Using Algorithmic Practice Maps to Teach Emergency Preparedness Skills to Nurses

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1. Read the article: “Using Algorithmic Practice Maps to Teach Emergency Preparedness Skills to Nurses,” on pages 19-26, carefully noting the tables and other illustrative materials that are provided to enhance your knowledge and understanding of the content.
2. Read each question and record your answers. After completing all questions, compare your answers to those provided within this issue.
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This activity is co-provided by Vindico Medical Education and THE JOURNAL OF CONTINUING EDUCATION IN NURSING.

Objectives: After studying the article, “Using Algorithmic Practice Maps to Teach Emergency Preparedness Skills to Nurses,” in this issue, the participant will:
1. Describe the benefits of using algorithmic practice maps to teach situational awareness and preparedness skills to nurses.
2. Identify one strategy used by The George Washington University to ensure the widest possible dissemination of “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters.”
3. Explain the course development process used in creating “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters.”

AUTHOR DISCLOSURE STATEMENT

The authors disclose that they have no significant financial interests in any product or class of products discussed directly or indirectly in this activity, including research support.

COMMERCIAL SUPPORT STATEMENT

All author(s) and planners have agreed that this activity will be free of bias. There is no noncommercial support for this activity.

abstract

In 2004, The George Washington University received funding from the U.S. Department of Homeland Security to develop a web-based emergency preparedness course for nurses. The purpose of the course was to provide training that would be accessible regardless of work setting or location. In designing the course, the development team used algorithmic decision making as a conceptual framework to transcend the linear, didactic focus of traditional online preparedness training to provide learners with a learning experience crafted around the decision-making process. This article describes the design of the algorithmic practice maps underlying this course and provides a replicable structure for those interested in developing similar offerings for nurses. J Contin Educ Nurs 2012;43(1):19-26.

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The authors disclose that they have no significant financial interests in any product or class of products discussed directly or indirectly in this activity. The development of “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters” was supported by funding from the U.S. Department of Homeland Security Office of Grants and Training under Cooperative Agreement Number 2004-GT-T4-001. Points of view or opinions in this document are those of the authors and do not represent the official position or policies of the U.S. Department of Homeland Security.

The authors thank Karin Hannah Stern, creative director/designer/programmer for the NNEPI online course, for her efforts in bringing the project team’s vision for algorithmic practice maps to life. They also thank the Maryland Nurses Association for approving “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters” as a 6-hour continuing nursing education offering. The Maryland Nurses Association is accredited as an approver of continuing nursing education by the American Nurses Credentialing Center’s Commission on Accreditation.

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Received: May 26, 2011; Accepted: July 11, 2011. doi:10.3928/00220124-20111122-89
When The George Washington University School of Nursing (at that time still a department of nursing education) was funded by the U.S. Department of Homeland Security’s Office of Domestic Preparedness in the fall of 2004 to develop a web-based emergency preparedness course for nurses, the project team recognized both the opportunity and the obligation to develop an interactive continuing education offering that would transcend the linear, didactic focus of traditional online preparedness training to provide learners with an interactive learning experience crafted around the decision-making process. The purpose of the course “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters” was to provide emergency preparedness training to nurses in a format that would be accessible and relevant to nurses working in varied clinical settings, regardless of whether they lived in an urban, suburban, rural, or otherwise remote location.

Given the unpredictable nature of emergencies and disasters, the project team was challenged to design a continuing education course that would enable nurses nationwide to learn and practice essential critical thinking and decision-making skills that could be applied effectively in diverse emergency situations, clinical settings, and geographic locations. This article describes the design and development of an innovative design framework based on interactive algorithmic practice maps and offers suggestions for ways in which this approach could be replicated in the design and development of other continuing education courses for nurses.

DEFINING THE PREPAREDNESS TRAINING NEEDS OF HEALTH CARE PROFESSIONALS

Foundational to any discussion of nurse emergency preparedness training is the identification of training needs. The preparedness training needs of nurses can be subdivided into two categories: (1) what nurses need to be ready for and (2) what nurses need to be ready to do. Although these categories seem conceptually similar, from an operational standpoint, they differ significantly.

