



Method Paper

Implementing an Undergraduate, Team-Based, First Aid Education Course

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Abstract

First aid (FA) skills, including Cardiopulmonary Resuscitation (CPR) are the foundation of first responder care. Best practice guidelines to educate FA trainees are lacking. The current structure of FA training programs is based on pedagogy, derived indirectly from hospital-based and Emergency Medical Services training models. Most FA training programs focus on educating the participant to function as the sole provider of care; however there may be instances when individuals providing FA find themselves suddenly engaged as functioning members of teams caring for an individual in need. Findings indicate that patients are safer and receive higher quality care when providers work as a highly effective team. As a result, teamwork training programs have been integrated into multiple health training programs. Teamwork training has been found to reduce medical errors, promote patient safety, enhance positive patient outcomes, and improve communication in a variety of medical settings; however the impact of team-based training in FA education is unknown. We describe the development of a semester long, undergraduate-level, FA educational course incorporating team-based training. Results of this project may impact the methods by which individuals receive FA education. Further investigation into the use of teamwork training as the foundation for FA training is indicated to determine the outcomes for the acutely ill and injured.

The goals of first aid (FA) are to preserve life, alleviate suffering, prevent further illness or injury, and promote recovery. Despite on-going progress to improve care delivery practices for the acutely ill and injured, the question as to how best educate

and provide on-going effective training for FA, including Cardiopulmonary Resuscitation (CPR), remains unanswered (Singletary et al., 2015). Results of a 2010 review of FA and CPR educational topics found no evidence to support

or recommend any method of evaluating or monitoring a first aid trainee's educational progress and knowledge (Markenson et al., 2010). The need for further investigation into FA education to promote safe and effective care has been further supported by the International Liaison Committee on Resuscitation (ILCOR) as findings from the 2015 recommendations indicate that little data exist on this topic (Bhanji et al., 2015). Many questions regarding FA/CPR education remain unanswered, and research is desperately needed, particularly in the realm of teaching techniques (Hazinski & Nolan, 2015).

Practices which have been identified as possibly improving outcomes for individuals requiring FA and CPR include: proper implementation of the Adult Chain of Survival (including components of effective communication in both assisted and unassisted CPR); education and training of individual responders; as well as training of teams of responders. Use of data driven performance focusing on debriefing of teams has been suggested as a possible methodology to improve performance of resuscitation teams. Team training has been further supported by the International Consensus on Cardio-pulmonary Resuscitation and Emergency Care Services with Treatment Recommendations (Hazinski & Nolan, 2015). The group recommends that organizations providing care for cardiac arrest victims should train healthcare providers in teams, using evidence-informed educational practices while

tailoring the training to the required skills of the practitioner and team. Team-training and leadership training have also been recommended as components of Advanced Life Support education for healthcare providers.

Interprofessional collaborative practice, inclusive of health professionals from multiple disciplines working together as a team, is key to providing safe, quality, and effective patient-centred care (IPEC, 2011). Teams providing CPR must continuously verbalize their coordination plan in order to effectively structure allocation of subtasks and optimize success. It is important that individuals learn how to function as a member of a team providing care for acutely ill or injured individuals (Fernandez, Russo, Reithmuller & Boos, 2013). Conditions under which FA is provided can be challenging for responders as the stressful nature of these situations can lead to increased confusion, impaired communication and poor clinical outcomes. Teams of highly trained rescuers often use an integrated approach that accomplishes multiple steps and assessments simultaneously rather than the sequential approach used by individuals (Fernandez et al., 2013). Teamwork training for health care providers has been found to enhance positive outcomes for patients; however its integration into FA/CPR education has been limited (Capella et al., 2010; Neily et al., 2010).

Inter-professional Education

Health profession students are traditionally educated within the confines of their discipline. These students are afforded little to no interaction with other members of the health care team. Upon graduation as new health care professionals, they are expected to effectively collaborate with others when providing patient care inclusive of FA and CPR. The disconnect between the educational preparation of health profession students and professional practice expectations, may be a key reason for errors in treatment and miscommunication in health care, especially during situations such as cardiac arrest (Andersen, Jensen, Lippert & Ostergaard, 2010). Team-based interdisciplinary education for undergraduate health profession students has been suggested as a teaching modality to enhance patient outcomes by the World Health Organization (2010) and has been identified as the cornerstone to providing safe, high quality, effective patient-centred care (IPEC, 2011).

