



Fire Protection Association Uses Gaming to Teach Electrical Safety

National Fire Protection Association
Best Use of Games or Simulations for Learning Program
November 2017



Company Background



Company At-a-Glance	
Headquarters	Quincy, MA
Year Founded	1896
Revenue	Confidential
Employees	Confidential
Global Scale	Domestic and International
Customers/Output, etc.	The National Fire Protection Association is a nonprofit organization devoted to eliminating death, injury, property and economic loss due to fire, electrical, and related hazards.
Website	www.nfpa.org



Budget and Timeframe

Budget and Timeframe	
Overall budget	\$36,000
Number of employees involved with the implementation?	2
Number of Operations or Subject Matter Expert employees involved with the implementation?	2
Number of contractors involved with implementation	3
Timeframe to implement	4 months
Start date of the program	3Q 2016

Business Conditions & Business Needs

In all 50 states, the National Electrical Code is the benchmark for safe electrical design, installation, and inspection to protect people and property from electrical hazards. Like all code books, the NEC is long, text-based, and often difficult for new users to navigate.

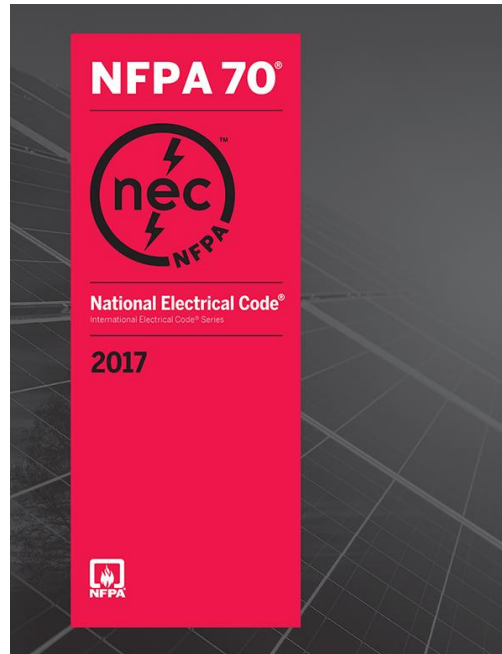
For that reason, the nonprofit National Fire Protection Association worked with Kick Learning to create eLearning with gamification to provide tips on how to navigate the NEC (NFPA 70) code book to get the answers electricians and others need when they need them.

Overview

The one-hour course is designed to enable the learner to:

- Identify the NEC purpose and enforcement responsibilities.
- Identify NEC components and structure.
- Navigate the NEC Code book for effective use of the NEC on the job.

Figure 1: NEC Cover



Source: NFPA 2017

The NEC consists of an introduction, nine chapters, and annex material. To correctly use the NEC, users need to understand and navigate the introduction and first four chapters because they lay the foundation of knowledge. Chapters 5 through 8 only apply to specific circumstances, so they do not build upon each other. Instead, they may modify one another or any of the first four chapters.

The user must be able to navigate the chapters for special circumstances and identify which chapters apply to a given task or scenario. Chapter 9 contains informative annexes and tables. Users of the NEC may reference that chapter at any time. In all circumstances, users must be able to identify where to look and in what order to consult the chapters.

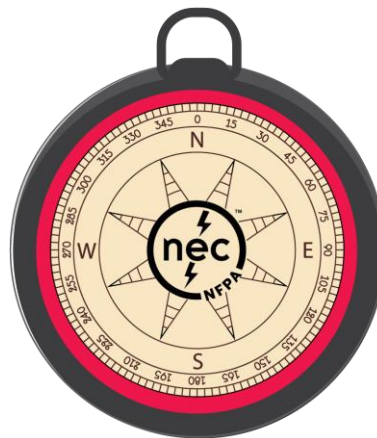
To teach the necessary navigation skills, Kick designed a course using the concept of a building with rooms and stories that resemble a school or museum. The “Institute for Electrical Safety” building emulates the layout of the code book, and the learner navigates the building in the same way they will navigate the NEC Code book.

Each chapter of the code has its own room, so Chapter 1 is Room 1, etc. At the beginning of the course, all the rooms are locked except the Information Desk, which represents the Introduction (Article 90), and the Library, which contains information on Chapter 9. Each room contains items or topics covered in that particular chapter as well as a knowledge

check on the chapter. As the learner finishes exploring each room, other rooms unlock. After a room has been unlocked, the learner may return to it at any time.

Questions and challenges are presented throughout the course. Challenges consist of real-world questions the user must answer to win a slice of the NEC Compass, a Trivial Pursuit-like pie incorporating the NEC logo divided into six slices. As the learner completes each challenge, they earn a slice of the compass. The course ends once they have gathered all six slices.

Figure 2: Compass



Source: NFPA 2017

Design

The gaming format was chosen because the NEC content is complex and requires practice for mastery. In feedback from other courses throughout the industry, audiences consistently have requested practice in the skill of using the code book rather than just knowledge of the code.

The course is aimed at apprentices and young electrician, although it also is available to the general public. But because the course primarily focuses on a younger, technologically savvy group, NFPA wanted a look and feel completely different from any of its other offerings.

