Fiscal Year 2021 Report on the Implementation, Expenditures, Outcomes and Recommendations for the Plasma Games Pilot Program

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Receiving Entities:
Joint Legislative Education Oversight Committee, North Carolina General Assembly
Joint Legislative Oversight Committee on Agriculture and Natural and Economic Resources, North Carolina General Assembly
Fiscal Research Division, North Carolina General Assembly

Submitting Entity:
The Office of Science, Technology & Innovation, North Carolina Department of Commerce

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About the Office of Science, Technology & Innovation:
The Office of Science, Technology & Innovation in the North Carolina Department of Commerce supports communities and businesses by expanding North Carolina's technology infrastructure, enhancing public and private innovation, and fostering a dynamic and diverse entrepreneurial economy. The Office develops, administers, and evaluates policies and programs that accelerate both the development of next-generation technology companies and the adoption of technology across existing industry. The Office also staffs the statutorily authorized North Carolina Board of Science, Technology & Innovation, which advises the Governor, Secretary of Commerce, and General Assembly on the role of science, technology & innovation in the economic growth and development of North Carolina. More information about the Office of Science, Technology & Innovation can be found at nccommerce.com/sti.

EXECUTIVE SUMMARY

The Plasma Games Pilot Program was a statewide pilot program to promote access to innovative digital and personalized learning solutions for North Carolina high school students to bridge the gap between chemistry and physical science classes and career pathways. The focus of the Plasma Games Pilot Program (the Program) was the use of the educational game, *Sci-Ops: Global Defense*, used to supplement existing curriculum in high school chemistry and physical science classrooms. The Program was implemented and evaluated by the North Carolina Department of Commerce, Office of Science, Technology & Innovation (OSTI).

This report summarizes the Program over the course of the 2020-2021 academic year. Overall:

- $2,488,000 of the $2,500,000 appropriated was distributed through the Program.
- All distributed funding was used to cover the cost of teacher gaming licenses.
- 20 local school administrative units (LSAUs) high schools participated in the Program.
- 167 teachers and approximately 9,047 students participated in the Program.
    - The approximate cost per teacher was $14,898/teacher.
    - The approximate cost per student user was $275/student.
- LSAU Administrators had mostly consistent views on the Program:
    - Implementation was simple and most LSAUs were properly equipped to implement.
    - Teachers (to a greater extent) and students (to a lesser extent) wanted to use *Sci- Ops: Global Defense* in their curriculum.
    - Administrators would recommend other schools participate and indicated a willingness to continue in the Program (but only if funding were provided.)
- LSAU Teachers had relatively mixed reviews about the Program:
    - Teachers generally agreed that *Sci-Ops: Global Defense* was a helpful resource and students enjoyed playing.
    - Teachers did not have consensus on the Program's impact on student learning, additional student interest in learning science, opinion of *Sci-Ops: Global Defense* in comparison to alternative supplements, and whether they would recommend it.

This legislative report provides an evaluation of the pilot program and details on the program's implementation in fulfilment of Section 4.2D(d) of North Carolina Session Law 2020-80.[1]
The report is divided into four sections: BACKGROUND; IMPLEMENTATION (which describes how funds were used and distributed); EVALUATION (which describes the number of teachers and students using the game and survey results from the LSAUs); and RECOMMENDATIONS. This report also includes several appendices to supplement the descriptions of the Project's implementation and evaluation. Questions about the Program and this report should be directed to the OSTI.

[1] …"The Office shall provide a report by June 1, 2021, to the Joint Legislative Education Oversight Committee, Joint Legislative Oversight Committee on Agriculture and Natural and Economic Resources, and the Fiscal Research Division on the implementation of the pilot and the information reported by participating local school administrative units pursuant to this section. The report shall include any data on student outcomes related to implementation of the pilot, the expenditure of funds described in subsection (c) of this section, and recommendations by the Office on modification of the pilot and the need for continued support."…

BACKGROUND

Online educational software and platforms have been an integral tool for helping provide curriculum to North Carolina students impacted by the coronavirus. When North Carolina public schools closed on March 14, 2020, teachers, students, and administrators were forced to continue education remotely.[2] Faced with physically closed schools and the need for student resources to promote education, the North Carolina General Assembly appropriated $2.5 million dollars to the Plasma Games Pilot Program (the Program) through Section 4.2D of North Carolina Session Law 2020-80 on July 1, 2020.

The purpose of the Plasma Games Pilot Program was to "promote access to innovative digital and personalized learning solutions for high school students that bridge the gap between chemistry and physical science classes and career and technical education career pathways."[3] Plasma Games, Inc. (Plasma Games, for whom the Program is named) is an educational technology company that develops science, technology, engineering, and mathematics (STEM)-related digital learning products. *Sci-Ops: Global Defense*, Plasma Games' flagship product, is a turn-based strategy game that incorporates high-school level chemistry and physical science concepts to serve as an educational supplement to traditional classroom teaching. In the game, players' actions and decisions are driven by chemistry and physical sciences' concepts, and reward and level advancement provide learning opportunities for how the concepts are applied in the real world.

IMPLEMENTATION

Several activities were undertaken to implement the Plasma Games Pilot Program. These activities began in the late summer of 2020 following Program authorization. Descriptions for the activities are mostly presented in the order of occurrence; for the Program timeline and sequential order of significant milestones, see *Appendix A: Plasma Games Pilot Program Timeline*.

Initial interest in the Program appeared high, as several LSAUs and other types of school districts contacted the OSTI and Plasma Games, Inc., for information. Plasma Games, Inc. established a price point of $6,000 for a teacher license, with teachers being able to administer an unlimited number of student/user licenses for the *Sci-Ops: Global Defense* game. To expedite the application process, a secure submission portal was developed and hosted on the Department of Commerce website. The website, https://public.nccommerce.com/OSTI/, which closed at the end of the application window, compiled application packages from the necessary grant, legal, and financial information submitted by LSAUs wishing to participate in the Program. The webpage went live on October 5, 2020 and the application deadline was November 30, 2020. The OSTI has retained all application materials.

To promote the Program, the OSTI worked with the North Carolina Department of Public Instruction (DPI), as DPI had relevant contact information and information channels. An initial email was sent by DPI on July 23, 2020 to more than 2,800 STEM teachers across the state announcing the creation of the Program and that licenses were available for teachers interested in utilizing the game as part of their curriculum; see *Appendix B: Gamification Licenses for Science Teachers Email*. DPI sent a second email to all LSAU Superintendents, Chief Financial Officers and Chief Technology Officers Program on October 14,

[2] U.S. News & World Report, "North Carolina Governor Orders Schools Closed for 2 Weeks," March 14, 2020. https://www.usnews.com/news/best-states/north-carolina/articles/2020-03-14/north-carolina-governor-orders-schools-closed-for-2-weeks.

[3] Section 4.2D. Plasma Games Pilot Program. North Carolina Session Law 2020-80. Available at: https://www.ncleg.gov/Sessions/2019/Bills/House/PDF/H1023v7.pdf. Last accessed March 29, 2021.

2020 with a link to the application website, each LSAU's unique passcode, and application instructions, and indicated when the application period would open; see *Appendix C: Plasma Games Pilot Program Submission Email*. Finally, Program information was added to DPI's Funding & Resources for Remote Instruction webpage on October 15, 2020.

Following the application deadline, the OSTI organized all materials to make funding decisions. Overall, the Program received a total of 24 applications totaling $3,132,000. One LSAU missed the deadline, and the application was accepted late, though there was only enough unallocated money to partially fund their request at that time. Table 1 shows the LSAUs that applied to the Program.

Table 1: Number of Classes, Students, Teachers Licenses, and Requested Amounts from Local School Administrative Units Applying to the Plasma Games Pilot Program

Local School Administrative Unit	Classes Using *Sci-Ops: Global Defense*	Approximate Number of Students per Class	Approximate Number of Students	Teacher Licenses Requested	Amount Requested
Alamance-Burlington Schools	8	30	240	8	$48,000
Avery County Schools	4	25	100	4	$24,000
Bertie County Schools	2	55	110	2	$12,000
Cabarrus County Schools	53	24	1,272	17	$102,000
Catawba County Schools	66	30	1,980	19	$114,000
Cleveland County Schools	20	20	400	16	$96,000
Cumberland County Schools	47	30	1,410	47	$282,000
Davidson County Schools	38	25	950	20	$120,000
Duplin County Schools	18	25	450	6	$36,000
Winston-Salem/Forsyth County Schools	53	100	5,300	53	$318,000
Granville County Schools	9	30	270	9	$54,000
Roanoke Rapids City Schools	9	24	216	3	$18,000
Harnett County Schools	66	22	1,452	14	$84,000
Haywood County Schools	28	24	672	10	$60,000
Johnston County Public Schools	132	28	3,696	44	$264,000
New Hanover County Schools	26	30	780	8	$48,000
Pitt County Schools	55	25	1,375	24	$144,000
Public Schools of Robeson County	156	30	4,680	26	$156,000
Rockingham County Schools	37	33	1,221	12	$72,000
Rowan-Salisbury Schools	13	24	312	13	$78,000
Stanly County Schools	10	30	300	10	$60,000
Swain County Schools	5	13	65	2	$12,000
Wake County Schools	752	18	13,536	150	$900,000
Warren County Schools	8	20	160	5	$30,000
Total	**1,584**	**-**	**40,272**	**498**	**$3,132,000**

Because the requested total amount exceeded the amount appropriated to the Program, the OSTI determined it would fully fund LSAUs from Tier 1 or Tier 2 counties and partially fund LSAUs from Tier 3 counties, as classified by the Department of Commerce's County Distress Rankings[4] and consistent with Department priorities. Twenty LSAUs agreed to participate, of which sixteen were fully-funded and four were partially-funded. All funds were used to reimburse the cost of the teachers' licenses and all but $12,000 was distributed. Award letters and contracts were issued on December 3, 2020, and executed contracts were finalized December 15, 2020. Table 2 shows the LSAUs participating in the Plasma Games Pilot Program, as well as award amounts and grant numbers.