In response to the call for team-based interdisciplinary collaborative practice, health profession curricula are changing from traditional isolated learning silos to curricula that provide more interactive learning between and among individuals from various health professions (Robertson & Bandali, 2008). Strategies such as interdisciplinary, team-based learning activities that promote effective communication, teamwork, and critical thinking can be used to promote

collaborative practice. Through working in teams or interdisciplinary groups, students learn how to effectively communicate and gain a greater understanding of multiple professional roles and responsibilities (Bandali, Parker, Mummery & Preece, 2008).

Health profession educators and trainers for FA and CPR have an obligation to prepare responders who are ready to assume their role and responsibilities as part of a team caring for individuals who are acutely ill or injured. Little data exist on the effectiveness of team-based training for FA and CPR education and team-based training may be incorporated into FA and CPR training to bridge this gap.

Post graduate team-based training has been shown to improve outcomes; however more research is needed on pre-graduate team-based training programs (Neily et al., 2010; Reagans, Argote & Brooks, 2005; Masters, O'Toole-Baker & Jodon, 2013; Brock et al., 2013; Horsley, Reed, Muccino, Quinoes & McCarthy, 2016). Recent initiatives, incorporating teamwork training for undergraduate students have shown promise in improving overall team communication and indicate that knowledge surrounding conditions such as cardiac arrest, rapid response, and trauma resuscitation can be improved by team-based training (VO Baker et al., 2015; VO Baker, Sturdivant, Masters, McCarthy & Carlson, 2015;

Masters, et al., 2013; Horsley et al., 2016; Brock et al., 2013). More research involving undergraduate health profession teamwork training as well as incorporation of undergraduate health profession teamwork training into health profession curricula is encouraged. While team training can improve care in many aspects of healthcare, there is limited research identifying the effect of team training in FA and CPR education (Weaver, Dy, & Rosen, 2014).

Participation in patient simulation experiences focusing on teamwork has been found to be an effective and efficient tool to enhance the learning process (Baker et al., 2008; Decker, Sportsman, Puetz, & Billings, 2008; Jeffries, Woolf, & Linde, 2003). Simulation can provide opportunities for the learner to gain valuable exposure to a variety of clinical situations and practice newly acquired skills in a safe environment while improving their interdisciplinary teamwork and communication skills (Weaver et al., 2014). Interdisciplinary, team-based simulation experiences lead to more effective team skills (Robertson et al., 2010; Tucker et al., 2003). In addition, utilizing simulation to enhance teamwork has been shown to enhance the quality of patient care while best preparing providers for practice (Bandali, Parker, Mummery, & Preece, 2008; Robertson & Bandali, 2008).

Course Development and Implementation

We developed a novel curriculum for undergraduate students to receive training in FA and

CPR based on content from the American Heart Association (AHA) and American Red Cross (ARC), as well as teamwork training using the Agency for Healthcare Research and Quality (AHRQ) Essential TeamSTEPPS® 2.0 program. We present our educational intervention which was developed based on the Kern 6-step model, and report our findings using Guidelines for Reporting Evidence-based practice Educational interventions and Teaching (GREET) (Kern, Thomas, & Hughes, 2009; Phillips et al., 2016).

A group of interdisciplinary faculty champions who support team-based education met over a 1-year time period to identify methods to enhance teamwork and learning among health profession and science students. By group consensus, the overarching theme that emerged was development of a course using an infrastructure of team building and communication with the ultimate goal of improving safety for the acutely ill and injured. A 3-credit elective course was designed using teamwork and communication as the infrastructure for implementing FA/CPR training based on ARC and AHA criteria. Kern's 6-step model for curricular development was used as the theoretical foundation for course development (Table 1) (Kern et al., 2009). No incentives were provided to the students. The course was approved by the university; however, approval from the university's Institutional Review Board was not indicated as information was reported as

the aggregate of the course and not on an individual basis.

Table 1. Kern 6-step model for curriculum development (Kern et al., 2009).