Kick Learning used a flat design concept and provided an animated character in the authoring tool. Kick normally avoids using characters that ship with authoring tools. However, this particular audience was unfamiliar with this new type of look and feel for a course, so NFPA took advantage of the opportunity to rapidly build the course using a

stock character. Learners are advised that they need a copy of the code in front of them when they take the course.

Figure 3: Electrical Safety Video – Opening Screen

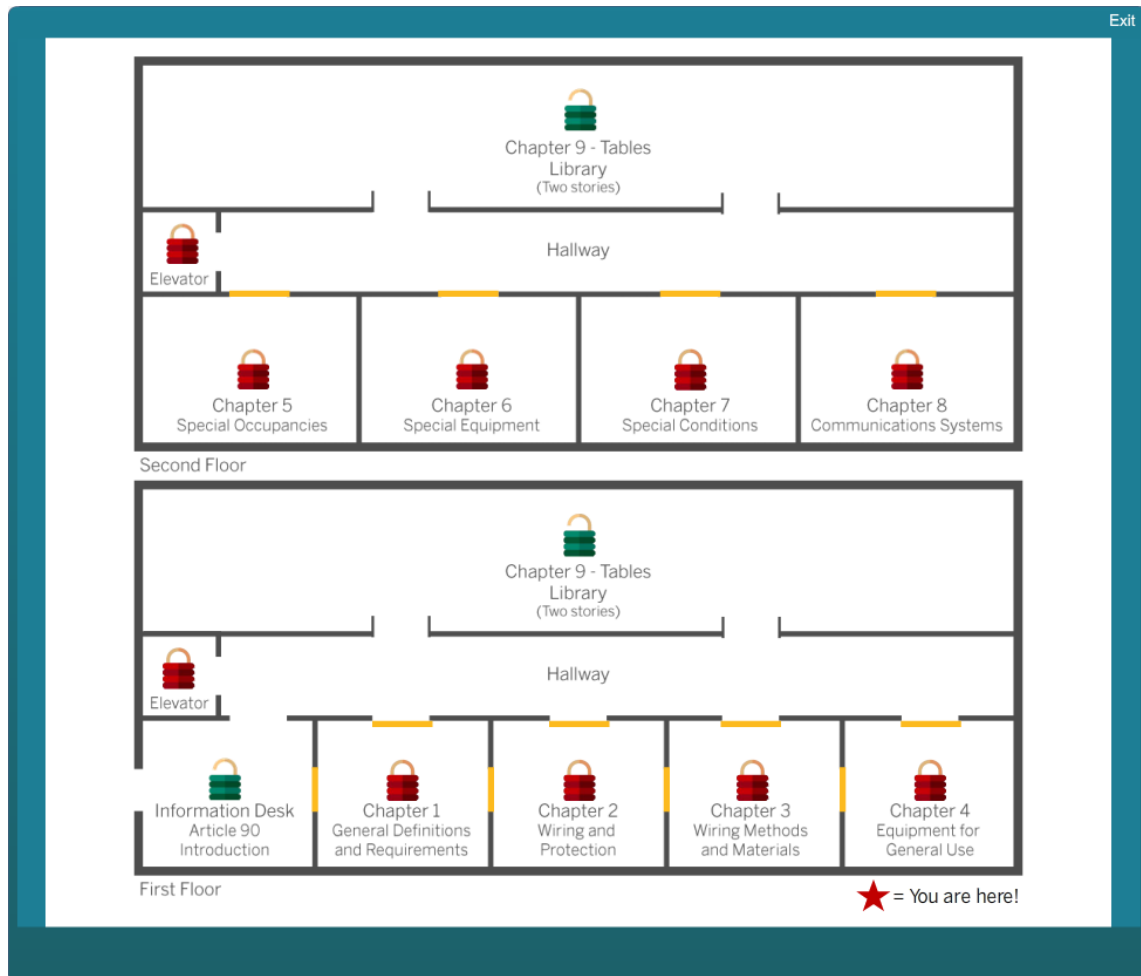


Source: NFPA 2017

A map in the course shows the learner the layout of the building. The map is accessible at all times during the course, and learners can see where they are in the course by using a star icon representing a “You are here” concept commonly seen on park, mall, or museum directories. Green locks and open doors represent rooms that have been unlocked because the learner has explored them. Red locks represent rooms the learner has not yet been allowed to enter.

The map in Figure 4 shows the course at the beginning when all doors are closed and rooms locked except the Information Desk and the Library, which may be entered at any time from any floor.