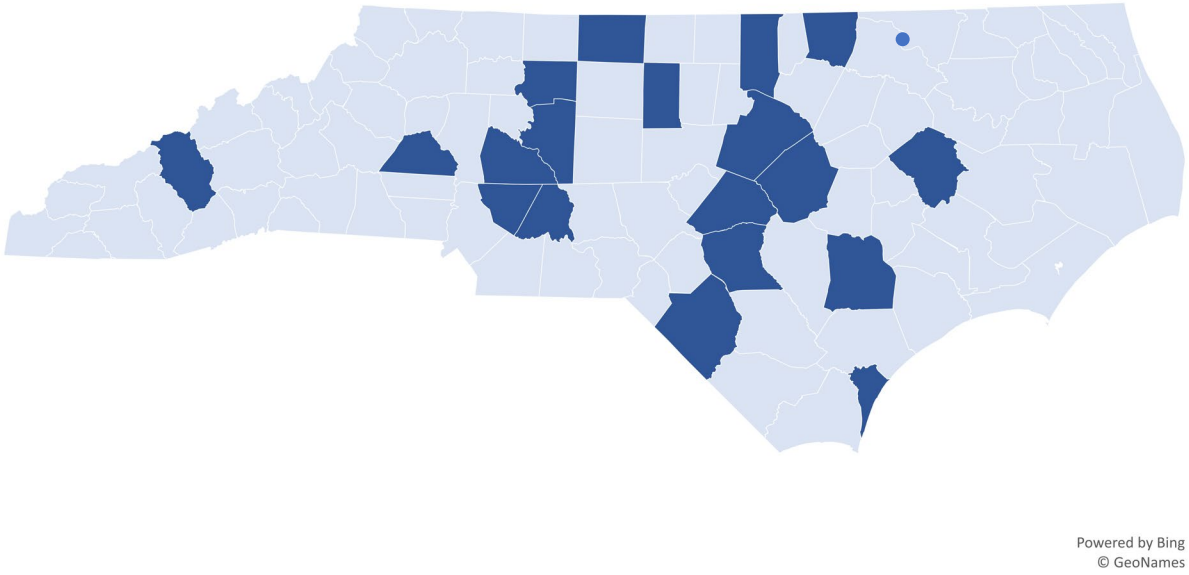
Table 2: Local School Administrative Units, Award Amounts, and Grant Numbers Participating in the Plasma Games Pilot Program

Local School Administrative Unit	Award Amount	Grant Number
Alamance-Burlington Schools	$48,000.00	62-00-23
Cabarrus County Schools	$64,616.11	62-00-03
Catawba County Schools	$114,000.00	62-00-04
Cumberland County Schools	$282,000.00	62-00-06
Davidson County Schools	$84,000.00	62-00-24
Duplin County Schools	$36,000.00	62-00-07
Winston-Salem/Forsyth County Schools	$318,000.00	62-00-08
Granville County Schools	$54,000.00	62-00-09
Roanoke Rapids City Schools	$18,000.00	62-00-10
Harnett County Schools	$84,000.00	62-00-11
Haywood County Schools	$60,000.00	62-00-12
Johnston County Public Schools	$167,241.71	62-00-13
New Hanover County Schools	$48,000.00	62-00-14
Pitt County Schools	$144,000.00	62-00-15
Public Schools of Robeson County	$156,000.00	62-00-16
Rockingham County Schools	$72,000.00	62-00-17
Rowan-Salisbury Schools	$78,000.00	62-00-18
Stanly County Schools	$60,000.00	62-00-19
Wake County Schools	$570,142.18	62-00-21
Warren County Schools	$30,000.00	62-00-22
Total	**$2,488,000.00**	**-**

[4] County Distress Rankings. 2021 County Tier Designations. North Carolina Department of Commerce. Available at: https://www.nccommerce.com/grants-incentives/county-distress-rankings-tiers. Published November 30, 2020.

Figure 1 shows the geographic diversity of the Plasma Games Pilot Program's cohort. Overall, the cohort included 19 county-level LSAUs (represented by the blue shaded counties) and one city-level LSAU (represented by the blue dot.) By economic tier, the Program included seven LSAUs from Tier 1 counties (the most economically distressed tier), ten LSAUs from Tier 2 counties, and three LSAUs from Tier 3 counties (the least economically distressed tier.)

Figure 1: Geography of Local School Administrative Units Participating in the Plasma Games Pilot Program



All twenty of the LSAUs had two specific reporting requirements to complete as part of the Program. The first, which was due January 30, 2021, required the LSAUs to submit an update on their implementation and receipt of their payment for the licenses. The second, which was due March 26, 2021, was the Plasma Games Pilot Program Reporting Survey, which collected Administrators and Teachers' perceptions[5] of the Program and its objectives. See *Appendix D: Plasma Games Pilot Program Reporting Survey Overview* or visit https://ncsu.qualtrics.com/jfe/form/SV_ebvJ8XXtLxHfQZ7 for the web form of the survey, which was the delivery method. Administrators completed the surveys themselves and forwarded the survey link to each of their teachers who had requested a license.

[5] While North Carolina Session Law 2020-80 specified that information be collected on "…the number of students pursing STEM-related CTE career pathways as a result of the pilot, measured by the number of students declaring interest in a career with a chemistry-dependent industry located in North Carolina and the number of students pursuing higher education in a chemistry-related major or technical certification at a school in North Carolina…", the possibility of collecting such information was limited given the program's one-year timeframe and insufficient resources to ensure information on minors was collected securely. Additionally, LSAUs were also reluctant to allow the OSTI to engage directly with students and release student grades (to measure achievement in their classes). Thus, administrator and teacher perceptions on student interest and career paths in STEM were solicited through the Plasma Games Pilot Program Reporting Survey.

Overall, 31 surveys from Administrators or Technology Officers were received, indicating that some LSAUs had more than one official assisting with the Program. Reponses from teachers proved more challenging. Of the 498 teacher licenses covered by the Program, the OSTI received a total of 404 surveys across all 20 LSAUs (an 81% response rate). However, upon review of the survey data, 218 teachers indicated they had not yet activated their licenses (and provided overwhelming neutral responses)[6] and 19 were from middle school teachers (who were not eligible for the Program but had obtained a license). The result was a total of 167 teacher surveys collected and used for this analysis. Of the 167 teacher surveys, 31 surveys were from teachers serving at LSAUs in Tier 1 counties, 89 surveys from teachers serving at LSAUs in Tier 2 counties, and 47 surveys were from teachers serving at LSAUs in Tier 3 counties.

EVALUATION

This analysis found that at least 167 teachers and 9,047 students across 20 LSAUs participated in the Plasma Games Pilot Program, making the cost per teacher $14,898 and approximate cost per student $275, respectively. These numbers represent all eligible high school teachers that used Plasma Games' *Sci-Ops: Global Defense* in their classrooms, as well as the cumulative total of the number of students the responding teachers indicated were playing the game. Overall, these estimates are likely to be an undercount of the total numbers, as several teachers who completed the survey stated they had not yet used the game in their instruction (and thus had not yet provided the game to any students),[7] and the 19% of the survey population who were non-respondents may have been using the game.

The results from both the Administrator surveys' and the Teacher surveys' questions are presented below. Selected comments are also presented and are sorted by their contents (as the comment question allowed open-ended, 'final thoughts' on the Program.) Overall, no significant variation in responses was observed across economic tiers in either the administrators' or teachers' results. Administrators, on average, tended to be more positive while teachers were more varied and often divided in their opinions.

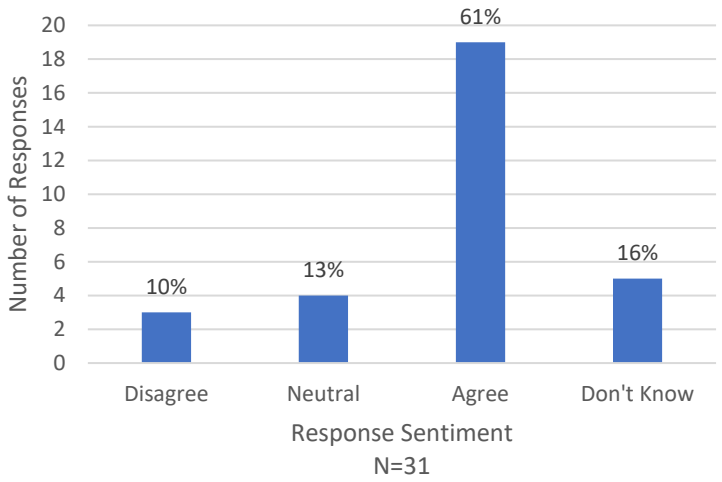
<u>Administrator or Technology Officer Survey Results</u>

Generally, the administrators of the participating LSAUs had mostly positive feedback about the program and were consistent in all but one of their survey answers. For the entire, unsorted list of comments from the administrator surveys, see *Appendix E: Comments Collected in 'Administrator or Technology Officer' Surveys*.

[6] Reasons for not using the game included technical problems, lack of training on the game, insufficient time to incorporate the game into lesson plans given the disruption of the COVID-19 pandemic, teachers waiting until the end of the semester or school year to implement *Sci-Ops: Global Defense* in their curriculum (and thus, not being ready to complete the survey yet), as well as teachers changing their minds about using the game as a supplement to their curriculum, and that they had never requested a license.

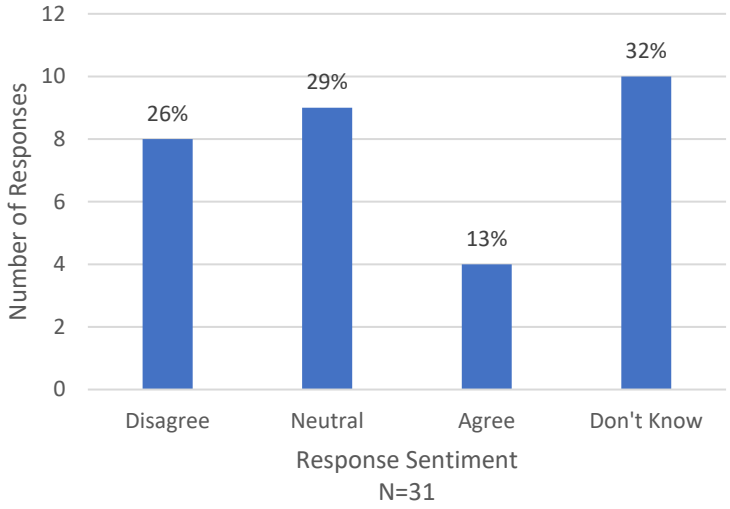
[7] As described in the previous section, 237 teacher surveys were dropped, suggesting more teachers and students have, or will, take part in the Plasma Games Pilot Program, but they are neither included in the count nor analysis.

How strongly do you agree or disagree with the following statements?
Implementing Sci-Ops: Global Defense into the curriculum at our school was easy.



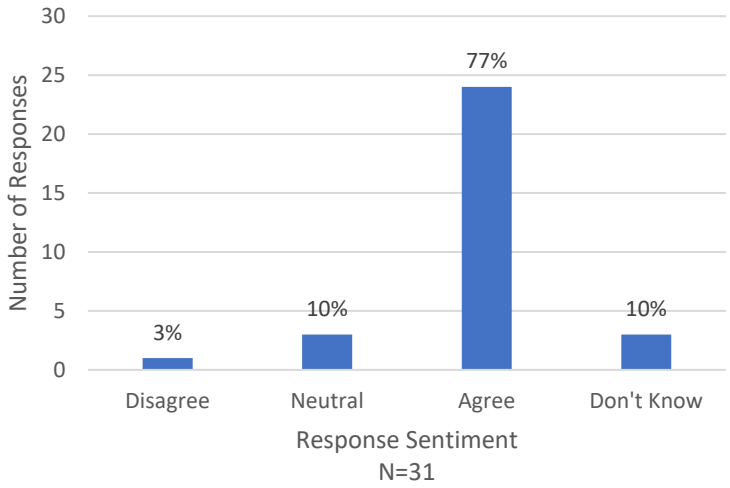
A majority (61%) of administrators indicated that the Plasma Games Pilot Program was easy to implement at their school. Only three administrators (10%) disagreed while four (13%) were neutral and five (16%) were unsure. Little variation in responses existed across County Tier designation, suggesting the game could easily be implemented in any school district's curriculum.

