

A One Health Approach to Risk Assessment Problem-Based Learning Lesson



Facilitator's Guide

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Abstract:

This lesson is centered on a Problem Based Learning (PBL) case study involving a One Health approach to the risk assessment process for a zoonotic disease hazard. It is recommended for use in university undergraduate courses with a focus on One Health related topics including social and health outcomes at the human – animal – environment interface. Prior understanding of microbiology, including virology and pathogen transmission will be useful, but is not required for students to be successful in this lesson. Students should have some experience locating, digesting, and synthesizing scientific literature. Supplemental literature resources are provided within the PBL lesson materials, but students may seek out additional resources on their own and should know how to discern appropriate sources.

Faculty role:

The main role of faculty will be to facilitate group discussions using open ended questions provided in each module and support students throughout their problem-solving group tasks. Throughout the modules there are points at which direct instruction is indicated, but they are few and intentionally included to support the PBL process. The information for direct dissemination is included in the accompanying slide set and may be augmented by the background information and additional resources provided for each module. However, it should be noted the background information and supplemental resources are not intended to be shared directly with the student unless and until it is recommended in the guide. Doing so will short-cut the students' learning process which is intended to include moments of frustration and discomfort as well as 'aha' moments and breakthroughs. To preserve the integrity of this process, faculty should take care to limit direct instruction to the specific moments indicated in this guide and focus on encouraging students to share, take risks, inquire, debate, reflect, review, clarify, collaborate, synthesize, and research. The goal of facilitators is to continually push students up against the limits of their understanding and support their creation of solutions rather than provide the solutions for them.

Learning Objectives:

Based on the Bloom's Taxonomy framework, the following learning objectives have been established for this lesson:

Remembering:

- At the end of this PBL activity, students will be able to define the following terms:
 - Risk, Likelihood, Impact, Mitigation, Pathogen, Stakeholders, Zoonotic Disease, One Health

Understanding:

- At the end of this PBL activity, students will be able to explain the following concepts:
 - Chain of Infection, Risk Pathway, Joint Risk Assessment, Qualitative Risk Assessment, Likelihood Estimate, Impact Estimate, Mitigation Strategies

Applying:

- At the end of this PBL activity, students will be able to demonstrate various hazards associated with Rift Valley Fever.

Analyzing:

- At the end of this PBL activity, students will be able to interpret supporting evidence from the literature as it pertains to zoonotic diseases and the contextual information necessary to understand their risks.

Evaluating:

- At the end of this PBL activity, students will be able to use evidence to develop a risk assessment question and develop a risk assessment report as well as ask generative questions of their peers and incorporate information to determine suitable mitigation strategies.

Creating:

- At the end of this PBL activity, students will be able to construct a process for performing a Risk Assessment that meets the general criteria of the JRA-OT.

Outline:

The following outline provides an overview of the lesson content. Note that each module may span more than one class period – or multiple modules may be incorporated into a single class session, depending on your scheduling situation. In addition, some of the tasks outlined in each module may be designated for out of class time work. It is recommended that facilitators read through the full set of modules and plan session times accordingly.

Each module outlined below has a set of slides for presentation and many also have one or more resources for facilitators or students. These resources can be delivered in hard copy or digitally. Items - noted with an * below are suitable for use as authentic assessments / evidence of learning using proficiency rubrics.

Please note: The information included in this facilitator's guide is not intended for distribution to students. This is for your use in preparing and facilitating sessions only. Distributing or verbally disseminating this information directly will take away from the intended experience for the students.

Module 1

- Students explore the concept of risk through open ended questions.
- Students are introduced to the general concepts relating to a One Health approach to risk assessment through evaluation of an article and follow up discussion.

Module 2

- Students are introduced to the practice of PBL including student and facilitator roles and responsibilities and co-created of ground rules.
- Students form working groups and self-assign roles.
- Students receive the first set of Case Study information.
- Students identify expertise and information needs to address the Problem.

Module 3

- Students begin their investigation of the pathogen in question.
- Students identify components of a Pathogen Model.
- Students create a Pathogen Model for RVFV.

