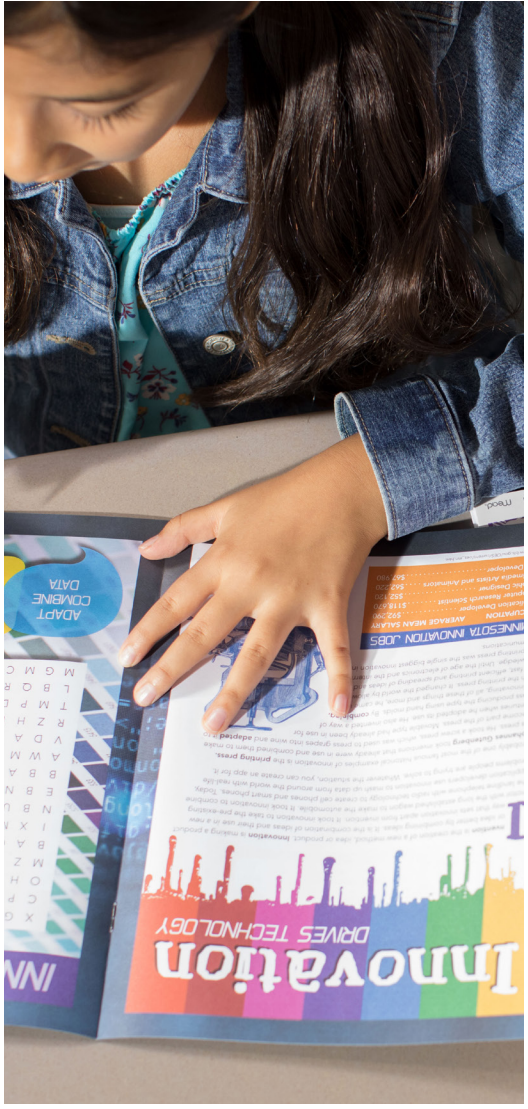






TEACHERS CALL FOR DIGITAL GAMES THAT HIGHLIGHT STEM SUBJECTS:

A Professional Educators Network Survey (Part 1)

Everything Connects with NTC®

Since 1978, NTC has brought dynamic educational programs to thousands of schools each year, presenting on important topics including STEM subjects and careers. Over the decades we've witnessed the formation of a national community of passionate educators, dedicated to providing their students with impactful educational resources. This is how NTC's Professional Educators Network (PEN) was born in 2014. Since then, we've utilized PEN to communicate with and solicit feedback from educators across the country – most recently with our PEN survey on the use of digital games in the classroom.

One of the fastest-growing educational breakthroughs in K-12 schools today is the use of digital games in the classroom. Recently, NTC surveyed the nearly 7,000 members of our Professional Educators Network (PEN) in order to greater understand the positive impacts of digital games on students and teachers.

While similar surveys have explored the benefits and implementation of digital games, NTC's PEN survey is one of the first to focus exclusively on the K-12 classroom teachers who have firsthand experience. The survey's 282 respondents come from rural, suburban and urban areas all across the country, representing both public and private schools in a variety of socioeconomic environments, ensuring an array of diverse perspectives. Read on to discover the results of our PEN survey on digital games and learn how teaching STEM through this innovative format can lead to breakthroughs for students, teachers and STEM organizations.

What's in a game?