How strongly do you agree or disagree with the following statements?
The cost of Sci-Ops: Global Defense was priced appropriately for my school district.



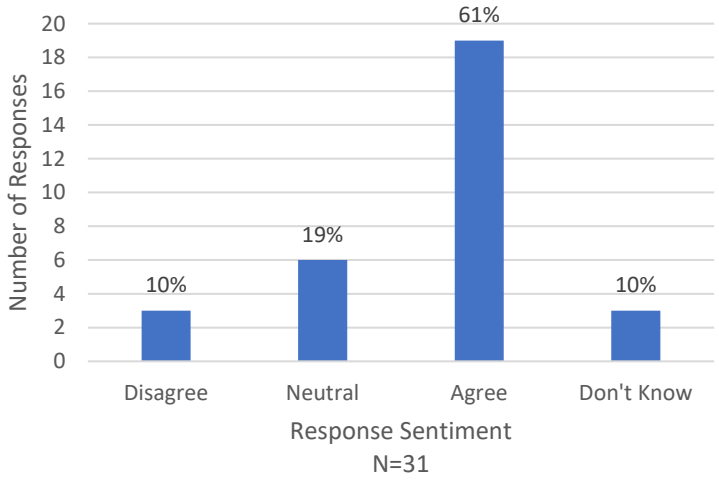
Administrators expressed mixed opinions on whether licenses for *Sci-Ops: Global Defense* were priced appropriately. Only four administrators (13%) indicated that the pricing was appropriate, while eight (26%) indicated that it was not appropriately priced, nine (29%) were neutral, and ten (32%) were unsure. Little variation in responses existed across County Tier designation.

How strongly do you agree or disagree with the following statements?
My school district had the resources to implement Sci-Ops: Global Defense into our curriculum effectively.



A large majority (77%) of administrators indicated that their school had the resources to implement this pilot program. Only one administrator disagreed while three (10%) each were neutral and unsure. These results were largely consistent across County Tier designation, suggesting LSAUs have the resources to implement similar programs.

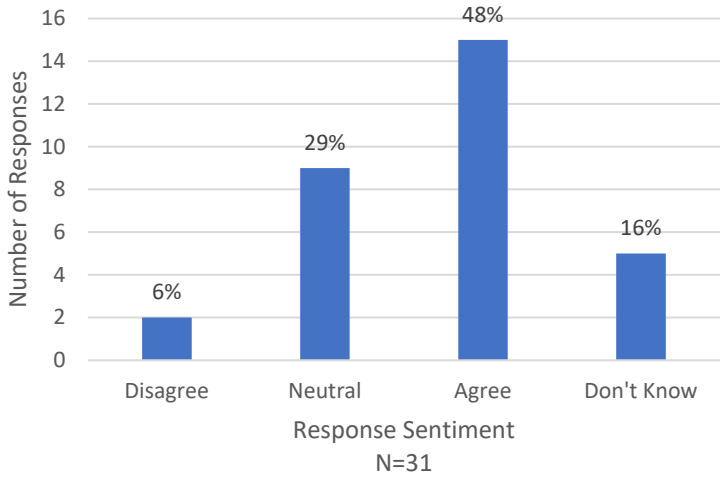
How strongly do you agree or disagree with the following statements?
Our school's science teachers were enthusiastic about implementing Sci-Ops: Global Defense into their curriculum.



A majority (61%) of administrators indicated that their teachers were enthusiastic about implementing this program. Only three (10%) disagreed, while six (19%) were neutral and three (10%) expressed uncertainty. Little variation in responses existed across County Tier designation, signifying equal perceived teacher enthusiasm about the program across a broad range of school districts.

How strongly do you agree or disagree with the following statements?

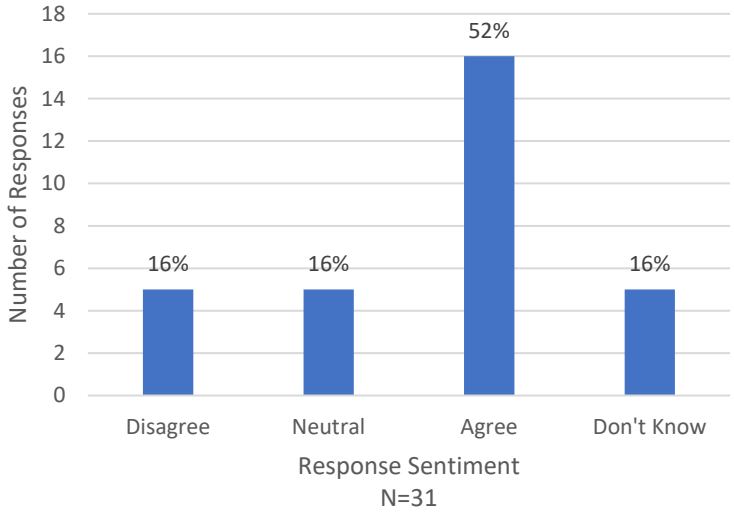
Our school's students were enthusiastic about using Sci-Ops: Global Defense in their coursework.



Approximately half (48%) of administrators indicated that their students were enthusiastic about using *Sci-Ops: Global Defense* as part of their curriculum. Only two administrators (6%) disagreed, nine (29%) were neutral, and five (16%) expressed uncertainty. Once again, little variation in responses existed across County Tier designation.

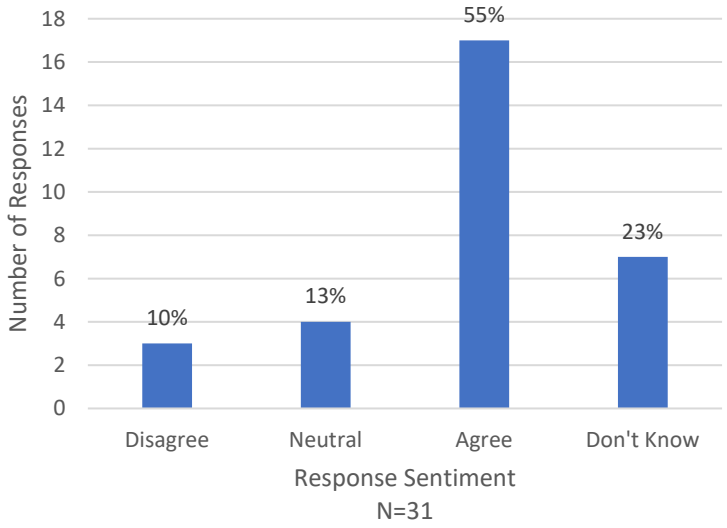
How strongly do you agree or disagree with the following statements?

I would recommend that all schools utilize Sci-Ops: Global Defense as part of their curriculum.



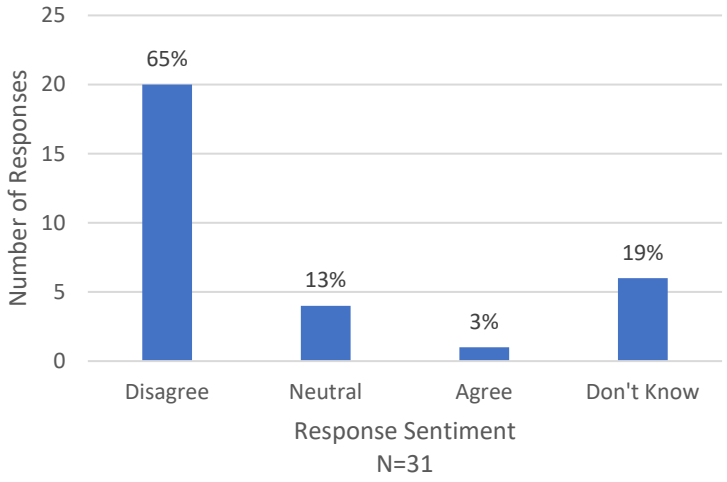
Approximately half (52%) of administrators indicated that they would recommend that other schools utilize *Sci-Ops: Global Defense.* Five (16%) each expressed disagreement, neutrality, or uncertainty. The findings were consistent across County Tier designation, signifying strong support from a broad range of administrators.

How strongly do you agree or disagree with the following statements?
My school district will continue the use of Sci-Ops: Global Defense if funding is provided again.



A majority (55%) of administrators indicated that they would be inclined to continue using *Sci-Ops: Global Defense* at their schools if they continued to receive funding for it. Only three (10%) indicated that they would not utilize this program again, while four (13%) were neutral and seven (23%) expressed uncertainty, suggesting a strong desire to continue the Program. LSAUs across all County Tiers shared in these levels of agreement.

How strongly do you agree or disagree with the following statements?
My school district has the resources to use Sci-Ops: Global Defense in the future if funding from this program is not continued.



Most administrators (65%) indicated that they would not continue to utilize *Sci-Ops: Global Defense* at their schools without additional funding for the Program. Only one indicated that they would continue without funding, while four (13%) were neutral and six (19%) were unsure, suggesting a strong reliance on external financial resources for future programs. LSAUs across all economic tiers shared in the disagreement.

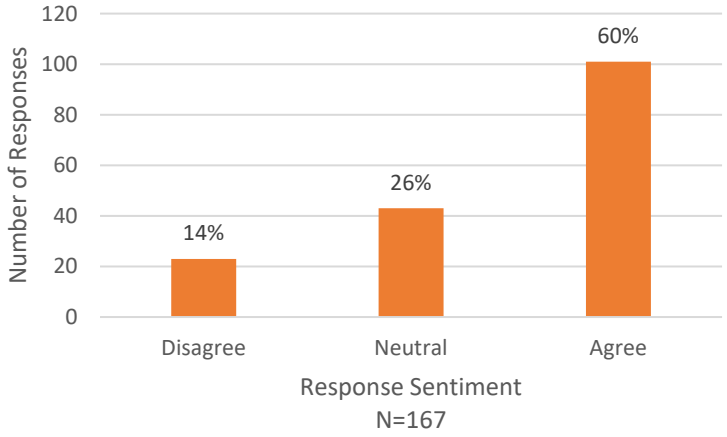
Overall, administrators agreed that the Program was easy to implement and their LSAUs had the resources to implement effectively. They believed that teachers, and students to a lesser degree, wanted to participate. Most administrators would recommend other schools participate in the Program and believed their LSAU should continue, but only if funding is provided. These sentiments were also expressed in the free-response comments, along with observations about challenges to implementing the program during the unusual circumstances of the pandemic; see *Appendix E: Comments Collected in 'Administrator or Technology Officer' Surveys*.

