Specific to the aviation program, 24 indicated they strongly agreed/agreed they liked aviation. Twenty-two of the respondents indicated they strongly agreed that they would recommend the program to other children. Twenty-two respondents also strongly agreed they liked flying the simulators. Twenty-three strongly agreed/agreed that the camp counselors were friendly and helpful, and 19 indicated they would attend the camp again. Most campers felt they understood the four forces with 16 strongly agree and five agree responses. Quizzes were less favorably rated with 14 strongly agree, four agree, three neutral, two disagree, and two strongly disagree. Finally, the question with the greatest number of negative responses was, “will you become a pilot in the future.” Nine respondents indicated strongly agree, with three selecting agree, and five neutral. The remaining eight responses were strongly disagreed.

The campers were asked three open-ended questions about what they liked, disliked, and if they had any suggestions about the program. Thirteen participants wrote that they liked the program. Specifically, seven participants mentioned either “Aviation” or “Flight Simulator,” while the remaining six wrote “Everything.” One participant added that they liked doing, “Different things each year.” Most of the participants did not have any dislikes in the program. Out of 24 responses, 15 mentioned “Nothing” when asked what they disliked. One participant stated that they did not like the flight simulator.

Table 2  
*Child End of Camp Survey Data*

Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	<i>n</i>
How much do you like the program overall?	18	2	4	0	1		25
Do you like aviation?	23	1	1	0	0		25
Do you recommend this program to other children?	22	0	1	1	1		25
Do you like flying aircraft simulator?	22	0	1	1	1		25
Are the teachers friendly and helpful in the program?	20	3	1	0	1		25
Will you attend the program again?	18	1	3	1	1	1	25
How much did you understand the forces of the airplane?	16	5	3	0	1		25
The questions in the quizzes are easy to answer. Rate it.	14	4	3	2	2		25
Will you become a pilot in the future?	9	3	5	0	8		25

Responses obtained from weekly satisfaction surveys were consistently constructive and optimistic. Campers responded positively to attributes like comfortability in the program, making new friends, trusting teachers, liking other kids, coming to the program, and talking about the program at home. Flight simulators and model rockets were the most popular activities of the program, while presentations and lectures were least favored. Most of the campers strongly agreed that they liked aviation, liked flying the simulator, and would recommend the program to others.

### **Counselor Satisfaction Data**

Camp counselor satisfaction data were collected each week and included ten survey questions and three open-ended questions. There were a total of 45 satisfaction surveys from the 12 camp counselors. The results indicated strong support for the weekly activities. Counselors agreed or strongly agreed that the campers were friendly and relaxed, listened, and responded, enjoyed, contributed, and engaged in the activities, and developed peer relationships. The strongest positive response indicated that the counselors believed the activities were helping to develop campers' critical thinking skills. Twenty-four responses indicated that the counselors thought the campers were easily distracted. However, counselors were generally positive regarding knowledge carryover from previous weeks, with 29 responses of strongly agree or agree and 7 disagree/strongly disagreed when asked if the children showed knowledge from the previous week's activities. The most varied responses were to the question of campers discussing their problems with the counselors (Table 3).



Table 3  
Camp Counselor Weekly Satisfaction Survey

Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Are the children friendly and relaxed in the program?	19	17	7	1	1
Did the children listen to you actively and respond accordingly?	17	18	9	1	0
Did the children contribute ideas and opinions about the activities this week?	18	18	9	0	0
Did the children enjoy the activities?	17	22	6	0	0
Did the children engage in the activities?	18	20	7	0	0
This week do the children show knowledge from previous week activities?	17	12	9	1	6
Are children developing peer relationships?	27	11	7	0	0
Did the children distract easily?	10	14	11	7	3
Did the children discuss their problems with you?	7	16	12	4	6
Do the activities develop critical thinking skills in children?	23	17	4	0	1