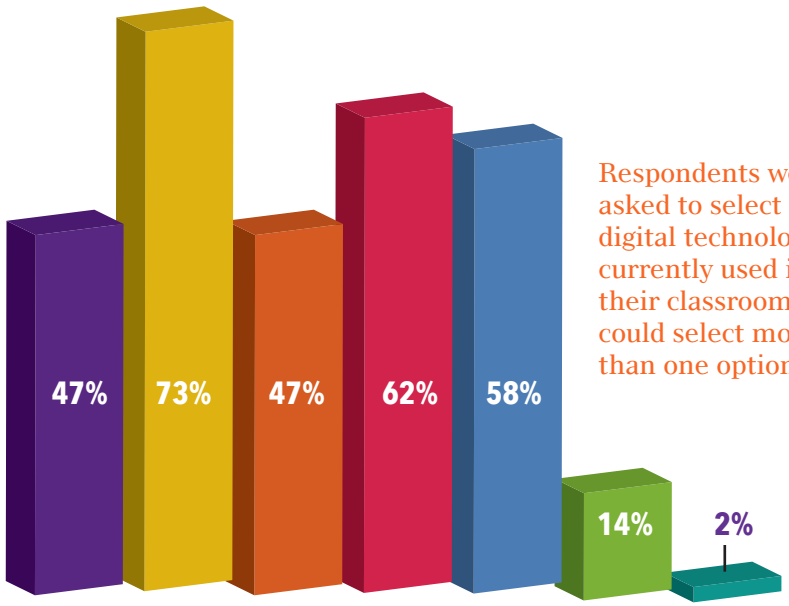
First and foremost, it was important for us to define exactly what we meant by "educational digital games." With the wealth of digital media and technologies now readily available, such definitions can change from one individual to the next, and can yield differing interpretations.

Our survey focused not on apps in general – which can take on many different forms, only some of which utilize game-based learning – but on educational digital games specifically. According to *eLearning Industry*, educational digital gaming "involves the use of computer and video games specifically aimed to produce learning outcomes. It is designed to balance subject matter and gameplay, and later assesses the ability of the learner to retain and apply the acquired knowledge to real-world scenarios."[1] This was the definition we used as a foundation to understanding the future of digital games in K-12 education.

Over the last several years, a great deal of research has extolled the use of digital games as the newest revolution in education. A 2015 report from the University of Michigan investigated how digital learning can enhance the educational experience for students as well as teachers, increasing the capacity for formative learning and follow-up assessment.[2] Similarly, the website Edutopia claims that "game-based learning has the potential to break up a dull routine, infuse your classroom with energy, and generate student interest."[3] In short, concludes the website Inside Higher Ed, "games offer active learning that some instructors say is hard to replicate in a traditional classroom."[4]

Teachers told us

For the most part, educators' responses to our PEN survey corroborated these claims, making it clear that digital games are being used more frequently in classrooms and that that trend is only likely to increase. A whopping 98% of educators reported that they already use at least one kind of digital technology in the classroom, most prominently laptop computers (73%), a computer hooked up to a projector (62%) and smartboards (58%). Only 2% of respondents claimed that they use no kind of digital technology whatsoever. See Figure 1.



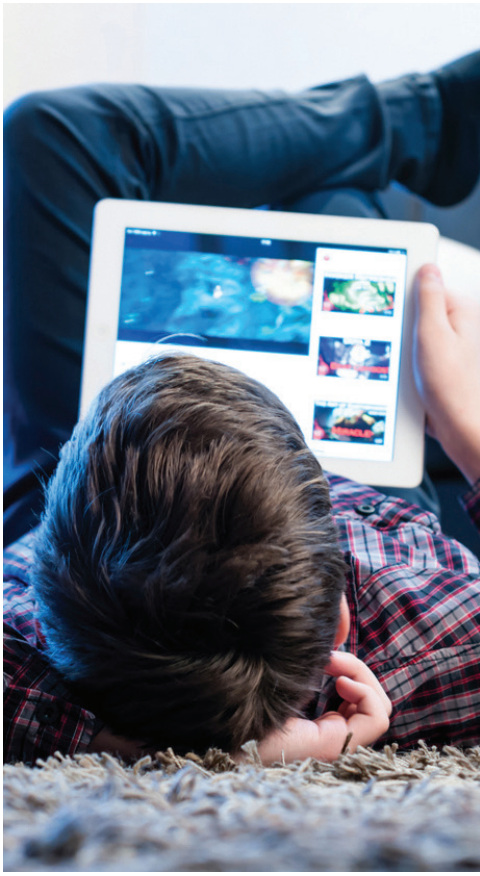
Respondents were asked to select all digital technologies currently used in their classroom, and could select more than one option.

FIGURE 1 WHAT KIND OF DIGITAL TECHNOLOGIES DO YOU USE IN YOUR CLASSROOM?