Nurses need to be ready for a wide variety of emergencies and disasters, ranging from natural disasters to unintentional manmade accidents to intentional acts of destruction or terrorism. Thus, nurse emergency preparedness training must prepare nurses working in a variety of settings to respond to hurricanes, tornadoes, floods, power outages, explosions, “dirty bombs,” chemical spills, and the intentional or unintentional release of biological agents. With such a long and varied list of possible emergencies and disasters, the challenge of training nurses to be “ready” for any and all of these is clear. The many disasters that nurses are expected to be ready for generally fall into the categories of chemical, biological, radiological, nuclear, and explosive (CBRNE) events, whether the result of intentional or unintentional acts, as well as natural disasters. But what exactly are nurses supposed to be ready to do?

Although CBRNE events and natural disasters may involve widely disparate scenarios in terms of the effect on critical infrastructure, public health, and individual health and wellness, there are commonalities across all types of events, leading to a core set of behaviorally based skills that nurses need to know how to perform. Regardless of the type of emergency or disaster, nurses need to be ready to: (1) recognize a possible emerging event; (2) notify the appropriate authorities when an event is suspected or confirmed; (3) protect (self, patients, facilities, community, families) when a possible, probable, or confirmed event occurs; (4) triage patients; (5) assess and treat patients affected by an event; and (6) support patients, families, and communities in recovering from an event. Each of these skills involves critical thinking and decision making within the context of an emergency or disaster, including events that are emerging in real time and have not, as of yet, been identified as such.

Teaching nurses how to respond effectively to unpredictable CBRNE events requires a subtle but significant change in the way in which preparedness training is delivered. Instead of simply teaching nurses what to do if a CBRNE event occurs, nurses must be taught how to scan for signs of possible CBRNE events in their everyday clinical practice and to remain alert to changing situational cues in the context of complex clinical decision making. To address this need, nursing preparedness training must go beyond teaching emergency response skills and provide nurses with foundational skills related to situational awareness.

Situational awareness was succinctly described by Endsley and Garland (2000) as “knowing what is going on around you” (p. 4). The Institute of Medicine provided a congruent but more expansive definition within its recent publication on medical surge capacity: “‘Situational awareness’ is a term that simply means understanding the current situation. It is the ability to look at a huge variety of data, determine what is relevant, synthesize the data, and act on it” (Institute of Medicine, 2010, p. 30). Integrating situational awareness skills into preparedness and response training for nurses is of critical importance because it helps to bridge the real-world, daily experience of nurses with the more distant
(and difficult to grasp) reality of a nurse in the midst of an emergency or disaster. The Association of State and Territorial Directors of Nursing highlighted the importance of this when they included the following in their list of competencies for public health nurses: “Recognize deviations from the norm that might indicate an emergency and describe appropriate action” (Jakeway, LaRosa, Cary, & Schoenfisch, 2008, p. 358). Recognizing “deviations from the norm”—and knowing what to do with that information—is a central theme running through the “Nurses on the Front Line” online course.

Although nurses are referred to in the literature as “first receivers” because they work in health care facilities where victims of a CBRNE event or natural disaster are likely to seek help, nurses have the potential to serve also as “first perceivers,” recognizing that a CBRNE event is happening as it occurs, if they are provided with the necessary training. Teaching these kinds of preparedness-related critical thinking and decision-making skills to nurses in an online course requires a shift in the preparedness training paradigm.

Before the development of the course “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters,” nurse emergency preparedness courses tended to emphasize what to do if an emergency or disaster occurs rather than how nurses can incorporate situational awareness into their daily care of patients. This disconnect between situational awareness and emergency and disaster response is fraught with problems. Without both aspects of decision making integrated into a cohesive model, it becomes all too easy for nurses to conceptualize their preparedness training as something to mentally dust off and pull out once an emergency or disaster occurs—or worse, as something that is not needed at all.