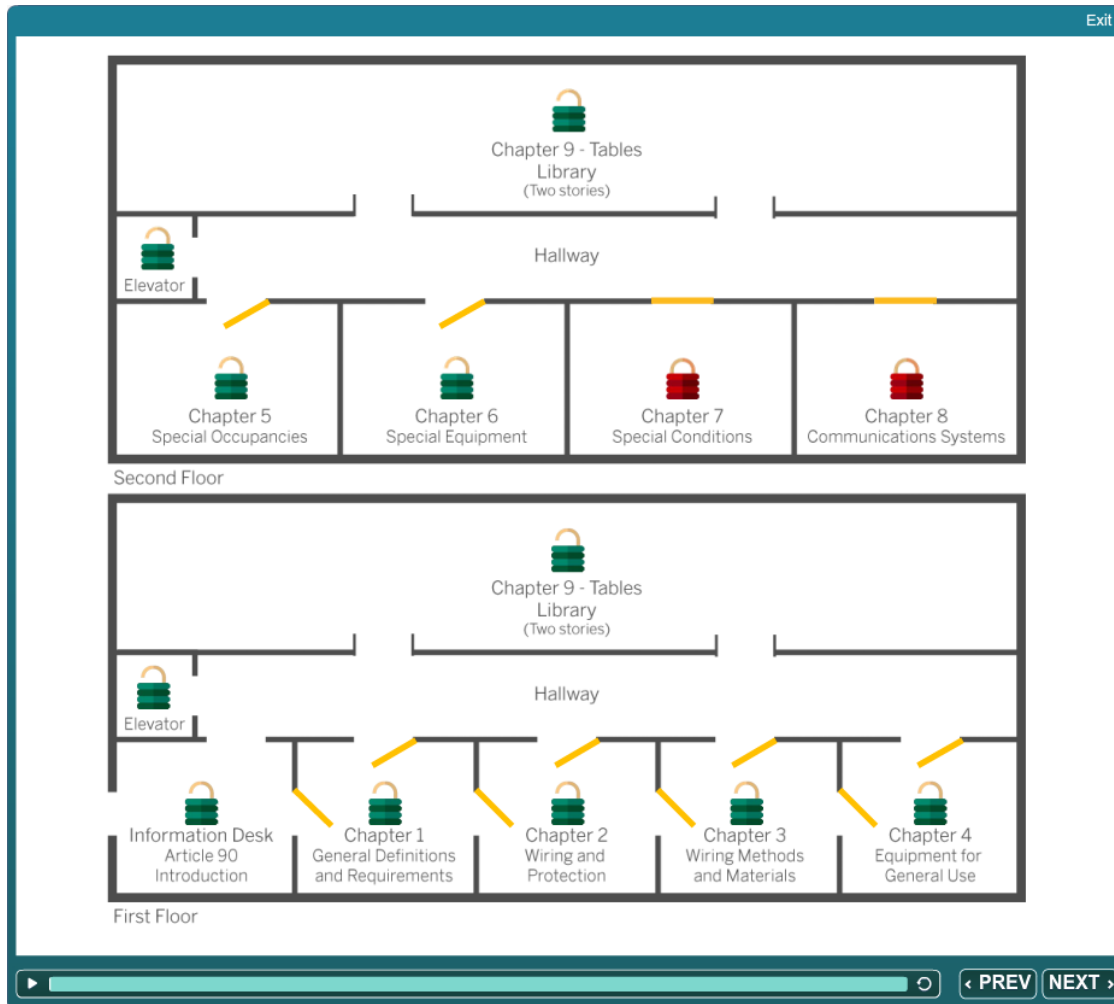
Figure 4: First Map



Source: NFPA 2017

In Figure 5, many rooms have been unlocked and doors opened.

Figure 5: Unlocked Rooms



Source: NFPA 2017

Throughout the course, an animated guide appears in each room to offer hints and guidance. The guide narrates the entire course.

In Figure 6, the guide is welcoming the learner to the Information Desk. Learners click on items in the room that correlate with the NEC Code book to learn about those sections of the code. The number in the bottom left corner counts down as each item is clicked to show how many items are left to be found.

Figure 6: Items to Find



Source: NFPA 2017

In Figure 7, the learner sees the various icons that will be available to them as they progress. The icons represent the map, the Library, the Table of Contents for the chapter being explored, and the learner's earned slices of the NEC Compass.

Figure 7: Icons



Source: NFPA 2017

In Figure 8, a room representing Chapter 2 of the code covers wiring and protection. Each item in the room represents something from that chapter. While not comprehensive, it gives the learner a high-level view of what Chapter 2 contains and an introduction to the most commonly used articles.

Figure 8: Chapter 2



Source: NFPA 2017

In Figure 9, when a learner clicks on the meter that represents Article 230 in Chapter 2, a short description appears with a photograph of the object. Photography was incorporated to relay the real-world look of the chosen object.