- Tablets **47%**
- Laptops **73%**
- Desktop computers **47%**
- Computer w/ projector **62%**
- Smartboards **58%**
- Smartphones **14%**
- I don't use digital technologies in the classroom **2%**

Given the variety of digital technologies now available for classroom use, it has become increasingly clear that educational digital games need to be compatible across a number of different platforms, and that developers as well as vendors should prioritize ease of use no matter what technology is being deployed.

Insight: **98% of educators already use some kind of digital technology in the classroom. In addition, 87% of respondents currently use educational digital games as part of their curriculum, with that trend expected to increase over the next few school years.**



Insight: **Given the variety of digital technologies now available in the classroom, it is important for developers and vendors of educational digital games to prioritize ease of use across numerous platforms (laptops, tablets, smartphones, etc.).**

Games on the rise

Beyond simply utilizing digital technologies in the classroom, a large number of educators currently use digital games as a major part of their curriculum, with 87% of respondents claiming that they currently use digital games for classroom learning. Furthermore, educators overwhelmingly indicated that they will continue to prioritize the use of digital games in the classroom: 51% of respondents plan on using digital games approximately the same amount in the upcoming school year, while 39% intend to use them more frequently. Only 8% of educators who currently use digital games in the classroom expect to use them less frequently in the upcoming school year. See Figures 2 and 3.

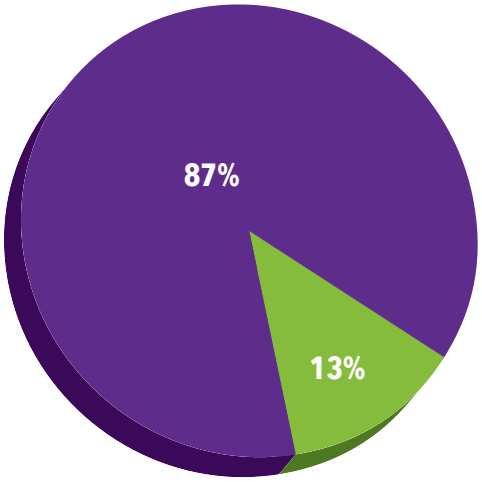


FIGURE 2 DO YOU CURRENTLY USE DIGITAL GAMES FOR CLASSROOM LEARNING?

- Yes **87%**
- No **13%**

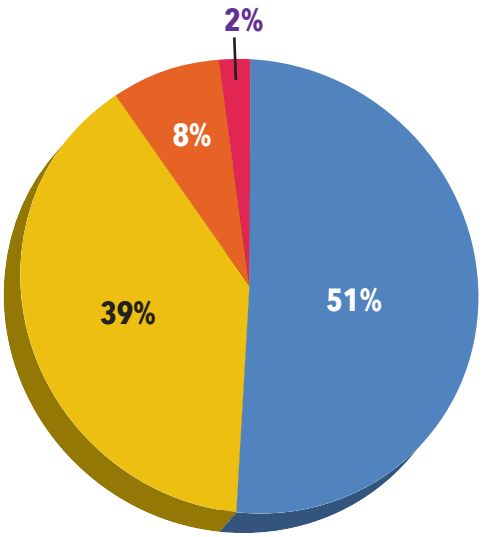


FIGURE 3 HOW MUCH TIME WILL YOU DEVOTE TO DIGITAL GAMES IN THE UPCOMING SCHOOL YEAR?

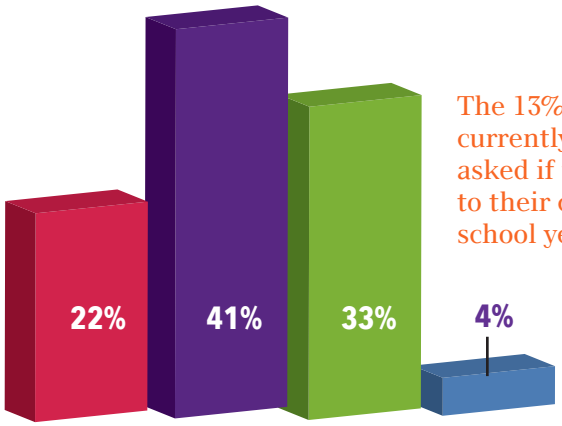
- The same as in previous years **51%**
- More than in previous years **39%**
- Less than in previous years **8%**
- None at all **2%**