Although there is a pressing need for situational awareness training for nurses, figuring out how to teach this skill is challenging. Because situational awareness is a nebulous construct that loosely describes an individual’s awareness of the environment, operationalizing it within any training program, let alone an online course, presents challenges (Endsley & Garland, 2000). Teaching situational awareness is especially difficult in an online, self-directed course because of the inherent complexity of the skill.

Situational awareness, by definition, is not a linear concept. It is an ongoing, iterative, critical thinking process, with no defined beginning or end point. Therefore, the project team determined that a linear, didactic approach to content design and delivery would be ill suited to teaching situational awareness. Because nurses taking

the “Nurses on the Front Line” course are unlikely to have had first-hand experience with CBRNE events, it was important to equip them with a foundational decision-making process that could be applied to both routine care and emergency situations. By organizing and presenting course content using algorithmic “practice maps” designed to teach and reinforce situational awareness and critical thinking throughout the clinical decision-making process, the course “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters” seeks to transform nurse emergency preparedness training and prepare nurses to be not only first receivers but also first perceivers.

DEVELOPING THE ALGORITHMIC PRACTICE MAPS
At the beginning of the process of course design and development, the project team made a conscious decision to organize the online course content in a non-linear fashion using algorithmic “practice maps” mirroring the decision-making process involved in both routine care and emergency situations. That decision came with a complex set of cascading challenges, the first of which was the most difficult to surmount: developing a generalizable algorithm that nurses could apply within routine care settings, with decision points to prompt recognition of, and appropriate responses to, developing emergencies and disasters. The resulting main practice map provided the basis for an overarching general module through which nurses learn a core decision-making process. This foundational algorithm provides the basis for context-specific maps integrating specific knowledge and skills needed to respond effectively to CBRNE events.

Each practice map serves a dual purpose: (1) as a succinct, stand-alone decision-making flow chart for nursing care and (2) as a graphic advance organizer that includes an interactive module menu. Advance organizers ground new learning in prior knowledge and help learners to assimilate the logical relationships among the elements of the concepts, processes, and skills to be learned (Driscoll, 2000). By providing graphic advance organizers as a menu for each module, the core decision-making algorithms are reinforced as learners work through the menus to complete the general and subsequent CBRNE modules.

Main Module Practice Map
To develop the main module practice map, the project team first drafted a terminal learning objective (TLO) for the content module as a whole: “Upon completing this module, nurses will be able to prepare for, recognize, and respond appropriately to a CBRNE event” (John-
Next, the project team developed enabling learning objectives (ELOs) that learners would need to master to achieve the TLO (Table).

The ELOs provided the basis for task-related categories of content: prepare, protect, triage, decontaminate, assess and diagnose, treat, notify, and recover. Based on these categories, the project team crafted an algorithmic practice map that would capture the correct sequence of action steps and decision points (Fig. 1).

The two ovals on the main module menu/practice map—“Prepare” and “Recover”—deliver foundational knowledge to learners through multimedia content and exercises. The nine rectangles on the main module menu/practice map deliver skill-based content and practice opportunities for nurses to learn the skills needed to assess, protect, triage, decontaminate, diagnose, and treat patients before and during a possible CBRNE event. Again, learning is facilitated through the use of rich multimedia content and interactive exercises.

The four diamonds on the main module menu/practice map are key decision points that the course module is designed to highlight. In this foundational module, nurses carrying out their routine daily clinical duties are encouraged to stop and ask themselves the questions noted within these decision diamonds: (1) Do you know about or suspect a CBRNE event or exposure? (2) Do the patient’s signs and symptoms suggest a possible event? (3) Are there patterns among multiple patients that suggest a possible event? (4) Are there multiple patients/victims?
These questions are designed to prompt the nurse to be proactive in looking for signs of a possible event. The practice map design process was informed by recognition of the importance of repetition in transforming the way in which nurses approach situational awareness and decision making. Learners move through the main module content by clicking on a button on the practice map and exploring the content contained within it, returning to the main module practice map nine times while completing the module to select the next area to explore. Each time learners return to the practice map, they view the decision-making process again. In this way, they are exposed repeatedly to one of the core aspects of the course content.