Figure 9: Short Description and Photograph



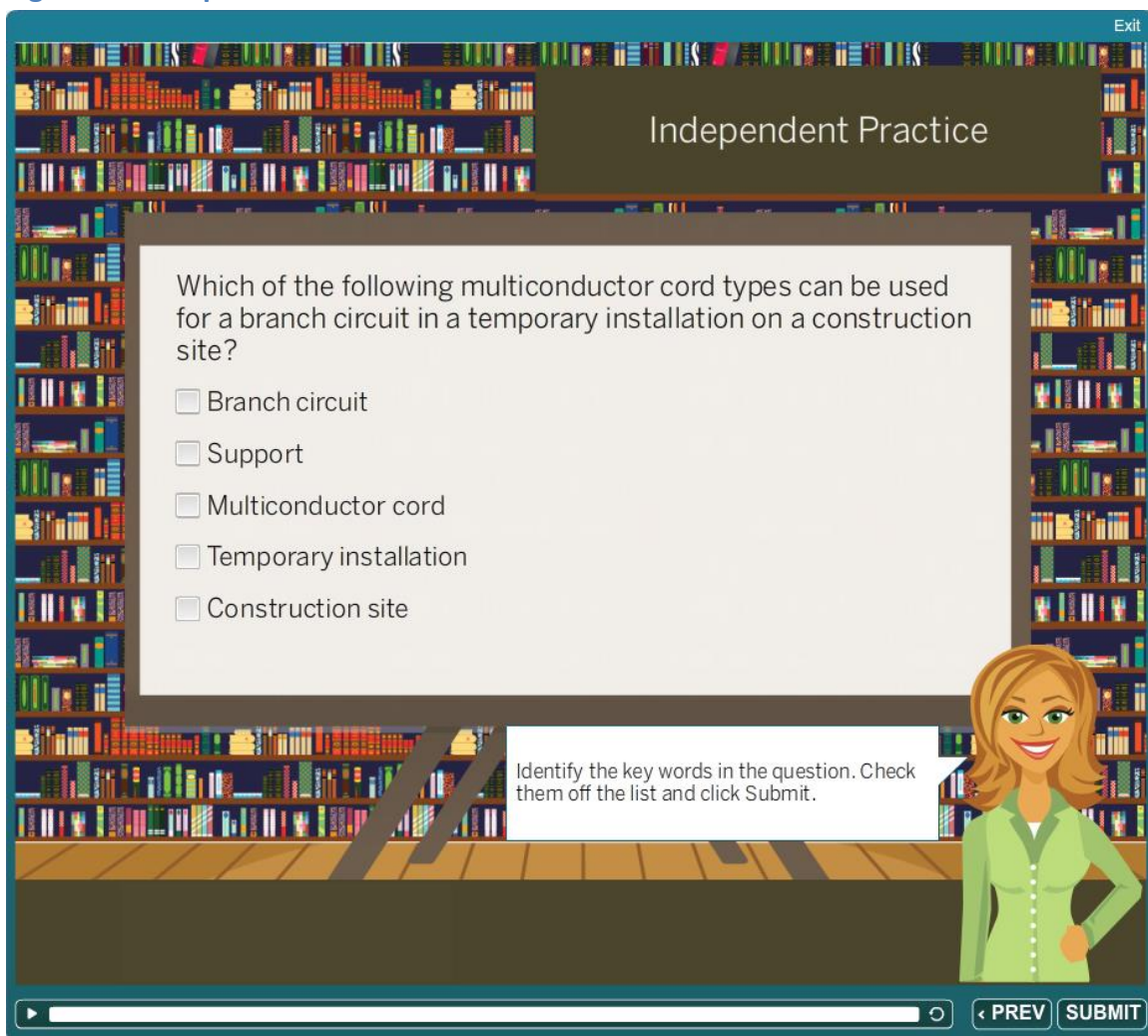
Source: NFPA 2017

After completing the first four chapters, learners are taken to the Library where the challenges take place. Each challenge is a series of multiple choice, drag and drop, and click one or many questions. Using the “I do, we do, you do” approach, the avatar guides the learner through the first challenge (Demonstration), prompts them through a challenge (Practice with Prompts), and then lets the learner complete the remaining challenges independently (Independent Practice).

In testing the course, learners were clicking the icons, leaving the Library, and forgetting where they were within the challenge. The temptations needed to be removed to increase focus, so none of the icons appear on the bottom of the screen and the learner cannot leave the challenge until completing it.

For each challenge, the learner is taught to look for key words in the question.