Insight: **87% of K-12 educators already use digital games for classroom learning. Furthermore, 90% of educators plan on using digital games the same amount or more frequently in upcoming school years, suggesting that digital games will be regularly used by teachers if they are made available.**



Clearly, the majority of educators who currently employ digital games in the classroom plan on continuing that trend. What's interesting is that among the 13% of educators who currently *do not* use digital games in the classroom, many plan on adding them to their curriculum in the upcoming school year. Specifically, 67% of educators who don't currently use digital games intend to use them next year: 22% will feature them regularly in their lesson plans, 41% plan on using them sporadically and 4% intend to use them as a reward to incentivize students. See Figure 4.



The 13% of respondents who do not currently utilize digital games were asked if they plan on adding them to their curriculum in upcoming school years.

FIGURE 4 IF YOU DON'T CURRENTLY USE DIGITAL GAMES, DO YOU PLAN ON ADDING THEM IN THE NEXT FEW SCHOOL YEARS?

- Yes, I plan to make them a regular part of my lesson plans **22%**
- Yes, on certain occasions **41%**
- Yes, but only as a reward for students **33%**
- No **4%**

This suggests that many educators who do not currently use digital games would have an interest in incorporating them into their curriculum if they were provided to them. Their primary reason for avoiding digital games, then, may not be because of an aversion to digital learning, but rather because of lack of access or prohibitive costs.

Insight: **Of those educators not currently using digital games in the classroom, 67% intend to add them to their curriculum in the next few school years, indicating that the rise of educational digital games will only continue to gain steam.**

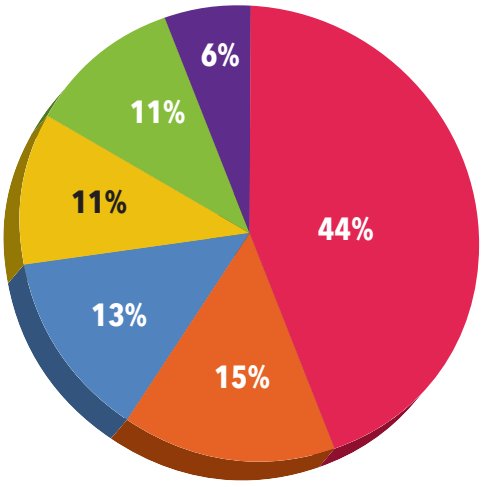


Why use digital games to teach STEM?

The data from our PEN survey confirms that educational digital games have become a major resource in K-12 learning, and that that trend will only continue to increase. But it remains to be seen *why* digital games are so powerful at engaging students who might otherwise have little interest in subjects such as STEM industries and careers.

While the specific benefits of educational digital games have been extensively researched and discussed, we turned to the K-12 educators that make up PEN and asked them to rank the positive aspects of digital games from their own perspective. Among the numerous benefits that respondents cited, one stood out as the most prevalent. Nearly half of the educators polled (44%) said that digital games' ability to appeal to a wide variety of learning types – including those "right-brained" students who respond emotionally, rather than through logic or analysis – is the most important benefit of using digital games in the classroom.

The other educational benefits of digital games were voted for almost evenly, with the second and third place responses receiving 15% and 13% of the top-ranking votes, respectively. See Figure 5.

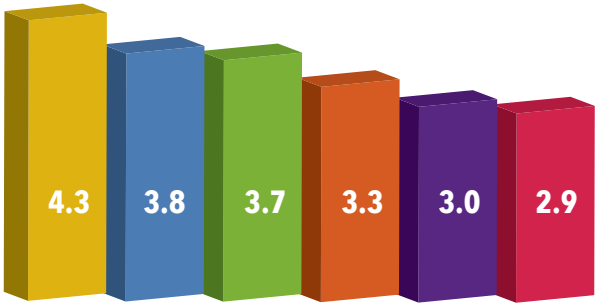


Educators were asked to rank the most important benefits of using digital games in the classroom; this data indicates the percentage of top-ranking votes each benefit received.