Chemical, Biological, Radiological, Nuclear, and Explosive Practice Maps

The same algorithmic practice map development and TLO/ELO mapping process was repeated for the chemical, biological, radiological, nuclear, and explosive modules of the course. The project team developed a TLO and a set of ELOs that provided the basis for each topic button on the practice maps (see Fig. 2 at www.slackjournals.com/jcen).

Although the algorithm used in the main module practice map is designed to teach nurses the day-to-day skills needed to recognize signs, symptoms, and patterns of illness that may indicate a possible CBRNE event, the chemical, biological, radiological, nuclear, and explosive modules are designed using algorithms that assume that the nurse knows or suspects that a CBRNE event has occurred. Within each module, learners explore content by clicking buttons on the module menu/practice map. Learners are not required to view the module content in any particular order, but each time they finish viewing the content associated with a button on the menu/practice map, they are brought back to that menu to select the next topic. Thus, for each module in the course, learners are repeatedly exposed to the critical thinking practice maps.
The structure of the individual module menus/practice maps is similar to that of the main module in that the ovals deliver foundational knowledge on preparing for and recovering from an event; the rectangles deliver skill-based content and practice opportunities for nurses to learn the skills needed to assess, protect, triage, decontaminate, diagnose, and treat patients during and after a possible event has occurred; and the diamonds show key decision points that the module is designed to highlight.

**ASSESSMENT APPROACH**

Within the “Nurses on the Front Line” course, interactive practice activities are offered throughout the instruction, with immediate feedback provided to enable learners to self-assess their formative understanding of the content. To provide learners with an opportunity to practice applying the situational awareness and responses that they have learned, the course includes comprehensive video-based practice scenarios in which learners make a series of decisions from a first-person perspective to respond to an unfolding CBRNE event. At each decision point, positive or remedial feedback is presented to reinforce learning.

The course uses scenario-based multiple-choice questions for both pre- and post-assessments (see Fig. 3 at www.slackjournals.com/jcen). Each assessment question is based on a situation or vignette that is explained by a paragraph or audio conversation with accompanying photos. Learners then answer one or more questions related to the situation.

With any instruction, to demonstrate learning, it is important first to establish learners’ entry-level knowledge and performance (see Fig. 4 at www.slackjournals.com/jcen). After instruction, it is possible to test for increased knowledge and performance mastery. To engage learners in the assessment process, the pre-assessment is presented within the context of a poignant question: Are you ready? When learners first access the course menu, this is the only option available. Pre-assessment questions are designed to target critical content provided by the course and draw learners’ attention to the nursing skills that they already have and may be called on to use in CBRNE situations. Questions are designed to demonstrate likely situations that learners could face and encourage them to recognize the importance of planning for such events while encouraging their confidence in their ability to handle any of these situations with the nursing skills that they have already mastered.

Student performance on the pre-assessment is tracked and saved to demonstrate increased knowledge of CBRNE situational awareness and responses at the end of the course. The 20-question pre-assessment is relatively short so that learners do not feel as if they are being forced to take a “test.” The introduction to the pre-assessment explains to learners that their responses do not affect their final score for the course and that the purpose of the pre-assessment is to help them to gauge how much they know before taking the course—how ready they are to respond to the unimaginable.

On completing the pre-assessment, learners are presented with a performance summary. Ideally, the pre-assessment summary promotes learners’ confidence that many of the skills that they will need to respond to a CBRNE event are the skills that they already have and use to treat patients every day. The pre-assessment also highlights gaps in knowledge and skills that the course is designed to fill. To preserve the integrity of the pre-assessment data, learners can complete the pre-assessment only once. When learners return to the main menu after completing the pre-assessment, the main menu items are accessible and they are prompted to begin the course modules.