### Counselor Open-Ended and Reflection Data

Open-ended feedback from the counselors pointed to a number of strengths and weaknesses of the camp structure and delivery. Of 45 responses, 20 responses indicated “Nothing” or “N/A” regarding things they disliked about the camp. Negative comments tended to focus on frustration with a lack of attention or engagement in an activity. Several responses focused on the age or experience level of the campers and the level of difficulty or repetition of the activity. For example, one counselor commented, “we spent too much time reviewing, which prevented the kids from really exploring the new simulator set up/directions.” Another echoed this perspective, “this activity was a little bit too simple for the students who have retained knowledge from before.” On the other hand, several responses supported repetition. Likewise, there was support for the development throughout the aviation modules. One counselor observed, “kids made connections between discussion & previous experience.”

Counselors also pointed to activities that they liked. The use of computer-based flight simulation was consistently listed as a positive. The incorporation of worksheets and lectures were mentioned as well. One response commented on the combination of the worksheet and simulation sessions, “worksheets with sim lessons were effective.” Specific lessons noted included taxi, take-off, flight controls, Bernoulli’s Principle, instrumentation, and the phonetic alphabet. Regarding the instrumentation session, one counselor remarked, “the discussion of the gauges enhanced the children’s understanding of detailed flight terminology.”

Comparable to simulator activities, rocket building and launching were frequently mentioned. As one counselor remarked, “rocket building helped with reading instructions and motor skills and children liked this activity.” Likewise, the incorporation of air traffic control-style communications was explicitly mentioned as a positive aspect of simulation sessions. This was a feature that was introduced during the third week of the second summer camp. One counselor stated, “Once they got involved with Air Traffic Control (ATC), they seemed more focused and less inclined to fly off or intentionally crash.” Similarly, games were mentioned as something the counselors liked. Suggestions for improving the program included developing challenges of increasing complexity, additional worksheets, lessons, and the use of more children’s games.

The two aviation undergraduate counselors were asked to complete an additional reflection on aviation activities. Both commented that, in addition to the simulators, worksheets were the most compelling aspect of the aviation camp modules:

The simulators paired with the worksheets were the most effective in teaching the basics of flight.

The most effective aspect of the aviation module was worksheets. Without the worksheets, planning out sims and finding a universal way to teach the kids would be more difficult.

When asked about the value of the aviation component of the summer camp, the aviation counselors offered complementary, yet distinct reflections. One spoke to the developmental knowledge, skills, and abilities provided. For this person, the aviation program, “Improves listening and motor skills. Children also learn basic physics and other subjects while having fun. They also came up with creative solutions, and it engaged their imagination.” The other counselor spoke to the broader impact such an encounter provided the children, “The value of the aviation module is indescribable. It showed the kids a new world with various possibilities for them.”

Regarding what they learned about themselves as a result of their participation, both wrote about the need for patience when working with children. Both counselors reflected on connecting with the children. One focused on the need to develop a varied teaching style to connect with different children, “I learned how to adapt to each child’s learning pace and find creative visuals to teach the kids.” The other spoke to the challenge of maintaining focus during difficult times with the children, “they also liked learning but tried to act as if they did not.” This person concluded, “It was neat how the children grasped new concepts and knowledge and how behaviors changed during the progression of camp.”

## **Observations**

The researchers shared and reflected upon their individual observations within the broader context of the data collected from each group of participants. A number of themes emerged that appeared to expand and further nuance the results achieved through analysis of

participant provided data. These observations are discussed below in terms of active learning, simulator use, and one-on-one interactions.

**Active learning.** Lecture and other, more passive activities were a challenging aspect of the program. The youth showed more interest in events that were higher energy. For example, the youth seemed more interested in launching rockets than building them. Even with hot temperatures outside, the patience and interest of the youth were consistently greater during the rocket launch activities. Moreover, many appeared to be enthusiastic to see how the rocket they built flew.