Teacher Survey Results:

Data from the teachers' survey revealed greater variation than the administrators' survey. Each survey question and its results are examined, and selected comments relative to the questions are presented. For the entire, unsorted list of comments from the administrator surveys, see *Appendix F: Comments Collected in 'Teacher' Surveys*.

How strongly do you agree or disagree with the following statements?

My students enjoyed playing Sci-Ops: Global Defense.

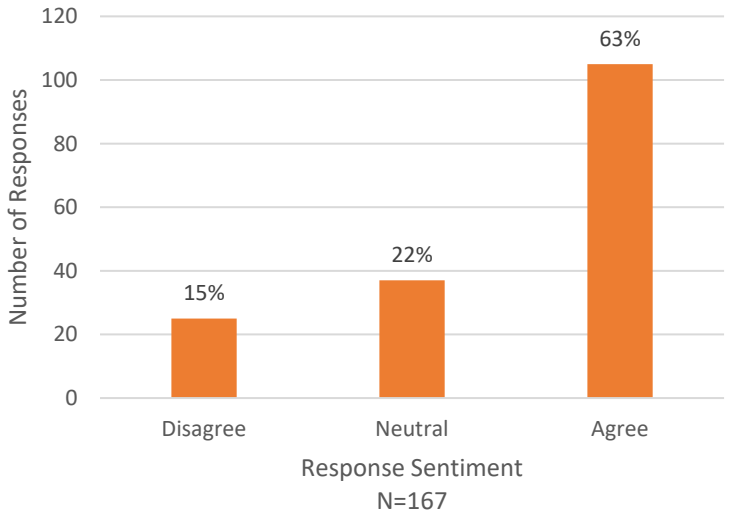


A majority of teachers (60%) indicated that their students enjoyed playing *Sci-Ops: Global Defense.* Fourteen percent indicated that their students did not enjoy the game and 26% expressed neutrality. Little variation in responses existed across County Tier designation, suggesting overall satisfaction across all types of school districts.

Twenty-five teachers referenced their students' opinions of the game, with 9 making positive comments, 14 making negative, and 2 describing mixed student opinions. For example:

- "The game was very engaging for my students."
- "Plasma Games has engaged my students where I cannot currently with other simulations. There is nothing out there for students like this video game. Plasma Games give my students the confidence to get through a chemistry assignment with a challenge they are comfortable with while also teaching them how chemistry knowledge can be used to create things, they are interested in. I've used it for the past three years and the company is only getting better with the content they are creating for teachers. My students are engaging with the program more and more every year."
- "Students found it "braindead"; "boring"; "stupid". There are MANY more sites to use. Students are very savvy these days with regards to "video games", and this was extremely low level for high school."
- "Students said more game than instruction."
- "I had a hard time getting my students to actually play the game, even when I assigned it. Also there are not many teacher resources to choose from so I can only really use Plasma games in a few units."
- "The material goes far too deep for Physical Science, into topics not covered in the Phys Sci. curriculum. It would be appropriate for Honors Physical Science or for Chemistry. Students who do not like video games do not care for it. Students who do enjoy it."
- "My honors and AP level Chemistry students were very frustrated with the game. They felt it was a waste of time for them and they got very little learning out of it."

How strongly do you agree or disagree with the following statements?
Sci-Ops Global Defense was a helpful and appropriate supplement for my class(es).



A majority of teachers (63%) indicated that they found *Sci-Ops: Global Defense* to be a helpful and appropriate teaching supplement. Fifteen percent of teachers disagreed and 22% were neutral. This agreement was consistent across teachers from all economic tiers.

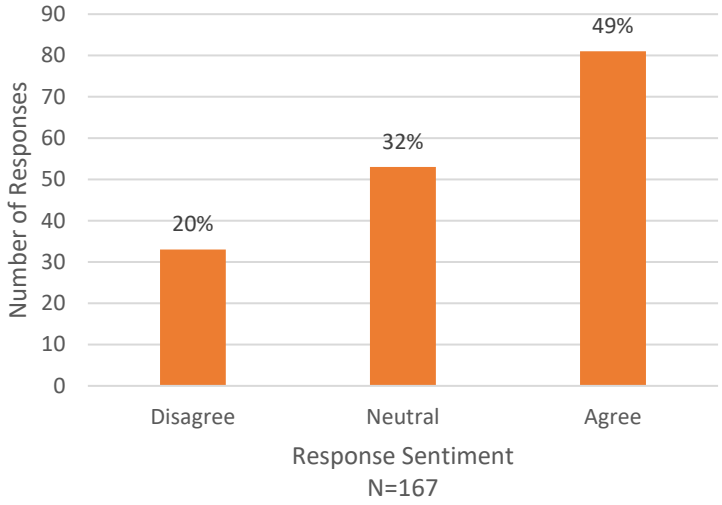
Thirteen teachers indicated dissatisfaction with the amount of material covered or that the game was "incomplete." Two of them stated:

- "I wish that there was more content available. Sci-Ops was a lot of fun for my students but was really only aligned to one unit that we covered. I'd love to see the topics expanded."
- "The Pilot program has had some hiccups with logging in and accounts not working. Things have seemed to smooth out, but it has been back and forth. I have REALLY appreciated the Teacher Resources and Units for ideas using STEM while teaching Chemistry. It is a great tool. Not knowing pricing details, there are some limitations to the actual game itself, with the unfinished levels and such. It is hard for me to recommend my district paying for an incomplete product. If it was set up a little differently, like it didn't look unfinished in the game play I would probably feel differently. If Zones 2, 3, and 4 were added later, excellent, but don't make me think I'm paying for an incomplete game."

Meanwhile, nine teachers indicated that they would like the game to align more to curriculum standards or have more flexibility in matching it to their teaching. Two of them stated:

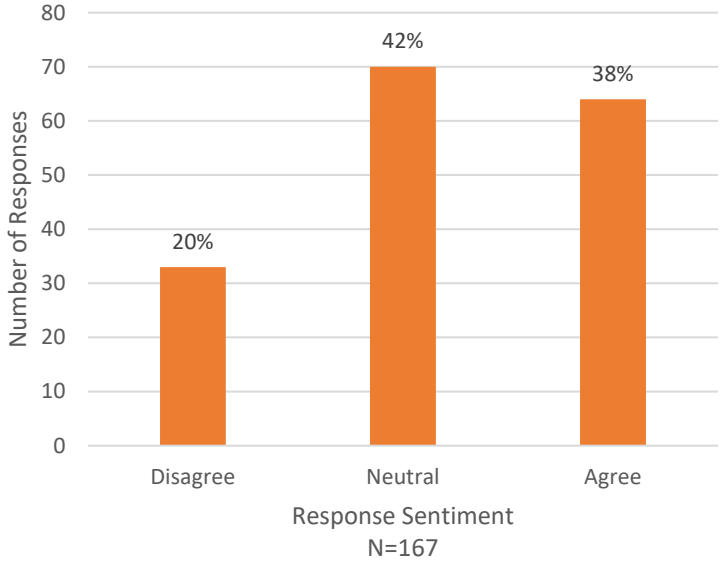
- "It was difficult to incorporate the game into my pacing because my sequencing was a little different than the games. And it required the students to have already learned somethings that I had not covered yet. The game did get some good feedback from some of the students who did explore with my incorporation."
- "Just note that teachers need flexibility in teaching with *Sci-Ops*. The order of content did not match the district pacing guide at all because it is a more integrated approach to chemistry instead of what is traditionally taught. Also, for physical science, do not expect teachers to use it for the whole course. Sci-Ops does not cover the physics based standards of physical science (only partly with waves, but no forces, motion, circuits, magnetism, energy, machines, momentum, etc.)"

How strongly do you agree or disagree with the following statements?
My students learned more about chemistry and physical sciences with Sci-Ops: Global Defense than they would have if we had not used this resource.



Approximately half of teachers (49%) indicated that their students learned more chemistry and physical science using *Sci-Ops: Global Defense* than they would have without using it. Twenty percent indicated that their students did not learn more and approximately a third (32%) were neutral. There was no variance in responses based on County Tier designation.

How strongly do you agree or disagree with the following statements?
My students are more interested in learning science broadly after playing Sci-Ops: Global Defense than they would have been without it.



Teachers indicated mixed opinions about whether their students were more interested in learning science after playing *Sci-Ops: Global Defense* than they would have been without playing. Thirty-eight percent of teachers believed it did increase student interest, while 20% believe it did not increase student interest and 42% were neutral. These results suggest a need for resources to better assess student achievement as a result of the Program. Little variation existed in responses across County Tier designation.

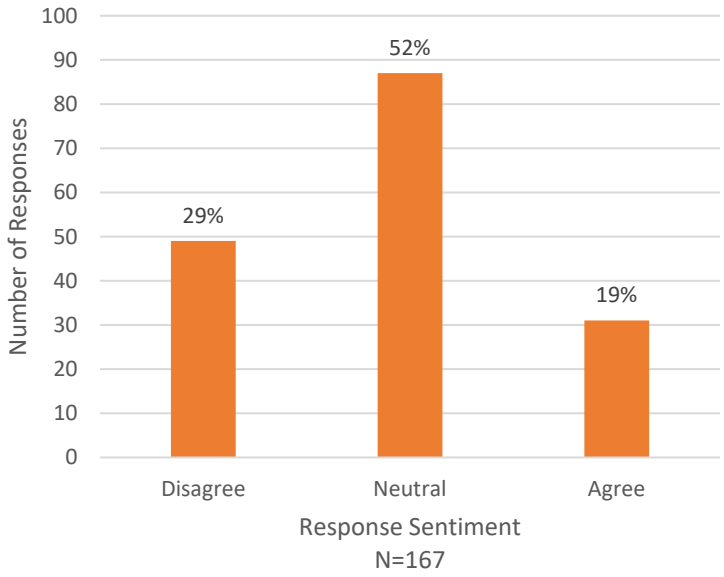
Several teachers indicated that they would like access to more information about how their students are doing in the game. For example:

- “All I see is what level they are on and how long they have spent playing the game. There is no break down by level of the content they have been exposed to. Personally, I hate playing the game. I’ve noticed no difference in student knowledge or understanding as a result of students playing the game.”
- “I think that if we had access to more game playing data than just total time and levels achieved it would be more useful than it already is. I feel a little "in the dark" after releasing students into a session and not really being able to see them. A multiplayer competition element to the game would also be very useful. To address my need for more accountability I plan on developing a video base assignment which would involve students doing a screen recording of some of their game play and a learning reflection.”

Several teachers commented on the gameplay or game design of *Sci-Ops: Global Defense*. For example:

- “The quality of the graphics is incredible, young people are very picky about this and it can be a deal breaker when attempting to engage youth, plasma games is on par or above all their games they play.”
- “The story and animation of the game was juvenile in comparison to other games students would play normally.”
- “The students say it is hard to play, I'm not a gamer and it is hard for me to lead the students especially hybrid. I like the worksheets/resources to use with Canvas or as a comprehension check.”