Steps
1. General needs assessment
2. Targeted needs assessment
3. Goals and objectives
4. Educational strategies
5. Implementation
6. Evaluation and feedback

Following Kern's Model (2009), a general needs assessment was conducted identifying the overarching theme of teamwork and communication as the foundation for the course. A focused assessment indicated FA, specifically CPR, as common content required by all health profession students prior to clinical experience and for those science students who wished to gain entry-level provider experience. Next, the group developed learning objectives, learning experiences, as well as methods to evaluate participant achievement of course outcomes (Table 2). A stepwise approach was used to build a milieu for team-based learning (Appendix A). Early in the course, students participating in panel discussions with multiple health care providers/responders described how each member of the team contributes to the care, well-being and quality of life of the acutely ill and injured followed by discussions focusing on the concept of collaboration and interdisciplinary care of those in need. Having gained an understanding

of roles and responsibilities of responders in the interdisciplinary care of patients, participants completed AHA BLS CPR certification with an emphasis on teamwork and communication. To defray direct cost to students, fees for this certification were included in tuition for the 3-credit course.

Teamwork training was then completed using AHRQ Essential TeamSTEPPS 2.0®. The rationale for use of this program include: there is no cost for use of the program; four members of our team are master trainers for AHRQ Essential TeamSTEPPS 2®; our team has trained hundreds of undergraduate learners; and we have had previous success when using this program for other educational initiatives.

Essential TeamSTEPPS 2.0® is a program used to review the four primary teamwork skills of leadership, communication, situation monitoring, and mutual support (Agency for Health Care Research and Quality TeamSTEPPS, 2011). Essential TeamSTEPPS 2.0® has been shown to be an effective method for providing teamwork training for health care providers. Components of Essential TeamSTEPPS 2.0® used for the course include:

- 1) **Briefing**-a tool used by the leader of the resuscitation team to delegate and oversee individual and team performance following the AHA 2015 guidelines.

Table 2. Course Objectives

Learning Objective	Learning Experience	Evaluation
1. Describe roles and responsibilities of responders including the contribution of each to the care, well-being and quality of life the acutely ill and injured.	Discussion panel with a variety of responders.	Rubric for discussion
2. Explain the concept of collaboration and interdisciplinary care of the acutely ill and injured.	Interactive lecture/discussion, discussion board participation, case studies and presentation of team-based care models for the acutely ill and injured.	Rubric for discussion
3. Obtain Basic Life Support for Healthcare Provider certification from the American Heart Association.	Completion of BLS from the AHA.	Certification achieved
4. Completion of Essential TeamSTEPPS 2.0 ®.	Completion and testing of Essential TeamSTEPPS 2.0 ® training.	Completion of training.
5. Complete First 5® Curriculum training.	Completion and testing of First 5® Curriculum training.	Completion of training
6. Model an awareness of personal and patient safety when caring for the acutely ill and injured.	Lecture/discussion, hands- on learning including human patient simulation scenarios.	Satisfactory return demonstration and verbal quiz.
7. Obtain blood pressure, radial pulse and respiratory rate of simulated patient.	Lecture/discussion, hands- on learning including human patient simulation scenarios.	Satisfactory return demonstration and verbal quiz.
8. Describe legal and ethical responsibilities for the care of the acutely ill and injured.	Interactive lecture/discussion, case studies and scenarios focusing on legal and ethical concepts when caring for the acutely ill and injured.	Satisfactory simulation participation
9. Demonstrate the ability to provide care to the acutely ill and injured incorporating team-based inter-professional principles.	Participation in inter-professional scenarios incorporating the TEAM and OSCAR tools	Satisfactory simulation participation, completion and review of TEAM, OSCAR

2) **STEP**- a situation monitoring acronym tool that reminds all team members to continually assess the **S**tatus of the victim, **T**eam members, **E**nvironment, and **P**rogress toward the goal.

3) **CUS**- a mutual support acronym tool that asks for team members to call attention to problems by using nonthreatening phrases such as-“This is a safety issue” “I am **C**oncerned about the patient’s condition” “I am **U**ncomfortable with the patient’s condition and “I believe the **S**afety of the patient is at risk.”

4) **Call out**-a communication tool used to convey information about the patient to all member of the team.

5) **Check backs**-a communication tool used to verify orders.