The course post-assessment is entitled “Are You Ready Now?” and follows the same format as the pre-assessment, using scenario-based multiple-choice questions. The post-assessment becomes available once learners have completed all of the other course modules. Learners can take the post-assessment as many times as they like. Retaking the post-assessment overwrites the previous post-assessment score. On successfully completing the post-assessment with a passing score, students are presented with a summary showing their mastery of course objectives related to each of the course modules. Students who achieve a score of 80% or higher are eligible to print a completion certificate (see Fig. 5 at www.slackjournals.com/jcen).

**COURSE REVIEW**

Validation of the algorithmic practice maps, course content, and assessment strategies was performed through a comprehensive multilayered external review process. The American Association of Colleges of Nursing and the National Organization of Nurse Practitioner Faculties each assembled review panels of experts who provided detailed feedback on course content and structure before course programming. A third, interdisciplinary review panel was convened to ensure the accuracy of course content before programming. The feedback provided by the three reviewer panels was invaluable in revising the algorithmic practice maps and course content.
Additionally, as per the requirements of the funder (U.S. Department of Homeland Security) under Cooperative Agreement 2004-GT-T4-001, the course underwent a rigorous review, approval, and certification process before being assigned DHS/FEMA-certified course number AWR-161-W. Pilot testers selected by the funder through their course reviewing entity, CRA, Inc., reviewed the course materials at two separate time points. Pilot testers first reviewed the course content in storyboard format, and edits were made to the course, based on their feedback. After course programming was completed, the pilot testers completed the online course and conducted a comprehensive review of the course. Minor modifications were made to the course, based on this final review. Written comments provided to the project team from the pilot testers included the following observation about the innovative course structure and presentation:

The developers of this course did not cut any corners and have a true appreciation for how students best learn new skills. This is demonstrated by the fact that the developers took the time to reinforce several difficult and sometimes unfamiliar concepts (triage, decontaminate, “doing the greatest good”). This repetition is great for reinforcing learning of unfamiliar skills and achieving true competency. I believe that nurses who take this course will be more competent to respond to a CBRNE event, and increasing competency is the goal of any good preparedness course. (Cash, Kosmos, & Stein-Spencer, 2007, p. 4)

COURSE DISSEMINATION

The George Washington University School of Nursing began offering the course “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters,” using the Inquisiq EX learning management system, in November 2007. To ensure access for the largest number of nurses, the 6-hour course is available free to all users. Individuals interested in taking the course for continuing education credits pay a nominal fee for the 6-hour course, but the overwhelming majority of learners sign up for the free version. Both versions of the course are available at http://learning.nnepi.org. Between November 2007 and April 2011, more than 6,000 nurses successfully completed the full 6-hour course. An additional 8,600 nurses are in the process of completing the course. In total, almost 15,000 nurses have registered for “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters” in the 3.5 years that the course has been offered. Although U.S. Department of Homeland Security funding for the development of this course ended 3 years ago, The George Washington University School of Nursing continues to offer the course at no cost to the federal government as a service to U.S. nurses.

FUTURE DIRECTIONS

The course “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters” uses algorithmic practice maps, rich multimedia content, and interactive exercises to equip nurses with a foundational decision-making process that could be applied to both routine care and emergency situations. As a result of this innovative continuing education offering, thousands of nurses nationwide have been introduced to the skills needed to assess, protect, triage, decontaminate, diagnose, and treat patients before and during a possible CBRNE event. Given the large number of learners who have completed the course “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters,” the project team at The George Washington University School of Nursing plans to seek funding to carry out an evaluation of learner satisfaction as well as an assessment of learners’ ability to apply what they learned in the course to clinical practice. Although anecdotal evidence indicates that the course “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters” was well received by learners, rigorous evaluation is needed to determine whether organizing online course content in a nonlin-

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key points

Emergency Preparedness


1. In developing “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters,” the project team determined that a nonlinear approach would be best suited to teaching situational awareness skills.

2. Using algorithmic practice maps to teach situational awareness and preparedness skills to nurses in an online course is beneficial because it helps to reinforce situational awareness and critical thinking throughout the clinical decision-making process.