FIGURE 5 WHAT IS THE MOST IMPORTANT EDUCATIONAL BENEFIT OF USING DIGITAL GAMES IN THE CLASSROOM?

- They appeal to a wide variety of learning types. **44%**
- They not only teach students, but require them to apply that knowledge in a productive way. **15%**
- They incorporate a narrative that calls for players to engage with another world, place or time. **13%**
- They encourage students to cooperate in order to solve problems. **11%**
- They bring students into a world of situations to which they can relate. **11%**
- They ask students to address circumstances that call upon their social-emotional skills to solve problems. **6%**

Interpreted differently, the data yields similar insights: When the average ranking for each educational benefit is calculated, the ability for digital games to appeal to a wide variety of learning types is still in first place, with educators ranking it a 4.3 out of 6. Other educational benefits ranked at a mostly consistent level, whether analyzed based on percentage of top-ranking votes or average ranking (with some minor variations). See Figure 6.



Educators were asked to rank the benefits of digital games, on a scale of 1 (the least educational) to 6 (the most educational). This data indicates each benefit's average ranking.

FIGURE 6 RANK THE MOST IMPORTANT BENEFITS OF USING EDUCATIONAL DIGITAL GAMES IN THE CLASSROOM.

- They appeal to a wide variety of learning types. **4.3**
- They not only teach students, but require them to apply that knowledge in a productive way. **3.8**
- They encourage students to cooperate in order to solve problems. **3.7**
- They bring students into a world of situations to which they can relate. **3.3**
- They ask students to address circumstances that call upon their social-emotional skills to solve problems. **3.0**
- They incorporate a narrative that calls for players to engage with another world, place or time. **2.9**

Whether analyzed according to the percentage of top-ranking votes or the average ranking on a scale of 1 to 6, the data indicates that all positive aspects of digital games received a portion of the votes. Even the lowest-ranking educational benefit had an average score of 2.9 out of 6, suggesting that some educators still viewed this as a relatively important asset. In other words, there are numerous reasons to employ educational digital games in the classroom, and all of them were cited as having a positive impact on students.

This conclusion is also supported by teachers' written responses to our survey, which expressed interest in using digital games to educate students about a variety of real-life skills. A sampling of teacher comments can be found to the right.

Insight: **Teachers believe there are a wide variety of educational benefits to digital games, with their ability to appeal to many different learning types commonly seen as the most impactful.**



I would love to have more digital games that support the skills that my students need to learn.

– 4th Grade Teacher, Wright City, OK

I would love to see something [where] they can interact with each other in the classroom while playing.

– 4th Grade Teacher, Plains, PA

I think this sounds like a great idea! They have responded well in the past to games that let them earn points/coins that they get to spend on virtual things like designing a house, etc.

– 5th Grade Teacher, Reading, OH

Scenario based instruction is very useful… This will make the scenario much more real and applicable to my students' lives.

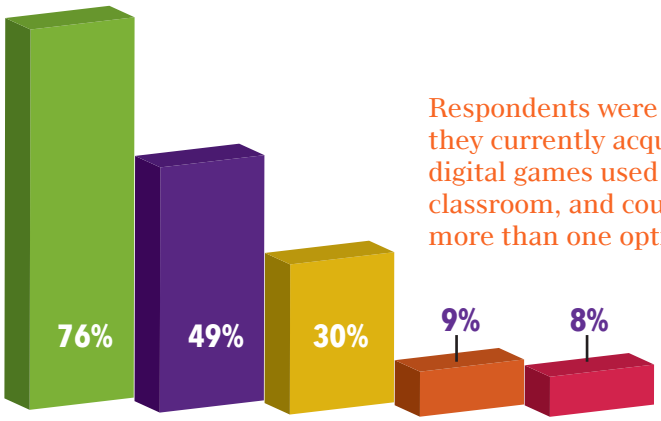
– 5th Grade Teacher, Bedford, IN



How do digital games get into classrooms?