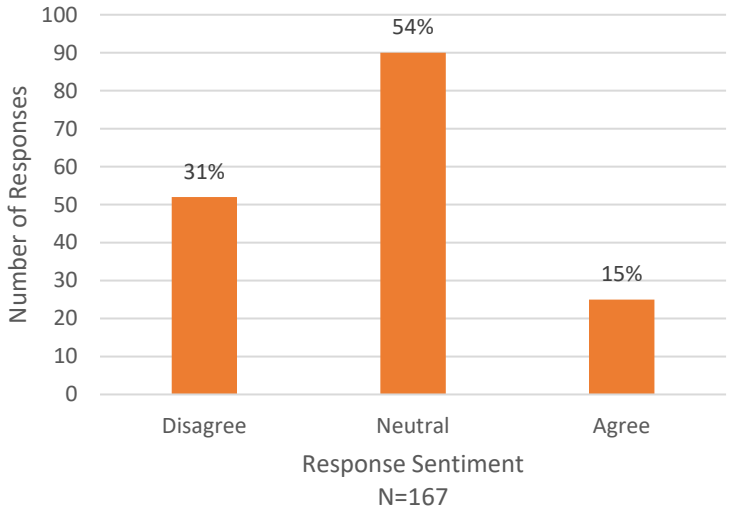
How strongly do you agree or disagree with the following statements?
More of my students have declared an interest in pursuing a STEM field of study in a post-secondary educational setting as a result of using Sci-Ops: Global Defense.



Teachers were predominantly neutral (52%) over whether their students were more likely to pursue higher education in STEM as a result of playing *Sci-Ops: Global Defense*, while 19% thought their students were more likely and 29% thought they were not more likely. These results signal a need for resources to study the impact on students’ academic interests (or to at least get data on student plans.) Little variation existed in responses across County Tier designation.

How strongly do you agree or disagree with the following statements?

More of my students plan to pursue a STEM career as a result of using Sci-Ops: Global Defense.



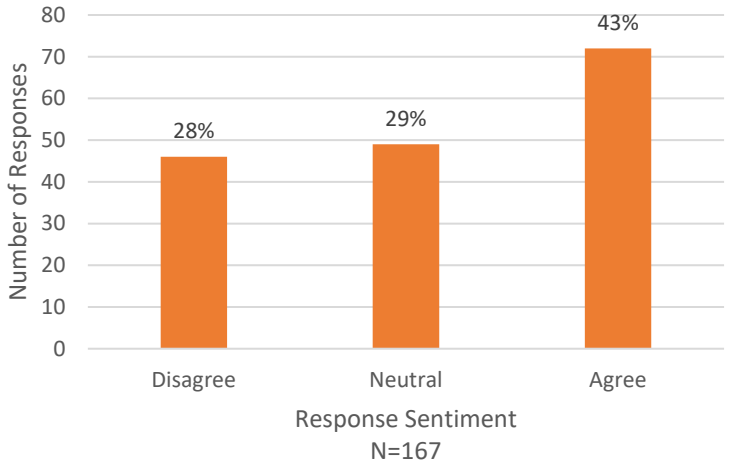
Teachers were predominantly neutral (54%) about whether their students were more likely to pursue a STEM career because of playing *Sci-Ops: Global Defense*, while 15% thought their students were more likely and 31% thought their students were not more likely. These results signal need for resources to study the impact on students' career paths (or to at least get data on student plans.) There was no significant difference in responses based on County Tier designation.

Five teachers noted gender disparity in their students' enjoyment of the program, with female students less inclined to play than male students. For example:

- "I am not a gamer myself, so I didn't really like it. The other physical science teacher is a gamer and he was really excited I about it. Some of my students were the same way. I was more worried about moving the characters than the content - again I am not a gamer. I noticed the girls were more like me and boys were more interested."

How strongly do you agree or disagree with the following statements?

Compared to other science-based resources and/or teaching aids, I would like my school to devote resources to include Sci-Ops: Global Defense as part of our science curriculum.



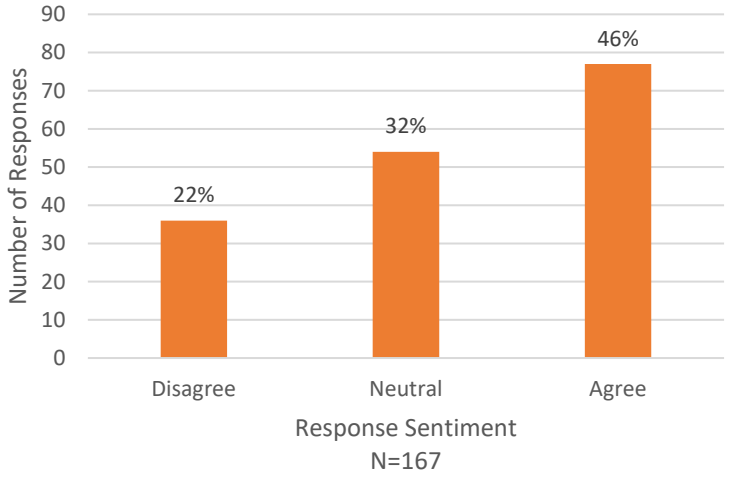
Teachers expressed mixed sentiment on *Sci-Ops: Global Defense* relative to other resources, with less than half (43%) indicating that they prefer this resource, 28% indicating that they do not, and 29% indicating neutrality. The mixed sentiments were consistent across teachers from all County Tier designations.

Seven teachers discussed the value of the supplementary materials outside the game. These teachers all liked these materials whether they liked the game itself or not. For example:

- "My absolute favorite part is the resources that come with unit. The students have enjoyed the comics and graphic organizer that come with the game."
- "I believe that the gaming component would be better suited for younger learners. My high school's students were not really interested in the game mainly due to the lag. However, they did benefit from the worksheets. Also, as a teacher, I found their digital worksheets and materials extremely helpful, colorful, and direct. Perfect for instruction!"

How strongly do you agree or disagree with the following statements?

I would recommend that all schools utilize Sci-Ops: Global Defense as part of their curriculum.



Nearly half of all responding teachers (46%) indicated that they would recommend that all schools utilize *Sci-Ops: Global Defense*, while 22% disagreed and 32% expressing neutrality. Once again, there was little variation in responses from teachers across all County Tier designations.

Twelve teachers described encountering technical or technology difficulties with the game. For example:

- "The game site had difficulty loading or was often very slow at loading."
- "It is very difficult to get students logged in for the first time. If we could go through [C]lever or just log in with [G]oogle it would be much easier."

Fifty-five teachers indicated an overall sentiment towards the educational value of the Program, of which 23 were positive and 32 were negative. Sentiments expressed include:

- "I am happy we have access to it. It improves the quality of teaching and learning."
- "It is a great supplement that not only meets many students where they are in the video game world but is very explicit about STEM careers."
- "I am very glad my students got to be part of this work. They are excited to play and have learned the science. it is a great game. What I also love is the tech support. My students have the ownership to report their own bugs with the game and the tech support staff are amazing at getting back with them and with me when issues arise. It is a GREAT model."
- "Not worth it. Glad it was free."
- "It was clunky and hard to use. The students did not like it. I quit using it after 2-3 sessions."
- "The game is "cute" but the instruction value is not worth the time students must devote. I can see the money spent in much better ways with other resources. Personally, my students did not really enjoy the game itself. Many of my girls are not "gamers" and thought it a little stupid.

The results from the teacher survey can be summarized relatively mixed in overall consensus but does exhibit some support for the Program. Teachers could not confidentially express the overall impact *Sci-*

Ops: Global Defense has on their students' academic progress or interests, suggesting a need for resources for further evaluations to be conducted. Despite this, their feelings on the Program tended to be positive, but not as positive as administrators.

Additional Results from Plasma Games, Inc.:
Additional research on the efficacy of *Sci-Ops: Global Defense* has been conducted by an external team of researchers from North Carolina State University and the University of Delaware, who were hired by Plasma Games, Inc. Brief descriptions of their research findings were shared with the OSTI and are based on a sample of 188 students (about two percent of the estimated population of students participating in the Program). Their preliminary results suggest that using *Sci-Ops: Global Defense* in the classroom may have a positive impact on students interested in STEM careers, having found correlation between students who extensively played the game and their interests in chemistry. Ultimately, like the findings conducted for the Pilot Program, their findings neither directly link to actual student achievement nor to long-term career outcomes of students. Additional information on these findings can be obtained directly from Plasma Games, Inc.

RECOMMENDATIONS
To better ensure student achievement and advance career paths in STEM fields for our state's students, the following are policy recommendations for the next phase of the Plasma Games Pilot Program or other similar initiatives. These recommendations include suggestions to alleviate delays in implementation, increase participation, and methods to improve program outcomes.

- **Open the Program to More Students:** Future versions of the Program could include more students through two actions:
    - *Increasing the Number of Eligible School Districts:* The current Program was open to local school administrative units in North Carolina, which includes 100 County-level school districts and 15 City-level school districts. Only allowing LSAUs to participate inadvertently excluded charter-, regional-, lab-, Innovative School Districts, and other schools from participation. The OSTI corresponded with several of the excluded types of school districts, all of whom expressed interest in the Program. In consultation with the Department of Public Instruction, it is recommended that future legislation include Local Education Agencies (LEAs), which includes all 115 LSAUs, plus all independent public schools (such as the types of schools listed above.)

    - *Open the Program to Middle School Students:* The game *Sci-Ops: Global Defense* is a game that is designed for both middle-school and high school students. North Carolina Session Law 2020-80 specified that only high school students were eligible, and several LSAUs provided licenses to middle school teachers even though this was not allowed by the Program. It is recommended that middle school teachers and students be included in future and/or similar programs to raise the number of student participants and have an impact on a greater number of students.

- **Determine Ways to Measure Long-Term Outcomes of Students:** Tracking student achievement and career advancement, generally, is a long-term task requiring significant oversight by institutional review boards and school districts, among others. The Plasma Games Pilot Program did not provide resources to undertake such an effort, nor was it designed to properly study the long-term effects on students. It is recommended that resources be provided to the Program

office and schools to properly measure student achievement if such outcomes are wanted in future legislation. Alternatively, it is recommended that measurement of student achievement and career advancement be defined in alternative ways that do not involve monitoring students, such as this report's approach that used administrator and teacher perceptions. And if undertaking such a longitudinal effort, it is recommended that another agency or external research team with expertise in measuring achievement be utilized for such research.

- **Ensure Students Have Access to Reliable Internet:** In direct communications with OSTI, several schools expressed concern that students may not have a reliable source of internet in which to play *Sci-Ops: Global Defense*. Reliable internet, much less broadband internet, is not available statewide and has been noted as a critical infrastructure issue in North Carolina. Furthermore, nationwide teachers have expressed concern about the digital divide between students with broadband internet versus those without it.[8] Having statewide, broadband internet available to all students (as well as the state's citizens) would maximize the impact of *Sci-Ops: Global Defense*, as well as other similar programs and virtual education generally, has on students, teachers, and school districts.