Figure 10: Independent Practice

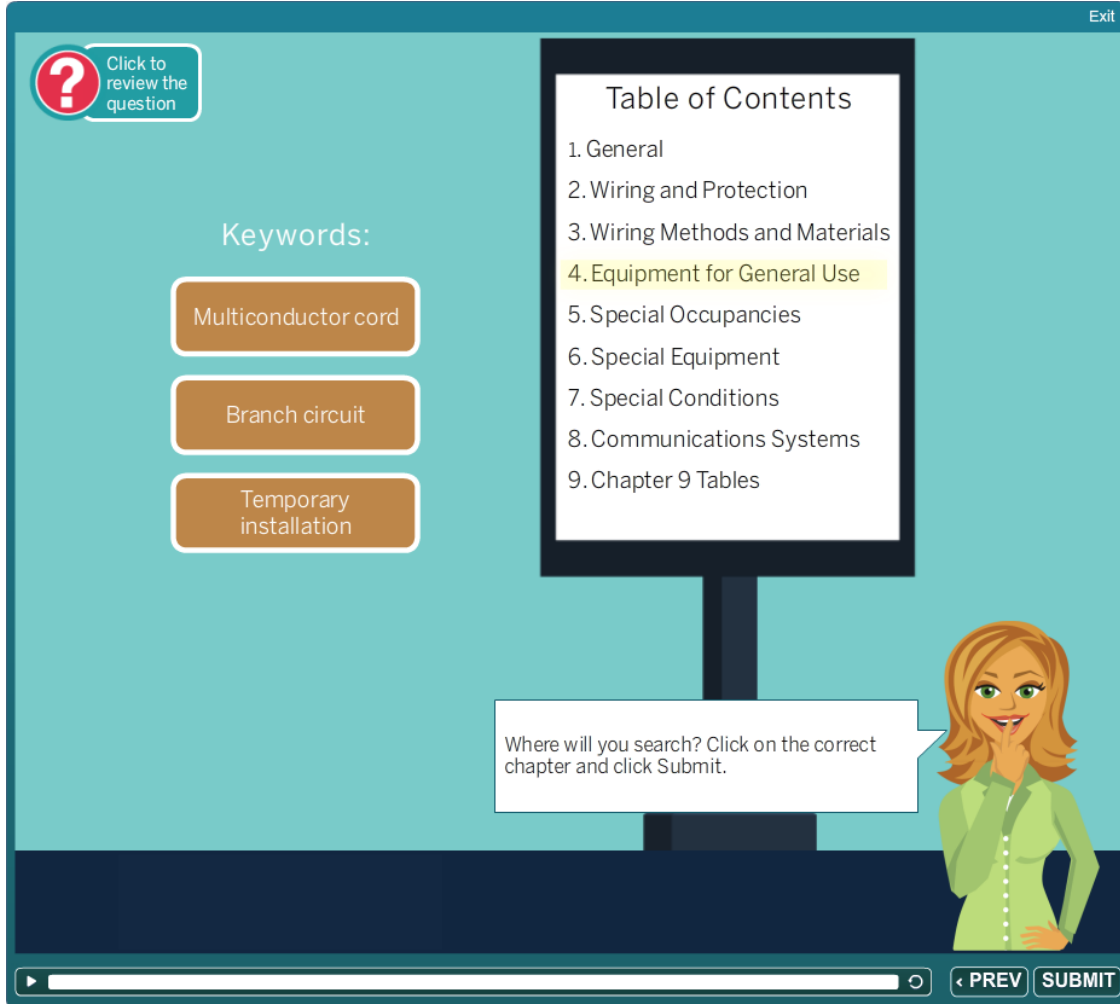


Source: NFPA 2017

Two hints are given if needed and then remediation is provided on this particular question only because answers sometimes can be ambiguous.

The learner then needs to use the key words to determine which chapter to check for information. A clickable icon is present throughout the challenge, so the learner can see the question at any time.

Figure 11: Keywords



Click to review the question

Keywords:

- Multiconductor cord
- Branch circuit
- Temporary installation

Table of Contents

1. General
2. Wiring and Protection
3. Wiring Methods and Materials
4. Equipment for General Use
5. Special Occupancies
6. Special Equipment
7. Special Conditions
8. Communications Systems
9. Chapter 9 Tables

Where will you search? Click on the correct chapter and click Submit.