We've seen that the overall trend of using digital games in the classroom continues to accelerate, and that there are many reasons why they make such a powerful impact on students and teachers. But how exactly can such digital resources be provided to schools, which in many cases have limited school and community budgets to work with?

The vast majority of teachers – 76% – only use digital games that they don't have to pay for, which is understandable given the financial constraints on most classrooms in the country. In some cases, these games are provided by the school itself (this was true for 49% of our respondents); by a PTA/PTO organization (9%); or by an outside source, such as a community fund or private company (8%). A sizable number of educators (30%) provide digital games themselves, but we believe this is an unsustainable model because teachers are struggling with limited funds, and over time this will dissuade a large number of educators from using digital games when they might otherwise embrace them. See Figure 7.



Respondents were asked how they currently acquire the digital games used in their classroom, and could select more than one option.

FIGURE 7 HOW DO YOU ACQUIRE THE DIGITAL GAMES THAT YOU USE IN THE CLASSROOM?

- I only use free digital games. **76%**
- My school pays for them. **49%**
- I provide them personally. **30%**
- They are provided by our PTA/PTO. **9%**
- They are provided by an outside source, such as a community fund or private company. **8%**

Insight: **If organizations deliver STEM-related educational digital games free of charge to schools, they will be used by teachers who have a high demand for them.**



The importance of providing free digital games to schools becomes even more apparent when considering the reasons why educators don't currently use them. We asked the 13% of educators who currently do not use digital games why they don't employ them in the classroom. While a number of reasons were provided, including limited class time (11%) and the inability to find useful or age-appropriate digital games (20%), about half of the respondents (51%) explained that they do not use educational digital games because their school does not provide them. As mentioned earlier, two-thirds of educators who don't currently use digital games claim that they would do so if they were made available, which makes their lack of access to free digital resources all the more significant.

Deep dive: How community wealth makes an impact

A deeper look at educators' use of digital games based on the area wealth status of the schools in which they teach reveals even greater insights.[5] While the general trends remain consistent regardless of schools' area wealth, some major differences arise when analyzing how educators in those schools acquire digital games.

While 70% of educators in high-wealth area schools only use free digital games in the classroom, an even higher number of educators in low-wealth area schools – 79% – only use free digital games. Similarly, while 37% of educators in high-wealth area schools are able to pay for digital games themselves, only 25% of educators in low-wealth schools are able to pay for the digital games that they use in the classroom (likely for a number of financial reasons outside the scope of this report).

The digital games utilized by educators in high-wealth area schools are provided by the schools themselves 44% of the time, with the PTA or PTO providing games a comparatively high 15% of the time. In only 7% of high-wealth area schools, digital games are provided by an outside source, such as a community fund or private organization.

Conversely, in schools in lower-wealth areas, educators rely on the schools themselves to provide educational games 54% of the time. The PTA/PTO in these communities is usually not in a position to provide no-cost educational games (only 2% of the time), though outside sources such as community funds or private organizations do provide digital games to low-wealth area schools in 12% of instances – higher than in areas of greater wealth. See Figure 8 on following page.



Insight: **PTA boards and individual teachers in low-wealth areas are rarely able to provide digital games for their classrooms, leaving it to the schools themselves and outside organizations to make them available.**