- **Ensure Appropriate Communication Channels:** The Department of Commerce did not have the established contacts or communication channels with school districts across the state, which is why the OSTI partnered with DPI on communications with LSAUs. It is recommended that future programs of this type be housed within an agency that has consistent and established lines of communications with school districts.

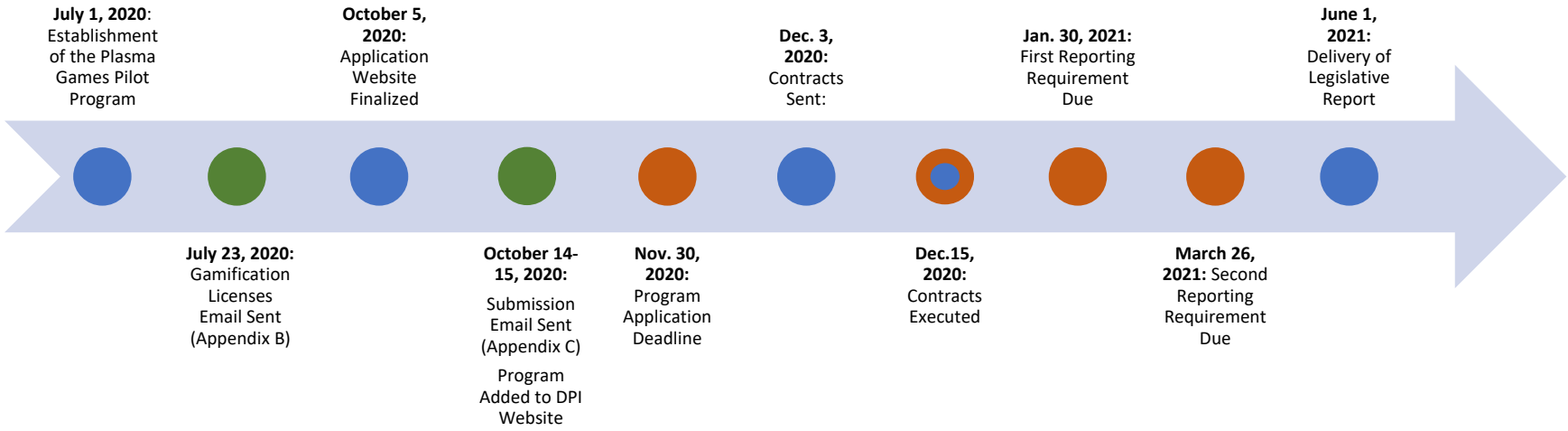
- **Continued Financial Support from the State is Needed:** As indicated in the survey results, LSAUs expressed a desire to continue participating in such programs, but they do not have the financial resources to do so. The Administrators' responses also expressed mixed results with regards to the price of the resource. It is recommended that future programs obtain financial support through state appropriations or other methods to continue operation and that the General Assembly investigate comparable programs to determine an appropriate price point.

[8] Stelitano, Laura, Sy Doan, Ashley Woo, Melissa Kay Diliberti, Julia H. Kaufman, and Daniella Henry, The Digital Divide and COVID-19: Teachers' Perceptions of Inequities in Students' Internet Access and Participation in Remote Learning, Creative Commons Attribution 4.0 International Public License, RR-A134-3, 2020. As of April 16, 2021: https://www.rand.org/pubs/research_reports/RRA134-3.html.

APPENDICIES

Appendix A: Plasma Games Pilot Program Timeline

The project timeline below depicts the sequential order of the implementation events, announcements, and reporting requirements to provide a sense of key milestones of the Plasma Games Pilot Program. The timeline highlights action taken by the North Carolina Department of Commerce, Office of Science, Technology & Innovation, the North Carolina Department of Public Instruction, and the twenty participating Local School Administrative Units.



Project Timeline Key:

	Action by North Carolina Department of Commerce, Office of Science, Technology & Innovation
	Action by North Carolina Department of Public Instruction
	Action/Due Date for Local School Administrative Units Participating in the Plasma Games Pilot Program

Appendix B: Gamification Licenses for Science Teachers Email

PUBLIC SCHOOLS OF NORTH CAROLINA
Educating the Whole Child

This announcement is being sent on behalf of Vanessa Wrenn, Director of Digital Teaching and Learning for North Carolina Department of Public Instruction. For more information contact Vanessa at [redacted] *or* [redacted]

Through 2.5 million dollars in funding provided to the NC Department of Commerce for Plasma Games, Sci-Ops: Global Defense has been purchased for science teachers to help them engage their students in class or virtually in a fun and effective way using a gamification platform.

This digital resource has been purchased for science teachers to help them engage their students in class or virtually in a fun and effective way using a gamification platform.

These resources are available to all North Carolina middle school science teachers, and high school chemistry and physical science teachers.

The resources cover middle school science, high school chemistry, and physical science standards.

- Teachers MUST register for a 2 hour PD Session, by clicking the link in the **Welcome Packet** to obtain access. PD sessions start the first week of August. Therefore, teachers will need to register as soon as possible to secure their spot.

Sci-Ops: Global Defense is a National Science Foundation award-winning, 3D game-based learning platform that helps science teachers engage students. Sci-Ops comes with teacher support materials and a portal to track their student growth.

As always, thank you for your service to our community - especially for your tremendous efforts during this time of crisis.

North Carolina Department of PUBLIC INSTRUCTION

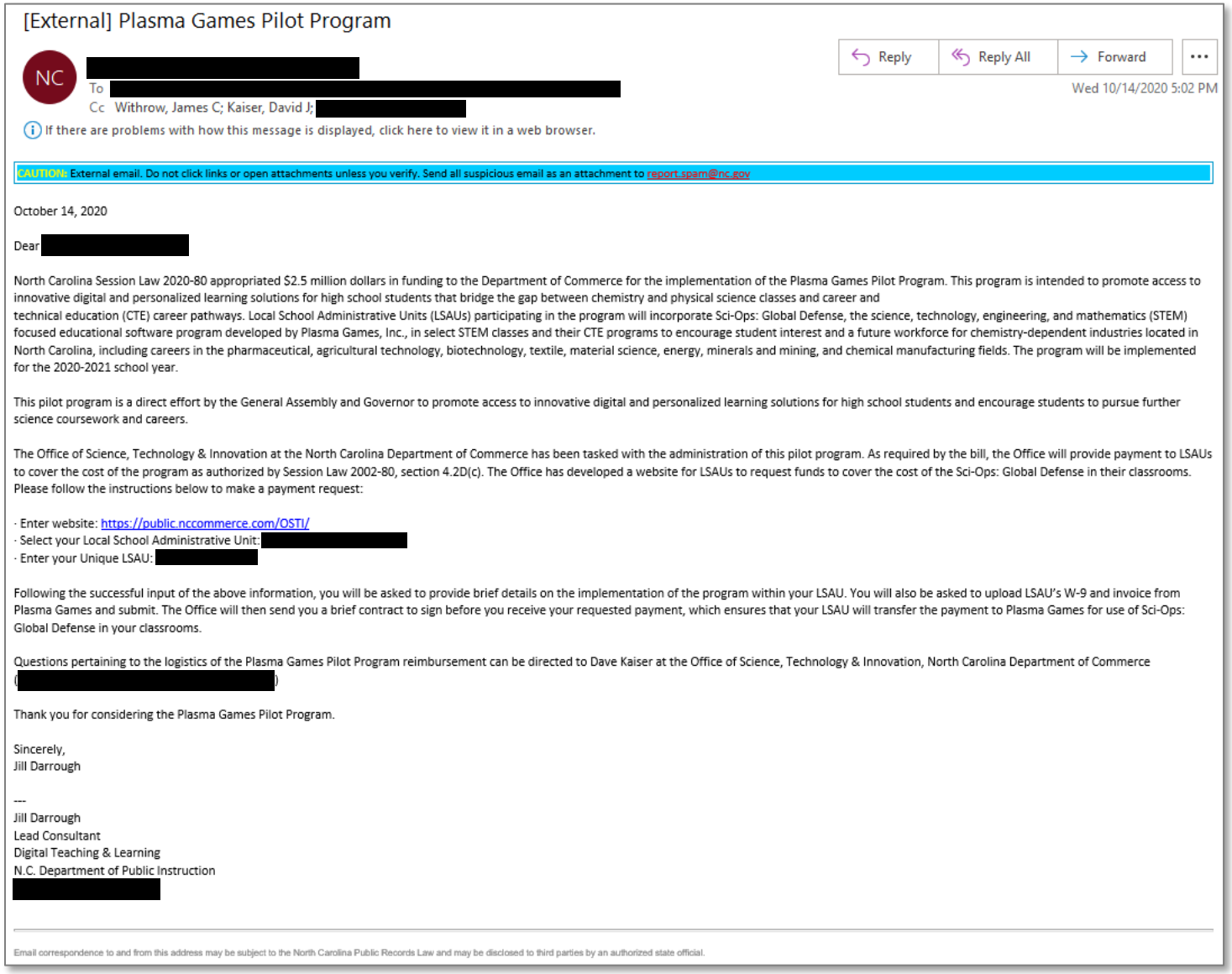
Stay Connected with North Carolina Public Schools:

SUBSCRIBER SERVICES:
Manage Subscriptions | Unsubscribe from All Topics | Help

This email was sent to [redacted] using GovDelivery Communications Cloud on behalf of: North Carolina Public Schools · 301 N. Wilmington St. · Raleigh, NC 27601

GOVDELIVERY

Appendix C: Plasma Games Pilot Program Submission Email



[External] Plasma Games Pilot Program

NC [redacted]

To [redacted]

Cc Withrow, James C; Kaiser, David J; [redacted]

Reply | Reply All | Forward | ...

Wed 10/14/2020 5:02 PM

If there are problems with how this message is displayed, click here to view it in a web browser.

CAUTION: External email. Do not click links or open attachments unless you verify. Send all suspicious email as an attachment to report.spam@nc.gov

October 14, 2020

Dear [redacted]

North Carolina Session Law 2020-80 appropriated $2.5 million dollars in funding to the Department of Commerce for the implementation of the Plasma Games Pilot Program. This program is intended to promote access to innovative digital and personalized learning solutions for high school students that bridge the gap between chemistry and physical science classes and career and technical education (CTE) career pathways. Local School Administrative Units (LSAUs) participating in the program will incorporate Sci-Ops: Global Defense, the science, technology, engineering, and mathematics (STEM) focused educational software program developed by Plasma Games, Inc., in select STEM classes and their CTE programs to encourage student interest and a future workforce for chemistry-dependent industries located in North Carolina, including careers in the pharmaceutical, agricultural technology, biotechnology, textile, material science, energy, minerals and mining, and chemical manufacturing fields. The program will be implemented for the 2020-2021 school year.