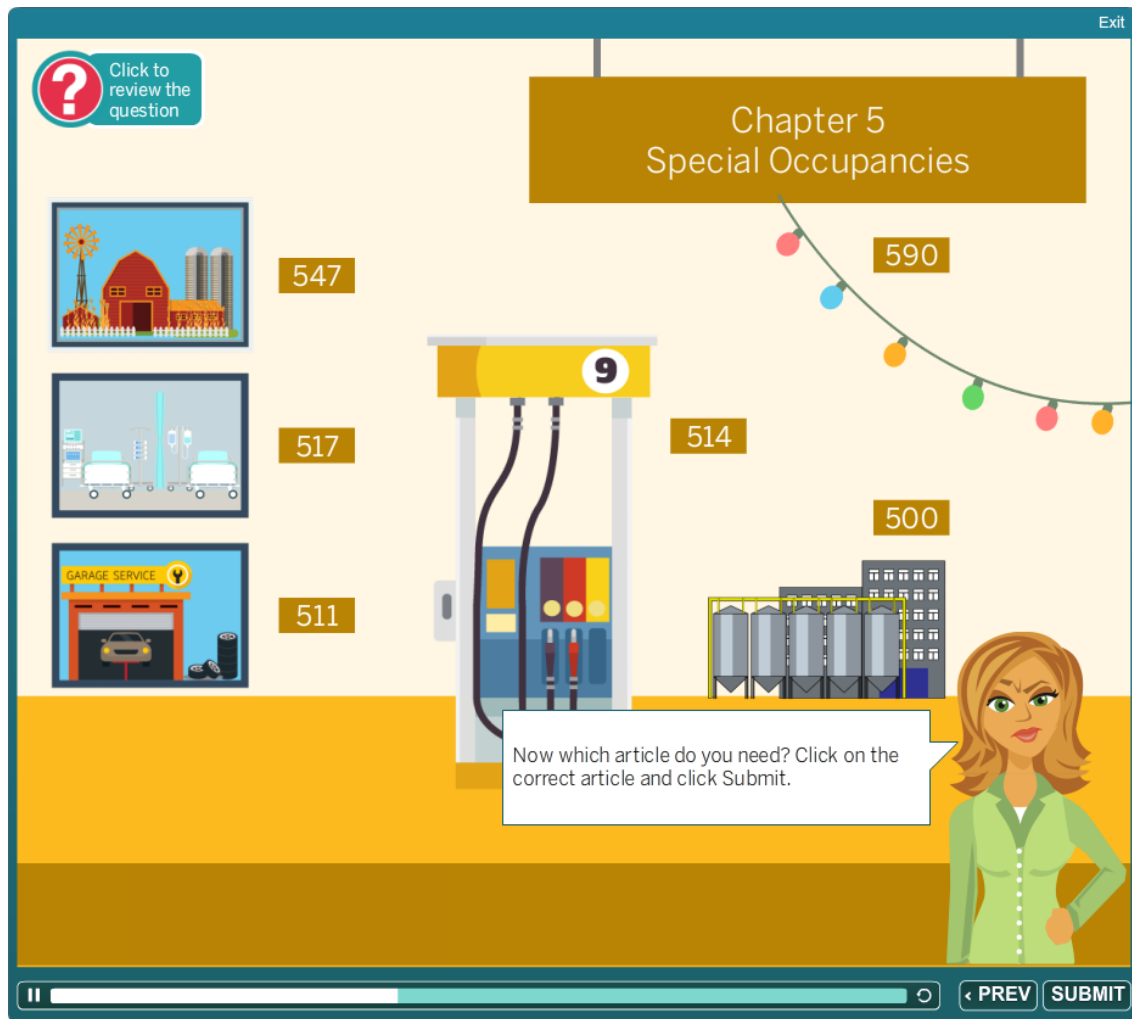
PREV SUBMIT

Source: NFPA 2017

Hints are provided, but the learner must figure out the answer by using the code. Remediation is not given for this question type.

Once in the right chapter, the learner determines which article will help to answer the question.

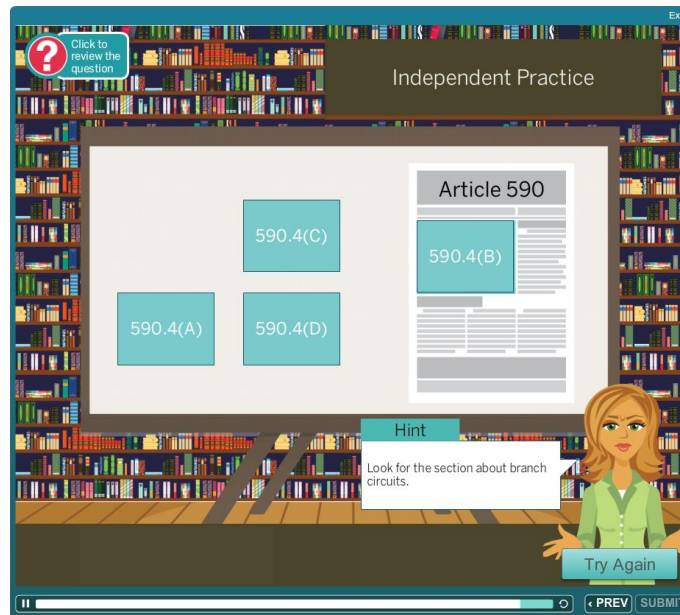
Figure 12: Determining Which Article to Use



Source: NFPA 2017

The learner must now determine which section of the article contains their answer. Again, hints are given, but remediation is not.