It was somewhat surprising that some campers shunned the rocket building activity. At the extreme, two campers initially refused to participate in building a water bottle rocket. These campers were given a choice to move to an adjacent room and sit or read quietly. One camper observed the others working on their rockets and soon decided to rejoin the activity. The other camper maintained that they thought the activity was childish and did not participate. However, once they saw the rockets fly, they became quite engaged with the launching process. A few days later, when the group began to build Estes model rockets, that camper was attentive and engaged. In each case, the campers did not appear to have an adequate perception of how the activity would unfold. By allowing them the option to observe but not participate resulted in their re-engagement of the activity.

Understandably, the least favorite activities were presentations and worksheets. In 2018, rewards in the form of candy were offered as an incentive to participate and pay attention. The campers were told they would get candy if they answered questions correctly. Not surprisingly, even those who did not appear to be paying attention raised their hands to answer the questions and frequently answered correctly. In 2019, there were no such rewards, and most of the time, the campers did not volunteer to answer the counselor's questions. However, when called on, most of the campers were able to answer correctly, even without the added incentive. Thus, in either case, it appeared to be a misconception that the campers were not paying attention to the lectures. Furthermore, over-reliance on gimmicks to increase participation may not yield the desired results. Understanding the attention span of the age group as well as the current techniques employed at the particular age level may have a more satisfactory outcome. A number of such approaches were observed during the study.

One such technique was limiting lectures in terms of length and material. Keeping lectures short and focused on a few key points appeared to be helpful in maintaining interest. Also, understanding that the campers may be paying attention even when it did not appear so seemed to bolster the counselors' confidence with an activity. Another strategy that helped to maintain engagement was the addition of various games designed to help introduce a topic and reinforce learning. Two such games were *Thumbs Up* and *Simon Says*. *Thumbs Up* was developed to review the four forces of flight. The counselor called out one of the four forces: lift, weight, thrust, drag. The campers would respond to the counselor's call-out by putting their thumbs up for lift, turn them down for weight, backward for drag, and point with their forefinger for thrust. If a camper indicated the wrong vector, they would sit down for the remainder of the round. Similarly, the counselors adapted *Simon Says* to help the campers practice the three degrees of freedom: pitch, roll, and yaw. A counselor would play *Simon* and direct the campers

to perform an action on the control yoke, for example, “Simon says roll left” or “Pitch up.” If the camper performed the function without hearing, “Simon says,” they were out of that round of the game.

Implementing worksheets was a third strategy for maintaining direction, particularly when used in conjunction with simulator activities. Worksheets were developed by the collegiate flight training camp counselors and required campers to use the simulators to in various ways in order to complete tasks or answer questions. Campers would have to identify basic aerodynamic principles, operate control surfaces, recognize and interpret flight instruments, and the like. The worksheets were developed to be age-appropriate and to aid in the development of problem-solving and critical thinking skills. From the first effort, it was clear that when presented with a worksheet, the campers engaged the simulation activity with greater attention.

***Simulator Use.*** It was not surprising that a great deal of interest and excitement surrounded opportunities to work with the flight simulators. Campers would ask to use them on days when aviation was not part of the camp schedule. However, similar to other activities in the program, it became apparent that simulator sessions were more effective when they were more closely tailored to the interests and abilities of the campers and had objectives they could achieve within a session. Activities that did not account adequately for the age group quickly lost interest and resulted in campers wandering off task. In addition to those noted above, a variety of techniques were implemented to maintain focus by providing age-appropriate challenges and goals for the campers to achieve. For example, basic aircraft control during taxi was introduced while concurrently working on airport markings and the phonetic alphabet and supplemented with games that reinforced the requisite knowledge for the activity.

During 2019, this gave way to a challenge for the campers to follow a set of instructions and taxi from one point on the airport to another. The activity did not include a flight component, and yet the campers maintained a fairly high degree of concentration as they worked to complete the task. Toward the latter stages of the camp, this was further supplemented by networking the simulators with an ATC station in a separate room. The campers used internet-enabled headsets to communicate with ATC. A counselor provided taxi and take-off clearances as well as radar vectors and other supporting instructions to help the participants navigate to a nearby landmark while utilizing proper communication techniques. The addition of “radios” to the simulation increased interest and maintained focus throughout the activity.