This pilot program is a direct effort by the General Assembly and Governor to promote access to innovative digital and personalized learning solutions for high school students and encourage students to pursue further science coursework and careers.

The Office of Science, Technology & Innovation at the North Carolina Department of Commerce has been tasked with the administration of this pilot program. As required by the bill, the Office will provide payment to LSAUs to cover the cost of the program as authorized by Session Law 2002-80, section 4.2D(c). The Office has developed a website for LSAUs to request funds to cover the cost of the Sci-Ops: Global Defense in their classrooms. Please follow the instructions below to make a payment request:

· Enter website: https://public.nccommerce.com/OSTI/
· Select your Local School Administrative Unit: [redacted]
· Enter your Unique LSAU: [redacted]

Following the successful input of the above information, you will be asked to provide brief details on the implementation of the program within your LSAU. You will also be asked to upload LSAU's W-9 and invoice from Plasma Games and submit. The Office will then send you a brief contract to sign before you receive your requested payment, which ensures that your LSAU will transfer the payment to Plasma Games for use of Sci-Ops: Global Defense in your classrooms.

Questions pertaining to the logistics of the Plasma Games Pilot Program reimbursement can be directed to Dave Kaiser at the Office of Science, Technology & Innovation, North Carolina Department of Commerce ([redacted])

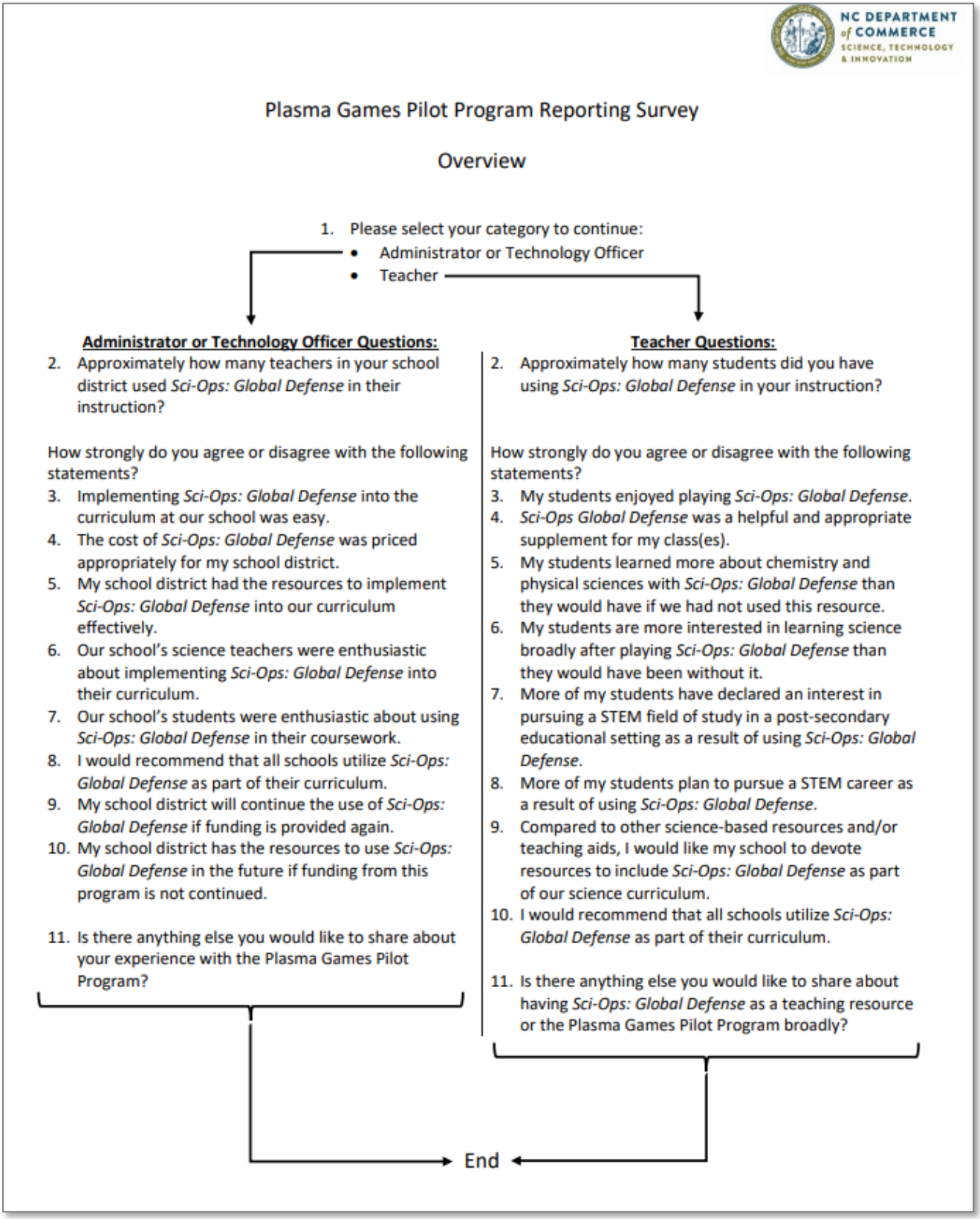
Thank you for considering the Plasma Games Pilot Program.

Sincerely,
Jill Darrough

Jill Darrough
Lead Consultant
Digital Teaching & Learning
N.C. Department of Public Instruction
[redacted]

Email correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties by an authorized state official.

Appendix D: Plasma Games Pilot Program Reporting Survey Overview



NC DEPARTMENT of COMMERCE
SCIENCE, TECHNOLOGY & INNOVATION

Plasma Games Pilot Program Reporting Survey

Overview

1. Please select your category to continue:
   - Administrator or Technology Officer
   - Teacher

Administrator or Technology Officer Questions:

2. Approximately how many teachers in your school district used *Sci-Ops: Global Defense* in their instruction?

How strongly do you agree or disagree with the following statements?

3. Implementing *Sci-Ops: Global Defense* into the curriculum at our school was easy.
4. The cost of *Sci-Ops: Global Defense* was priced appropriately for my school district.
5. My school district had the resources to implement *Sci-Ops: Global Defense* into our curriculum effectively.
6. Our school's science teachers were enthusiastic about implementing *Sci-Ops: Global Defense* into their curriculum.
7. Our school's students were enthusiastic about using *Sci-Ops: Global Defense* in their coursework.
8. I would recommend that all schools utilize *Sci-Ops: Global Defense* as part of their curriculum.
9. My school district will continue the use of *Sci-Ops: Global Defense* if funding is provided again.
10. My school district has the resources to use *Sci-Ops: Global Defense* in the future if funding from this program is not continued.

11. Is there anything else you would like to share about your experience with the Plasma Games Pilot Program?

Teacher Questions:

2. Approximately how many students did you have using *Sci-Ops: Global Defense* in your instruction?

How strongly do you agree or disagree with the following statements?

3. My students enjoyed playing *Sci-Ops: Global Defense*.
4. *Sci-Ops Global Defense* was a helpful and appropriate supplement for my class(es).
5. My students learned more about chemistry and physical sciences with *Sci-Ops: Global Defense* than they would have if we had not used this resource.
6. My students are more interested in learning science broadly after playing *Sci-Ops: Global Defense* than they would have been without it.
7. More of my students have declared an interest in pursuing a STEM field of study in a post-secondary educational setting as a result of using *Sci-Ops: Global Defense*.
8. More of my students plan to pursue a STEM career as a result of using *Sci-Ops: Global Defense*.
9. Compared to other science-based resources and/or teaching aids, I would like my school to devote resources to include *Sci-Ops: Global Defense* as part of our science curriculum.
10. I would recommend that all schools utilize *Sci-Ops: Global Defense* as part of their curriculum.

11. Is there anything else you would like to share about having *Sci-Ops: Global Defense* as a teaching resource or the Plasma Games Pilot Program broadly?

End

Appendix E: Comments Collected in 'Administrator or Technology Officer' Surveys

Survey prompt: Is there anything else you would like to share about your experience with the Plasma Games Pilot Program?

- "The teachers felt this program engaged students in content that was different than some of the other programs available to science teachers. Thanks for this opportunity."

- "This year was challenging to host the pilot - many teachers sought out to use this resource at the beginning of the year and into the second semester, but with changing timelines and barriers in schedules, the use of Plasma Games at the high school level varied. It was very helpful that Plasma Games provided teacher support through webinars and a bank of teacher and student resources to be used alongside the game play. Our teachers used these supplemental resources where it best fit into their curriculum alongside game play but could use more support from Plasma Games for how to implement them into intentional lesson design at the high school level. It would be nice to be able to expand this pilot to the middle school level if possible next year. Thank you!"

- "Customer support from the Plasma Games staff was wonderful."

- "Alignment issues to the current NCESS. Many teachers have found it difficult to align the program to the standards. We as a district are still waiting for the aligned correlation document that aligns Plasma Games activities to our state required science standards."

- "With more work, this resource may be of better quality for use with students. It currently has one game for all students to use. The many levels students have to go through and the time it takes does not justify the amount of time spent using the resource."

- "Participating in the Plasma Games Pilot Program has been a positive experience in our district. This year has been a challenging one and having resources to help support our teachers as they work to improve student learning outcomes has been welcomed by the content that was included in this program."

- "I am new to the Instructional Coach role. I have had brief conversations with our Science teachers about Plasma Games but have not personally seen it."

- "My teachers expressed to me that they thought that Plasma Games would be an effective tool in their classrooms. Due to the upheaval created by Covid 19, they did not all feel that they were able to implement like they would have in a normal year."

- "It was more appropriate for middle school students based on teacher and student usage."

- "Our teachers had a huge learning curve this year with the shift to virtual instruction. As such, many of our high school teachers did not feel they had the capacity to learn a new instructional tool. Our middle school teachers were much more enthusiastic about using this platform and I feel there would have been more accurate survey data if middle school teachers were included in the survey."

- “Thought this was an excellent opportunity for our students.”
- “Overwhelmingly positive feedback from teachers and students.”
- “Short turnaround time from Jan - March to answer this survey.”
- “Hunter Moore was responsive to my questions. I believe the program has value and can be of benefit to students. However, I think teachers were inundated with "free" resources during the pandemic and they did not take the time to see how Sci-Ops: Global Defense could be leveraged in their classrooms. I would like to see this pilot extended into next school year - this would provide my district team time to develop scenarios for weaving Sci-Ops into daily instruction.”
- “Thank you for making this resource available to our teachers and students.”

Note: Some participants did not leave a response to this question.

Appendix F: Comments Collected in 'Teacher' Surveys

Survey prompt: Is there anything else you would like to share about having *Sci-Ops: Global Defense* as a teaching resource or your experience with the Plasma Games Pilot Program broadly?