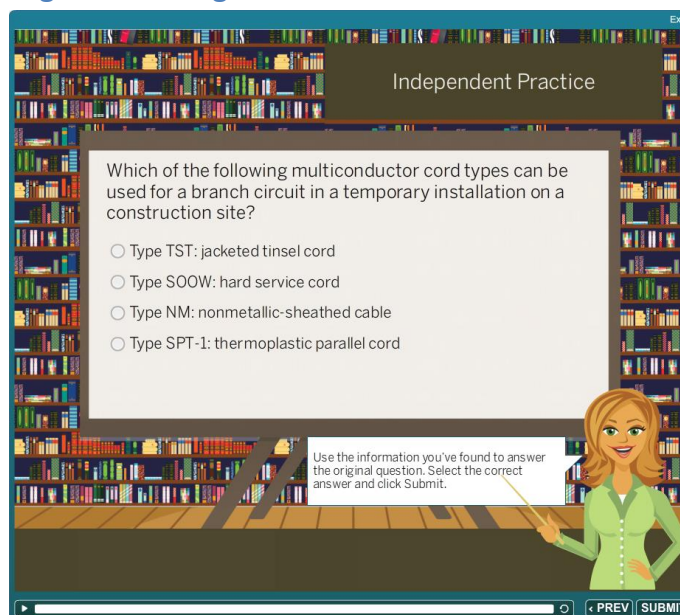
Figure 13: Hints



Source: NFPA 2017

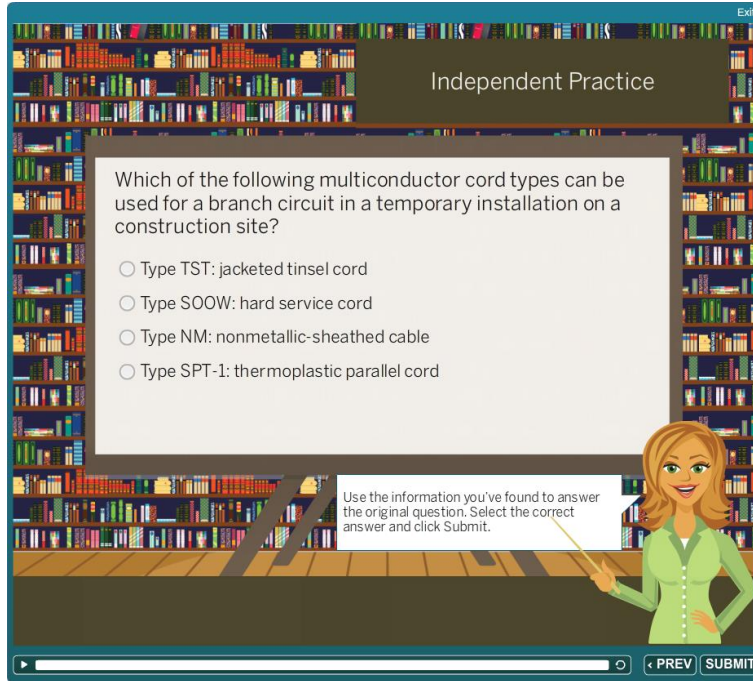
By now, the learner is in the location in the code book where the answer can be found. The challenge must be answered correctly to earn a slice of the compass and proceed through the course.