To evaluate the impact of Essential TeamSTEPPS[®], two validated tools Team Emergency Assessment Measure (TEAM) and the Observational Skill-Based Clinical Assessment Tool for Resuscitation (OSCAR) were used (Cooper, et al., 2010; Walker et al., 2011). Multiple tools have been developed for evaluating communication and teamwork, however not all are applicable to our work given the participant population and the course content. The TEAM tool was developed to produce a measure with an applicable focus on leadership and teamwork that was resuscitation context specific (Cooper et al., 2010). TEAM has been found to be a rapid (< 1 minute to complete), valid, reliable and feasible

nontechnical observational resuscitation teamwork assessment tool for trained observers to rate team performance and deliver a constructive debrief in simulated and clinical settings (McKay, Walker, Brett, Vincent & Sevdalis, 2012). Use of the TEAM tool enables team performance rating and feedback. The instrument is a checklist that can be used as a method of performance assessment and feedback provided by experienced clinicians for cardiac and trauma resuscitation teams in simulated settings (McKay et al., 2012). This tool was developed to produce a measure with an applicable focus on leadership and teamwork that was resuscitation context specific (Cooper et al., 2010). It is for these reasons we used TEAM as one of our assessment tools.

While TEAM provides a global assessment of teamwork, it provides little information at the individual provider level. Therefore, we also used a second tool: OSCAR. This tool has been found to be valid and reliable tool when assessing teamwork and non-technical skills in resuscitation contexts in a simulated environment (Walker et al., 2011). OSCAR also allows for detailed breakdown of the assessment of teamwork and non-technical skill as well as identification of areas of weakness in sub-teams and individuals facilitating constructive feedback to all team-members (Walker et al., 2011). It is for these reasons we decided to use OSCAR.

After completion of the teamwork training program, students then participated in a team-

based response to medical crisis training course, First-5® Minutes Curriculum (First 5, 2017). The First-5 is a simulation-based education and training program based on AHA and ARC guidelines for responders to foster collaboration and facilitate completion of key resuscitative tasks prior to the arrival of the medical emergency team. This program also provides a realistic and interactive learning arena for participants to practice key principles of the Basic Life Support “Chain of Survival”. First-5 training has been found to foster collaboration among providers when completing key resuscitative tasks (Tasota, Clontz, Shatzer & Dongilli, 2010).

Although the focus of the course was FA and CPR, support skills needed to effectively function as a responder including: patient and personal safety; patient assessment including vital signs; as well as legal and ethical responsibilities of responders were also presented. In the last few weeks of the course, after gaining an understanding of team-based FA and CPR care, students participated in realistic patient scenarios covering course content in our university’s Interdisciplinary Patient Simulation Laboratory. Use of simulation provided participants with the opportunity to apply acquired knowledge and skills in a safe environment followed by debriefing sessions.

Course content was presented via interactive lecture format, case studies, discussion, and clinical simulation to provide participants with

hands on learning and opportunities for interdisciplinary communication/teamwork experiences. Educational strategies were based on current adult learner theories and incorporated throughout the course to enhance the learners overall experience (Kern, Thomas & Hughes, 2009). Implementation of the course began in the Fall 2016 semester. The course topic schedule is found in Appendix A.

Course Experiences

A total of 9 students participated in the course; 3 baccalaureate degree nursing, 3 associate degree radiologic science, and 3 associate degree respiratory care students. Written course evaluations and verbal feedback were obtained from students and discussed amongst course and interdisciplinary champion faculty. Upon completion of the course, students demonstrated enhanced communication and teamwork skill when providing first aid and CPR to simulated patients as assessed visually by the faculty. Written course evaluation from students included statements such as; “I feel more comfortable with communication”, and “Teamwork is an important component of First Aid and CPR”. Through expert faculty evaluation of the course, we determined that the introduction of an interdisciplinary course for undergraduate health profession and science students incorporating team-based training and communication as the infrastructure positively impacted teamwork, communication, and simulated clinical outcomes.

Participants were able to demonstrate competency in FA and CPR skills. Observations by faculty indicated that participants incorporated critical thinking and improved communication while providing team-based care to simulated patients requiring first aid and or CPR.

Participants in the course had very positive comments about the course and most stated that they would take more interdisciplinary courses as they become available. Some comments made by students include; “We got to know each other as people first, then as responders caring for a patient together”, “I learned about the educational background of many people who I will be working with in the future”, “I gained respect for all members of the team”, “I learned is that everyone is responsible for their own actions”, “I didn’t know that certain health care professionals could perform CPR”, “I thought the doctor was in charge of all aspects of CPR” and “I feel more comfortable working with responders who are not in the same field as I am in”.