3. Algorithmic practice maps help to teach situational awareness and preparedness skills by reinforcing the fact that situational awareness is an ongoing, iterative, critical thinking process without a distinct beginning or end point.
ear fashion using algorithmic practice maps ultimately yields robust learning outcomes comparable to those of traditional, less resource-intensive, linear content presentation models.

REFERENCES
Using Algorithmic Practice Maps to Teach Emergency Preparedness Skills to Nurses

1. Situational awareness is:
   A. The ability to remain awake at all times and in all situations, regardless of how many hours you have been on duty.
   B. The ability to recognize one’s own feelings of fear and insecurity when facing large-scale emergencies and disasters.
   C. The ability to raise awareness among your patient population regarding the need for emergency kits.
   D. The ability to look at a huge variety of data, determine what is relevant, synthesize the data, and act on the data appropriately.

2. Which of the following activities would best demonstrate your use of situational awareness in the clinical setting?
   A. Mentioning to a friend that there seems to be a deviation from the norm in terms of the number of patients presenting to your clinic with flu-like symptoms.
   B. Mentioning to a coworker that there seems to be a deviation from the norm in terms of the number of patients presenting to your clinic with flu-like symptoms.
   C. Mentioning to a supervisor that you have noticed a deviation from the norm in terms of the number of patients presenting to your clinic with flu-like symptoms.
   D. Mentioning to your followers on Twitter that flu season seems to have come early and hit hard.

3. Using algorithmic practice maps to teach situational awareness and preparedness skills to nurses in an online course is beneficial because it helps to:
   A. Reinforce preparedness training as something to use once a disaster occurs.
   B. Reinforce critical thinking throughout the clinical decision-making process.
   C. Reinforce that nurses should focus solely on being “first receivers.”
   D. Keep the cost of online course development low.

4. Another benefit of using algorithmic practice maps to teach situational awareness and preparedness skills is that it reinforces the fact that situational awareness is an ongoing, iterative, critical-thinking process with:
   A. No defined beginning or end point.
   B. A clearly defined beginning point and a vague end point.
   C. A vague beginning point and a clearly defined end point.
   D. Clearly defined beginning and end points.

5. In developing “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters,” the project team determined that which of the following content design and delivery approaches would be best suited to teaching situational awareness skills?
   A. A linear, didactic approach using actual case studies.
   B. A circular approach using Venn diagrams.
   C. A nonlinear approach using algorithmic practice maps.
   D. A linear approaching using algorithmic practice maps.

6. To ensure the widest possible dissemination of “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters,” The George Washington University School of Nursing decided to:
CNE REGISTRATION

Please register me for the Learner-paced Program for 2.3 contact hours.

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A $20 payment must accompany the CNE Registration Form. Payment must be in U.S. dollars drawn on a U.S. bank. Checks/Money Orders should be payable to: JCEN-CNE. MasterCard, VISA, and American Express Credit Cards are accepted for payment. CNE Registration Forms must be received no later than December 31, 2013. Copyright © 2012 by SLACK Incorporated. All rights reserved.

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EVALUATION

Must be completed for contact hour certificate to be awarded.

YES NO

1. The content of the article was accurately described by the learning objectives:

☐ Describe the benefits of using algorithmic practice maps to teach situational awareness and preparedness skills to nurses.
☐ Identify one strategy used by The George Washington University to ensure the widest possible dissemination of “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters.”

☐ Explain the course development process used in creating “Nurses on the Front Line: Preparing for and Responding to Emergencies and Disasters.”

2. The content met my educational needs:

☐ 140
☐ 165
☐ 190
☐ 215
☐ 240

(minutes)

3. The content was relevant to my nursing practice:

☐ 140
☐ 165
☐ 190
☐ 215
☐ 240

(minutes)

4. How much time was required to read the article and take the quiz?

5. Please list the topics that you would like to see future activities address:

CNE QUIZ ANSWERS

1. D  6. B
2. C  7. A
3. B  8. D
4. A  9. A
5. C  10. C