***Working One-on-One.*** When able, campers and counselors were paired one-on-one. With the added attention, the campers developed a greater rapport and were more likely to listen to camp counselors, even outside of those sessions. During some sessions, not enough camp counselors were available to provide such focused attention. This was particularly detrimental during flight simulator activities where the shortage of counselors meant that the campers had to wait for direction and support. At times, this resulted in distraction and impatience. The on-line ATC activity alleviated this to some degree. The counselor in the other room performing the ATC role could monitor and provide direction almost simultaneously to multiple campers. This freed the in-room counselors to focus on campers who needed more attention. Additionally, the novelty of communicating via the headsets served to help maintain focus as the campers appeared to be more interested in following the directions provided over the radio.

## **Limitations**

The results of this study are limited. The study was purposefully focused on providing an aviation experience to an underrepresented group. As a collective case study, the findings are inherently limited in terms of generalizability. It is hoped that the perspectives will be useful for the development of similar activities and will encourage additional research (Merriam, 2009). The results obtained would benefit from further research across other disciplines and populations. Questions that attempted to elicit camper preferences did not always provide enough specificity, even when coupled with counselor feedback and observations. Future studies may wish to consider follow-up questions to clarify what the campers liked or did not like.

Additionally, some of the responses to various survey questions appeared to be in response to other activities of the summer camp. Because there were a variety of topics presented during the camp, it is possible that some responses were referencing aspects of the camp other than the aviation modules. This is particularly true where questions did not explicitly refer back to aviation. Finally, while the results identified a number of strategies, evaluating best practices was not a focus of the study. It did not address the question of how such programs might support interest and academic performance in STEM-related subjects, nor can it predict the effect such a program might have on youth development.

## **Conclusions**

The data collected from the campers and the camp counselors, and the observations of the researchers, all indicate that the perspectives and attitudes of the youth and counselors who participated in the program were decidedly positive. Twenty-three out of 25 youth participants responded that they liked aviation, and 22 would recommend the program to others. They found the camp to be a supportive environment and felt cared for. The children were engaged and motivated, even as they seemed at times to be distracted. The results suggest that the campers were connected to and engaged in the program.

Likewise, it appeared to the adults that the youth developed critical thinking skills and peer relationships; however, as this was not a primary focus of the study, additional research into critical thinking and OST programs may provide additional insight. Games, worksheets, age-appropriate challenges, and one-on-one supervision were effective in supporting lecture and simulator activities. The addition of on-line ATC was particularly effective at drawing focus on the planned activity. Overreliance on rewards did not appear to be as effective as identifying and implementing strategies that were more closely suited to the age and experiences of the participants. Given these outcomes, additional research into the educational benefits of the strategies identified would serve to advance understanding of their value. In particular, further investigation is needed to better understand the extent to which aviation programs may serve the development of critical thinking skills.

Given the outcomes of the study, the development of aviation programs with activities closely tailored to age-appropriate academic objectives is recommended. Almost half of the respondents indicated they would consider becoming pilots in the future, nine strongly so. The remaining were either not interested or were neutral. It was interesting that the responses of those

who did not want to become a pilot in the future were strongly so. While this outcome appears to be consistent with the age of the campers and a normal diversity of interests, there may be additional explanations for the response rate. Questions surrounding access to the idea of such a career track as well as financial, educational, and other barriers remain. Additional research into this area would provide a greater understanding of the motivations this population of young people carries and the barriers they face. Regardless of career aspirations, longitudinal studies that follow the progression of youth engaged in such programs may provide insight into long-term benefits, including how such programs may support and encourage involvement and persistence in educational pursuits, particularly as they relate to STEM disciplines.

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