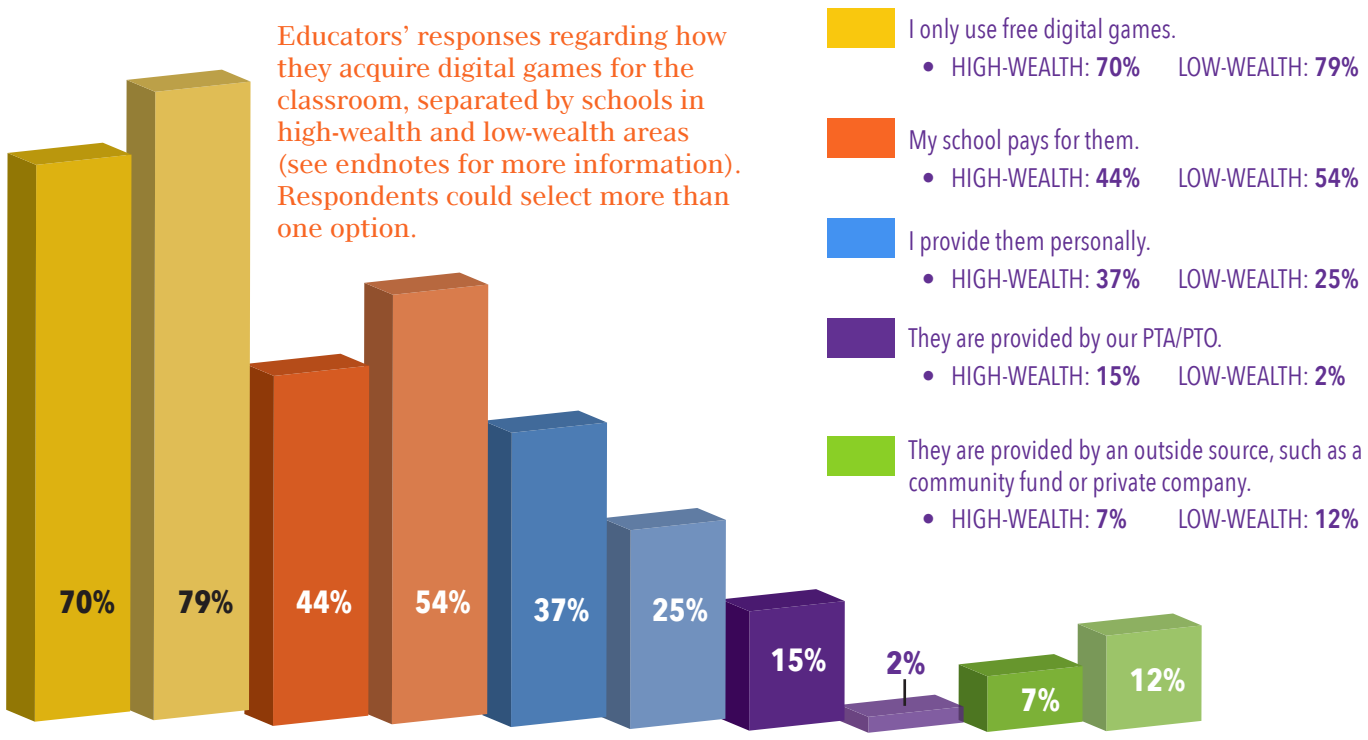


FIGURE 8 HOW ARE DIGITAL GAMES PROVIDED TO SCHOOLS IN HIGH-WEALTH AND LOW-WEALTH AREAS?

The discrepancies in how high-wealth area and low-wealth area schools acquire digital games are further demonstrated by educators' responses to why they *don't* currently use them. Among teachers in high-wealth area schools, 44% of the respondents who do not currently use digital games claim that the reason is because their school doesn't provide them; still a relatively high percentage, though other reasons were cited as well (for example, limited class time and the inability to find useful or age-appropriate games). Conversely, for teachers in lower-wealth area schools who currently don't use digital games, 75% stated that the reason was because games are not provided for free by their school.

In short, while there is a great demand among educators in low-wealth schools for utilizing digital games (even among those teachers who don't currently use them), there is also a financial obstacle: these schools, community PTAs and individual teachers do not have the funds at their disposal to provide them for their students. If digital games were provided to these schools by an outside organization, there would be an extremely high rate of usage among educators and a massive impact on students.

STEM + digital games = a perfect formula

Respondents to our PEN survey repeatedly expressed interest in using digital games to educate K-12 students on important life skills, including STEM subjects and careers. While only 20% of the educators surveyed have used digital games to teach STEM in the past, 84% expressed interest in teaching science, technology, engineering and math (including related careers) using age-appropriate digital games. A 3rd-grade teacher from Bethlehem, PA, specifically mentioned coding as a natural topic for educational digital games, with their ability to make potentially difficult subjects fun and engaging for students. The opportunity for STEM organizations to sponsor digital games and provide them to schools can make a lasting impact on the future innovators of STEM, not to mention for the organizations themselves. See Figures 9 and 10.