Anecdotally, faculty identified a difference in maturity of participants mostly based on the individual program of study. Associate degree students had a mean age of about 19 while baccalaureate students had a mean age of 21. Although there seems to be a slight difference in age of participants, faculty noticed that they

needed to encourage the associate degree students to fully participate in learning activities while this level of encouragement was not needed by baccalaureate participants.

Challenges

The major hurdle encountered in preparing and executing the course was identifying a day and time when most students who desired to take the course were available. Adding to existing curriculum is problematic since most health profession and science curricula may have little room to add new courses. An approach of adjusting the curricular design to include team based courses for areas of content of interest to health profession and science students such as care of a patient in anaphylaxis or care of the patient with an exacerbation of asthma. Courses such as these may provide the model by which health profession and science students are provided the opportunity to participate in interdisciplinary education and team based care of patients.

Future Directions

Our work lays the foundation for future team-based FA education. Formal assessment of the course with in-depth analysis of its impact is needed. Possible assessment tools may include; a pre-and post-course questionnaire utilizing a Likert-type scale; rubrics specific to clinical skill attainment and assessment; and validated performance assessment tools specific to

teamwork or first aid. Performing a pre-assessment of responder skills as well as assessing knowledge and readiness to provide care in the event of a medical emergency through a pre and post assessment such as Intent to Aid, may help to develop future courses and direct educational activities during the course (Miller & Pellegrino, In Press). Continued use and formal analysis of results of the TEAM and OSCAR tools is also recommended as they may be employed to better assess similar team based first aid education. We planned to measure resuscitation characteristics including time ventilation and time to compression; however we were not able to do so. We have planned additional measurement of these characteristics for future courses.

We plan to continue offering the inter-professional first aid/CPR course in the future and complete an ongoing literature review to continually identify best practices, keeping course content current and accurate. Another course focusing on teamwork and communication as the infrastructure for electrocardiogram interpretation is in development.

Implications for the Field

FA/CPR trainers have an obligation to the public and future employers to prepare responders who are equipped with knowledge and experience to assume their roles and responsibilities as a highly effective team member caring for the acutely ill and injured. Teamwork training has improved patient outcomes in the areas of healthcare including trauma resuscitation and surgical teams (Capella et al., 2010; Neily et al., 2010). Incorporation of team-based training as the infrastructure for FA/CPR may help to improve patient outcomes. Future work will be needed to understand how to best incorporate team training into first aid/CPR education.

Conclusion

Teamwork training has been incorporated for in-hospital critical situations and has improved patient outcomes. While little work exists exploring teamwork training for FA, we describe an undergraduate team training FA and CPR course that may help to address these gaps. Future work will be needed to identify the ideal way to perform FA team training and identify its impact on patient outcomes.

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Appendix A

GREET Checklist (Phillips et al., 2016).

BRIEF NAME
<p>1. INTERVENTION: Provide a brief description of the educational intervention for <u>all</u> groups involved [e.g. control and comparator(s)]. <i>A 3-credit elective course was designed using team-based training as the infrastructure for implementing an interdisciplinary first aid/CPR course incorporating guidelines from the American Red Cross and the American Heart Association.</i></p>
WHY - this educational process
<p>2. THEORY: Describe the educational theory (ies), concept or approach used in the intervention. <i>The theoretical foundation to develop the team-based interdisciplinary course was Kern's 6-step model (Kern et al., 2009).</i></p> <p>3. LEARNING OBJECTIVES: Describe the learning objectives for <u>all</u> groups involved in the educational intervention.</p> <ol style="list-style-type: none"> 1. Describe roles and responsibilities of responders including how each team member contributes to the care, well-being and quality of life of those in need. 2. Explain the concept of collaboration and interdisciplinary care. 3. Obtain Basic Life Support for Healthcare Provider certification from the American Heart Association and apply in interdisciplinary scenarios. 4. Apply TeamSTEPPS 2.0 ® and First 5 communication skill when part of an interdisciplinary group. 5. Model an awareness of personal and patient safety. 6. Demonstrate the ability to obtain and report vital signs. 7. Discuss legal and ethical responsibilities of providers <p><i>Concepts of teamwork and effective communication are the foundation for the course. Skills necessary for the care of the acutely ill and injured including basic assessment, vital signs, patient and responder safety along with legal and ethical responsibilities of responders were also included.</i></p> <p>4. EBP CONTENT: List the foundation steps of EBP (ask, acquire, appraise, apply, assess) included in the educational intervention. <i>Teamwork training has become increasingly popular in various healthcare settings (e.g. surgical teams); however; little data exist on how to teach teamwork skills to individuals in the context of first aid/CPR. A semester long course for undergraduate health profession and science students incorporating teamwork training as the infrastructure for first aid training and completion of Healthcare Provider CPR training from the AHA was developed. This course was an effective methodology to provide first aid/CPR training within a multidisciplinary framework.</i></p>
WHAT
<p>5. MATERIALS: Describe the specific educational materials used in the educational intervention. Include materials provided to the learners and those used in the training of educational intervention providers.</p>