- "I was teaching 100% remotely, so student participation varied."
- "I used the resources that were attached to the game more than the actual game itself.... the game in its current state of development showed its potential to be a great tool but was a bit slow-paced for many of my students to "stick" with it for the length of the curriculum. They suggested that it would have been more fun if there was a multi-player or role-player component to the game - some wanted to be the aliens and some wanted to be the scientist.... the best discussions were about the tools that you gained in the laboratory and how those could be made better."
- "The Pilot program has had some hiccups with logging in and accounts not working. Things have seemed to smooth out, but it has been back and forth. I have REALLY appreciated the Teacher Resources and Units for ideas using STEM while teaching Chemistry. It is a great tool. Not knowing pricing details, there are some limitations to the actual game itself, with the unfinished levels and such. It is hard for me to recommend my district paying for an incomplete product. If it was set up a little differently, like it didn't look unfinished in the game play I would probably feel differently. If Zones 2, 3, and 4 were added later, excellent, but don't make me think I'm paying for an incomplete game."
- "Students enjoy this resource."
- "This was a good part of the curriculum."
- "The game is "cute", but the instruction value is not worth the time students must devote. I can see the money spent in much better ways with other resources. Personally, my students did not really enjoy the game itself. Many of my girls are not "gamers" and thought it a little stupid."
- "Thank you for the opportunity to have this resource."
- "This was too elementary looking for my high school students."
- "My students are older (and all girls) only two of my seven students like video games. Their comments did not leave me with the impression of them being impressed with the games."
- "No, it was good and very exciting."
- "I really liked doing Sci-Ops myself, too!"
- "Please add environmental settings and scenarios."
- "I used Plasma Games in my Honors Chemistry and regular Chemistry courses. In particular, male students who are gamers at home learned more from Plasma Games than my female

students. In particular, spring semester 2021, my regular chemistry students thoroughly enjoyed Plasma Games, probably partly because I finished the challenge myself during the fall semester 2020, learned the laboratory resources, figured out how to sequence the challenges as quizzes, and realized the supplemental material and lessons I needed to use before attacking a challenge."

- "It is a good supplemental resource."

- "You are doing a great job. Keep aligning the high school content with the pacing guide."

- "The material goes far too deep for Physical Science, into topics not covered in the Phys Sci. curriculum. It would be appropriate for Honors Physical Science or for Chemistry. Students who do not like video games do not care for it. Students who do enjoy it."

- "Students found it "braindead"; "boring"; "stupid". There are MANY more sites to use. Students are very savvy these days with regards to "video games", and this was extremely low level for high school."

- "All I see is what level they are on and how long they have spent playing the game. There is no break down by level of the content they have been exposed to. Personally, I hate playing the game. I've noticed no difference in student knowledge or understanding as a result of students playing the game."

- "At the High School level in Physical Science, my students were not interested. They complained that it did not feel like they could lose. Even on higher difficulties. They thought it was an interesting concept and could work but compared to the games they normally play it was not interesting nor did it seem to do what it was intended to do."

- "This is an awesome resource to have. It is a fun way to learn about chemistry and physical science."

- "I am not a gamer myself, so I didn't really like it. The other physical science teacher is a gamer and he was really excited I about it. Some of my students were the same way. I was more worried about moving the characters than the content - again I am not a gamer. I noticed the girls were more like me and boys were more interested."

- "The story and animation of the game was juvenile in comparison to other games students would play normally."

- "Honestly with the way that the school year was this year, I had very time to work with this program. I would like to try this program next year when hopefully things will return to normal, that way I can truly answers the questions above."

- "It was clunky and hard to use. The students did not like it. I quit using it after 2-3 sessions."

- "I did not find it useful."

- “The students say it is hard to play, I'm not a gamer and it is hard for me to lead the students, especially hybrid. I like the worksheets/resources to use with Canvas or as a comprehension check.”

- “Not worth it. Glad it was free.”

- “The game was clunky and difficult to use. My students spent most of the time trying to figure out how to destroy the bad guys. They learned nothing. I did use some of the extension activities that were relevant to my curriculum.”

- “Students seemed to enjoy playing.”

- “My students were not impressed.”

- “As a teacher I found it difficult to understand the game and how it applied to the chemistry unit.”

- “I found the game difficult to understand. As the teacher I could not understand it to explain it to the students.”

- “The game site had difficulty loading or was often very slow at loading.”

- “Non-game issues were the biggest barrier. As a teacher, I was not able to adequately teach in virtual environment. I failed to correctly launch the program for my students.”

- “I really liked the student activities. “

- “I and my students thought it was pretty neat. I wished there had been more resources available like the Armor Manual when I taught Chemistry last semester. The folks at Plasma Games have indicated that more resources like that have been added, so I'd love to try them with next Fall's chemistry classes.”

- “Not well organized. Teachers cannot assign portions of the game. Must assign game all at once. Would love to have a crosswalk document ties to the NCSCOS with each available resource tied to the standards. Not aligned.”

- “The program is not aligned with the NC Essential Standards. As a teacher, it would be beneficial to have a guide on how to use each level and resources associated with the levels. It is to[o] much of a seek and find platform. Unorganized.”

- “It is very difficult to get students logged in for the first time. If we could go through [C]lever or just log in with [G]oogle it would be much easier.”

- “I would like to see more feedback on what the students are doing regarding stars achieved, etc.”

- “This resource is geared heavily to Chemistry and is too advanced for Physical Science students.”

- “It is a great supplement that not only meets many students where they are in the video game world but is very explicit about STEM careers.”

- “I believe that the gaming component would be better suited for younger learners. My high school’s students were not really interested in the game mainly due to the lag. However, they did benefit from the worksheets. Also, as a teacher, I found their digital worksheets and materials extremely helpful, colorful, and direct. Perfect for instruction!”

- “Building up the Unit resource and making the game more able to be tailored to specific units would help me integrate this resource into day-to-day curriculum. As it is, I could only use it as a review sporadically.”

- “I think that if we had access to more game playing data than just total time and levels achieved it would be more useful than it already is. I feel a little "in the dark" after releasing students into a session and not really being able to see them. A multiplayer competition element to the game would also be very useful. To address my need for more accountability I plan on developing a video base assignment which would involve students doing a screen recording of some of their game play and a learning reflection.”

- “I am very glad my students got to be part of this work. They are excited to play and have learned the science. it is a great game. What I also love is the tech support. My students have the ownership to report their own bugs with the game and the tech support staff are amazing at getting back with them and with me when issues arise. It is a GREAT model.”

- “It was helpful to have it as a resource during the pandemic. using Sci-ops would look different during a time when more students are on campus.”

- “Students said more game than instruction.”

- “Plasma Games has engaged my students where I cannot currently with other simulations. There is nothing out there for students like this video game. Plasma Games give my students the confidence to get through a chemistry assignment with a challenge they are comfortable with while also teaching them how chemistry knowledge can be used to create things they are interested in. I've used it for the past three years and the company is only getting better with the content they are creating for teachers. My students are engaging with the program more and more every year.”

- “I thought it was a good resource and my students liked playing it.”

- “It is very frustrating for me and my students.”

- “It would be good if I as a teacher could pull data that shows how long (time spent) and how often (date) a student utilized Plasma Games so I could give them credit for playing the game on a regular basis.”

- “It was difficult to incorporate the game into my pacing because my sequencing was a little different than the games. And it required the students to have already learned somethings that I

had not covered yet. The game did get some good feedback from some of the students who did explore with my incorporation."

- "I need to play with it more over the summer."
- "I am happy we have access to it. It improves the quality of teaching and learning."
- "This is an awesome resource that my students really enjoyed!!! Really helped as an amazing extension tool this semester and will be used even more next year."
- "The game was an excellent supplement to our chemistry curriculum."
- "Being able to change the order of some of the topics in levels in order to follow what I am teaching."
- "At AG we mostly used Sci-Ops as a supplement to what we were teaching. Had students beat levels then summarize lab settings to observe the science behind the game."
- "I wish that you program would cover more subject area that could correlated better with all subject units."
- "This was an excellent and fresh take on gaming in Science. I love this resource!"
- "You need a mouse to use the game on IPADs."
- "It is a really helpful program that I enjoyed AND my students enjoyed."
- "It was hard to get my student motivated to play this game."
- "I had a hard time getting my students to actually play the game, even when I assigned it. Also, there are not many teacher resources to choose from so I can only really use Plasma games in a few units."
- "For higher level courses, it is limited in how much it can be used. We cover the topics for chemistry within a 2-3 week span, so the time students can really utilize the game is short. Could see more integration of additional concepts included."
- "Just note that teachers need flexibility in teaching with Sci-Ops. The order of content did not match the district pacing guide at all because it is a more integrated approach to chemistry instead of what is traditionally taught. Also, for physical science, do not expect teachers to use it for the whole course. Sci-Ops does not cover the physics-based standards of physical science (only partly with waves, but no forces, motion, circuits, magnetism, energy, machines, momentum, etc.)"
- "I realize it was a new game, but I had student "beat" the levels and then the[y] went back and did them again. So there needs to be more resources and levels to the game."

- “The game was very engaging for my students.”

- “I believe this is a good resource. I think it would be good if it could be provided at no cost to schools. More specific PD should be devoted to how to include it in lessons.”

- “The additional teacher resources for activities were really helpful.”

- “The quality of the graphics is incredible, young people are very picky about this and it can be a deal breaker when attempting to engage youth, plasma games is on par or above all their games they play.”

- “My absolute favorite part is the resources that come with unit. The students have enjoyed the comics and graphic organizer that come with the game.”

- “It has been so nice to meet my student where their interests are! Bringing curriculum and fun together! I love how lessons and material for teacher use is available. It materials are very good and useful! Love it.”

- “I wish the Wake County Public Schools had used these funds for PIVOT.”

- “Our chemistry unit is not until quarter 4. I have introduced my students to this resource but plan to use it more during quarter 4.”

- “Thank you for the opportunity. We plan to continue to use in Quarter 4 during Force & Motion unit.”

- “I wish that there was more content available. Sci-Ops was a lot of fun for my students but was really only aligned to one unit that we covered. I'd love to see the topics expanded.”

- “I will know much more about the effectiveness of the program AFTER we work through the physics unit during 4th quarter.”

- “I REALLY cannot tell yet if the program is the excellent support, I hope it is until we teach physics in 4th quarter! I have had students engage with the program and some played all the way through just for the sake of playing a video game(boys). I had some play and enjoy what they could do in the game (boys & girls). Only a few played but did not enjoy it much or complained that it was slow to load on their old devices. I even had requests from younger siblings to be able to play once they saw what their older brother/sister was doing! Overall - it's a nice resource. Is it the bang for the buck we are looking for? I won't know until we apply some physics lessons to their background knowledge as they play during the next quarter of school.”

- “I sincerely hope that they can develop more resources similar to Sci-Ops: Global Defense that focus on other science strands.”

- “My honors and AP level Chemistry students were very frustrated with the game. They felt it was a waste of time for them and they got very little learning out of it.”

- “I like the gamification of the topic, but I worry it may almost be too gamified. Students focused more on the gameplay than the overall lesson.”

Note: Some participants did not leave a response to this question.

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