Figure 14: Answering the Challenge Question



Source: NFPA 2017

Figure 15: Answering the Challenge Question



Source: NFPA 2017

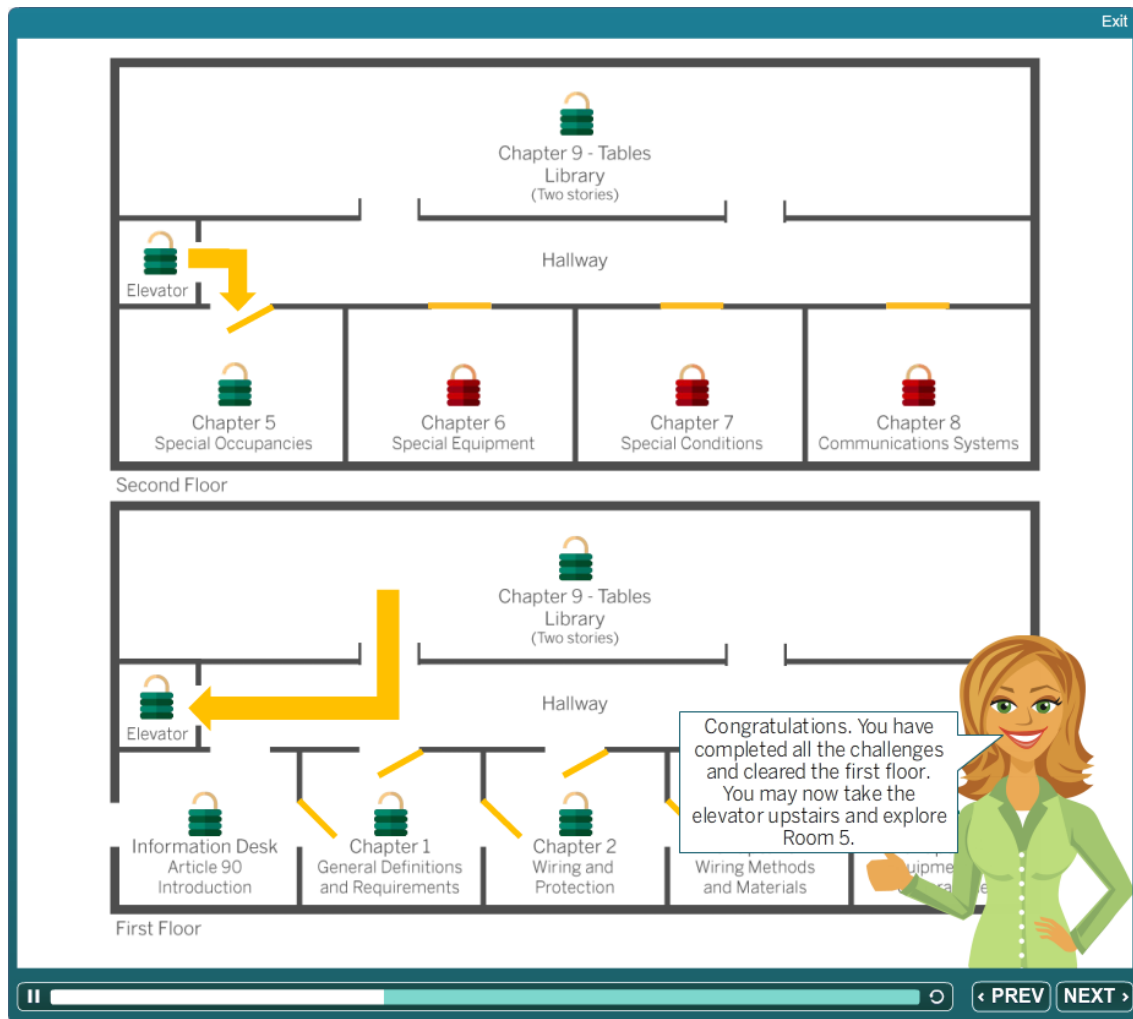
Figure 16: Learners Win the First Slice



Source: NFPA 2017

Learners are shown the map and guided to the next room, which in this case means taking the elevator to the second floor and entering Room 5.

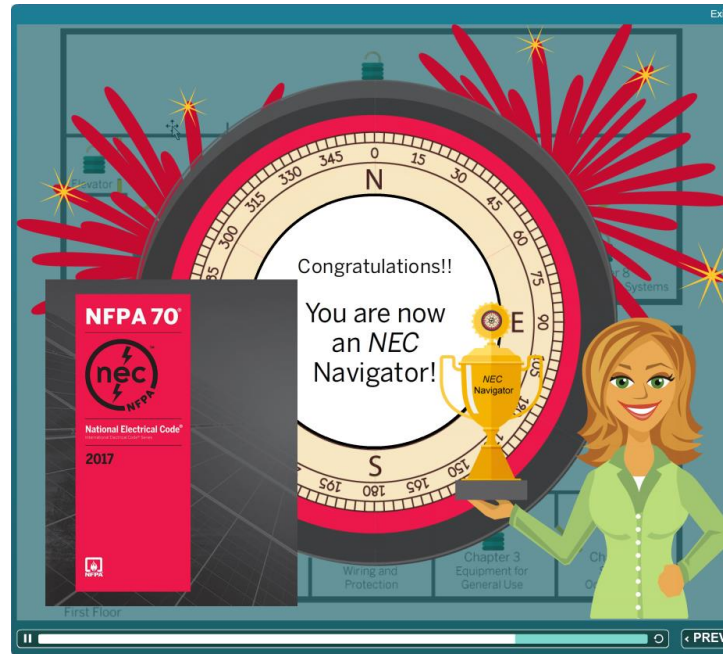
Figure 17: Guided to the Next Room



Source: NFPA 2017

The same process is used for the remaining challenges until learners have explored all rooms, correctly answered all challenge questions, and earned all six slices of the NEC Compass. In the end, they are awarded a virtual trophy and have earned the moniker "NEC Navigator."

Figure 18: NEC Navigator



Source: NFPA 2017

Delivery

The course was distributed to the public using NFPA's LMS, Blackboard. Because of the unique offering, the course was marketed heavily through many channels, including web sites, mailings, and flyer distribution at other trainings.

Measurable Benefits

With such a new design approach for a course distributed publicly, NFPA leaders decided that the best method to measure impact and results was to follow-up directly with learners. Staff members of NFPA reached out by phone to learners who had taken the course to gather feedback. The feedback was overwhelmingly positive.

In one case, NFPA spoke with a Master Electrician who teaches high school electrical students in West Virginia. His class focuses on training the students to take the Journeyman Electrician's Exam. He has so embraced the course that he is working with NFPA to make it available to his students. He would like his students to take the course as a prerequisite at the beginning of each school year.

On the professional end of the spectrum, NFPA spoke with a seasoned Health Safety Consultant who serves as the electrical-safety subject matter expert for his consulting

company. He travels 40 weeks a year and makes recommendations to Fortune 100 firms on a continual basis.

His feedback on the NEC Navigator course spoke to how beneficial the design is for adult learning. He said most courses are straight-through, linear, and tough to absorb after working all day. The NEC Navigator course is less dependent on reading comprehension and forces learners to stay engaged and actively make decisions. He would love to see this design employed with other codes.

Overall

Extensive testing was performed on the course throughout development. NFPA staff members learned that it is very hard to predict human behavior in a non-linear course. It was quite a challenge to anticipate what learners may do and provide a method for navigating the course that wouldn't let the learner get lost.

Some engineers who tested the course were not fans of the flat design, in part because they didn't embrace the simple representations of complex items or ideas. However, feedback from actual learners was positive and they indicated they were very happy with the look and feel as the information presented was not as overwhelming as they had anticipated.

The most interesting nugget gleaned in interviews with learners who had taken the course was the desire by all to get the course into other learner's hands. NFPA usually receives basic-level feedback about the courses being fine for students obtaining their continuing education requirements but never such across-the-board support for making sure fellow learners, both seasoned and new to the field, get the opportunity to view a training course.

Due to the success of this course, NFPA and Kick are working to apply the same type of gaming solution to other programs with similar material/needs.

The NEC Navigator course will now be a suggested pre-requisite for learners before they take other training courses that rely on using the NEC Code book (Overview of the NEC, NEC Changes, etc.)



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