Participants completed AHA BLS certification using all material provided by the instructor; Essential TeamSTEPPS 2.0 ® content was accessed at no cost from the website and First 5 Curriculum® content was purchased by the university for use in this course. No specific textbooks were used in the course.

6. EDUCATIONAL STRATEGIES: Describe the teaching / learning strategies (e.g. tutorials, lectures, online modules) used in the educational intervention.

The course included didactic/theory training, case studies, discussion, and clinical simulation to provide participants with hands on learning and opportunities for interdisciplinary communication.

7. INCENTIVES: Describe any incentives or reimbursements provided to the learners. **None**

WHO PROVIDED

8. INSTRUCTORS: For each instructor(s) involved in the educational intervention describe their professional discipline, teaching experience / expertise. Include any specific training related to the educational intervention provided for the instructor(s).

Suzanne Sturdivant, Med, RT,(R)(M)(CT) Director of Radiological Sciences Program, Instructor Radiological Sciences Program 17 years teaching experience

Michael McCarthy, MBA, CHSOS 4 years as ROTC instructor teaching leadership and 4 years teaching leadership elective, TeamSTEPPS 2.0 ® Master Trainer, Certified Healthcare Simulation Operations Specialist, multiple publications and research initiatives related to team-based training.

Valerie O'Toole Baker, RN, MSN, APRN-BC, CHES, Assistant Professor Villa Maria School of Nursing 30 years critical care teaching experience, TeamSTEPPS 2.0 ® Master Trainer, Certified Healthcare Simulation Education Specialist, multiple publications and research initiatives related to team-based training.

HOW

9. DELIVERY: Describe the modes of delivery (e.g. face-to-face, internet or independent study package) of the educational intervention. Include whether the intervention was provided individually or in a group and the ratio of learners to instructors.

The class met for face-to-face classes in the university's Patient Simulation Center. Methods of content delivery included interactive lecture, panel discussions, on-line group discussions, hands-on use of equipment needed to obtain skill proficiency, human patient simulation. The class size was 7. Three faculty from the disciplines of emergency first aid, radiologic science and nursing taught the course.

WHERE

10. ENVIRONMENT: Describe the relevant physical learning spaces (e.g. conference, university lecture theatre, hospital ward, community) where the teaching / learning occurred.

The course was held in the university's Interdisciplinary Patient Simulation Centre; a 5,800 square foot facility that was built to emulate the real-world environment. It is equipped with 14 high and medium-fidelity simulators, debriefing rooms, classrooms and integrated audio-visual recording capability and real-time viewing access.

WHEN and HOW MUCH

11. SCHEDULE: Describe the scheduling of the educational intervention including the number of sessions, their frequency, timing and duration.

The course was presented in weekly 3 hours classes over a 14-week semester. The topic schedule follows;

Weeks 1-2 Discussion of roles and responsibilities of responders to the care, well-being and quality of life of the acutely ill and injured. Panel discussion, discussion board

Weeks 3-4 Basic Life Support for Healthcare Provider American Heart Association Certification (CPR)

Weeks 5-6 TeamSTEPPS 2.0 ® training

Week 7 First 5® Curriculum training

Week 8-9 Theory and lab experience personal and patient safety, vital signs

Week 10- Legal and ethical responsibilities for responders

Week 11-13 Interdisciplinary scenarios

Week 14 Student presentations

12. Describe the amount of time learners spent in face-to-face contact with instructors and any designated time spent in self-directed learning activities.

During each class student were face to face with instructors for the entire class period. Most students spent about 10 hours in discussion forums and about 10 hours developing student presentations