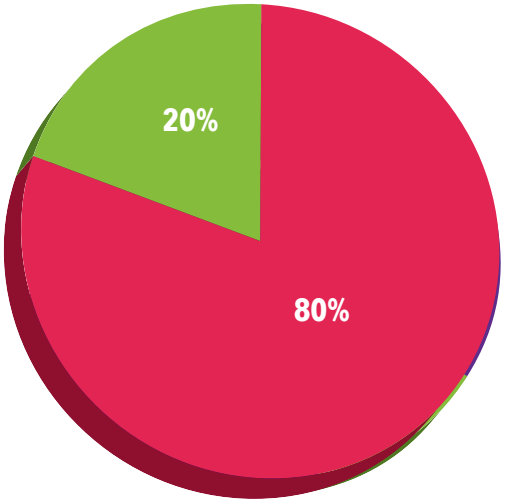


FIGURE 9 HAVE YOU TAUGHT STEM USING EDUCATIONAL DIGITAL GAMES?

Yes **20%**
No **80%**

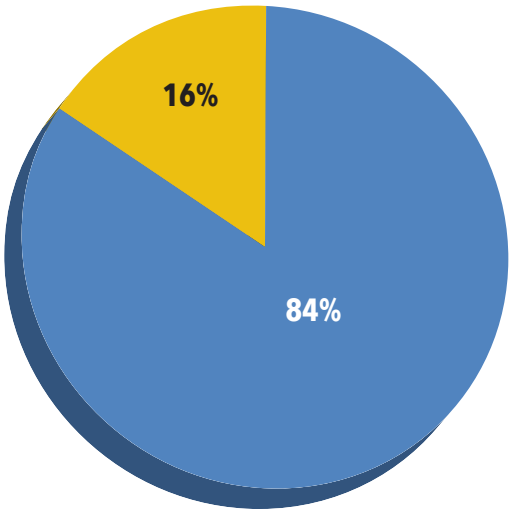


FIGURE 10 WOULD YOU BE INTERESTED IN USING AGE-APPROPRIATE DIGITAL GAMES TO TEACH STEM IN THE FUTURE?

Yes **84%**
No **16%**

The future of digital games

This report has been a first look at the use of digital games in the classroom. We have explored why they are being embraced as effective educational tools and made recommendations for providing games to schools on behalf of STEM organizations. The survey data confirmed that the use of educational digital games will only continue to skyrocket, while highlighting many educators' lack of access to high-quality games.

Stay tuned for Part 2 of our PEN report on digital games in K-12 classrooms, which will explore in finer detail how educators' responses vary among grade level, including lower elementary, upper elementary and secondary teachers. The insights from Part 2 of the PEN report will help ensure that age-appropriate digital games provide the greatest impact for students of all ages.

Insight: **While only 20% of educators have used digital games to teach STEM in the past, 84% expressed interest in doing so – suggesting an important educational market with high demand and low supply.**



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[2] University of Michigan. "Digital games and classroom learning: Study finds helpful features, gaps." *ScienceDaily*, February 19, 2015. www.sciencedaily.com/releases/2015/02/150219090456.htm

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[4] O'Malley, Sharon. "More Than Fun? Educational video games offer active learning that some instructors say is hard to replicate in a traditional classroom." *Inside Higher Ed*, July 19, 2017. www.insidehighered.com/digital-learning/article/2017/07/19/educational-games-expand-classroom-learning

[5] Schools' area wealth status is based on reporting from MCH Strategic Data, which determines area wealth by the average household income of the school's zip code. According to this criteria, a "low-wealth area" has an average household income of $41,584 or less; a "high-wealth area" has an average household income of $60,959 or more.

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6305 Sandburg Road, Suite 100
Minneapolis, MN 55427
www.ntccorporate.com