Module 4

- Students are introduced to the Chain of Infection as a Pathogen Model.
- Students develop a Chain of Infection for RVFV.
- Students finalize a Pathogen Model*.

Module 5

- Students explore the concept of Risk Pathways.
- Students create Risk Pathway Diagrams*.

Module 6

- Students craft a Risk Assessment Question from their identified Risk Pathways.
- Students share and revise and finalize their Risk Assessment Question*.

Module 7

- Students explore strategies to estimate and communicate likelihood.
- Students perform Likelihood Estimates for their Risk Assessment Question.
- Students develop a method for communicating their estimates.
- Students finalize and graphically present their Likelihood Estimates*.

Module 8

- Students explore strategies to estimate and communicate impact.
- Students perform Impact Estimates for their identified risk assessment question.
- Students develop a method for communicating their estimates.
- Students finalize and graphically present their Impact Estimates*.

Module 9

- Students receive the Climate Change Challenge
- Students finalize and write-up their Climate Change Considerations*.

Module 10

- Students present their Risk Assessment Report Oral Presentation* to classmates who represent stakeholders.
- Stakeholders ask generative questions*.

Module 11

- Students develop Risk Mitigation Strategies.
- Students finalize Risk Mitigation Strategy Recommendations*.

Final Deliverables

- Group Presentation and Discussion Participation
- Completed Risk Assessment Report
- Final Reflections

Module 1: Principles of Risk Assessment

Background

A One Health Approach to Risk Analysis

Risk analysis is a systematic approach to evaluating both the likelihood of occurrence and the magnitude of impact if a particular adverse event occurs and taking steps to mitigate that risk and communicate with relevant stakeholders and populations. In the context of endemic or emerging zoonotic diseases, risk analysis is important to understand the potential impacts of a disease event on human and animal health as well as environmental, economic and social consequences. The coordination of expertise from multiple sectors is required to jointly assess and manage zoonotic disease risk effectively. To operationalize this process, the Tripartite organizations – the Food And Agriculture Organization of the United Nations (FAO), the World Organisation of Animal Health (OIE) and the World Health Organization (WHO) developed a Joint Risk Assessment Operational Tool to support coordinated efforts to prepare for and respond to issues impacting global health security.

The activities in this module have been developed to provide students with an overview of the One Health approach to zoonotic disease risk assessment well as with practice in executing adapted versions of the JRA OT process.

Please see: [Joint Risk Assessment Operational Tool](#) for more information.

Session 1 opens with a series of questions to stimulate discussion, continues with an introduction of key concepts, and closes with an exercise reading and analyzing an article (provided).

Opening Questions (slide 2)

1. Explain what the word “risk” means to you.
2. Describe some examples of risks you are aware of in your own environment or routine.
3. When you make decisions about activities that involve risk, what information do you use to help inform those decisions? Explain.

Experience

Principles of risk assessment (Slides 3 - 7)

Use the slides provided (or modify as you see fit) to introduce the concepts listed below. For additional information in preparing for this module you may refer to the [Joint Risk Assessment Operational Tool](#).

1. Principles of Risk Assessment
2. In the context of One Health risk assessment is often used in the context of a zoonotic disease event.
3. Risk assessment comprises two components: likelihood and impact
 - a. Likelihood is the probability that the event in question will occur
 - b. Impact is the consequences that event will have on health, economy or other areas of interest.
4. Risk assessments can be qualitative or quantitative

- a. In quantitative assessments likelihood and impact are expressed using numbers. Missing data are estimated using models.
- b. Qualitative assessments use descriptive sets of categories (low, medium, high, etc.) with clear definitions for each. Qualitative assessments are appropriate for faster assessments in situations where data are limited.

In Class Activity

Why Joint Risk Assessment?

Provide a news article with a description of a zoonotic disease event:

<https://news.mongabay.com/2021/08/black-death-aside-we-know-surprisingly-little-about-rodents-and-disease/>

Have students read article

Engage students in a group discussion about the article focusing on the following topics (slide 9)

1. Describe the risks you identified when reading the article
2. Share your thoughts on the different groups/stakeholders/sectors that could have an interest in the assessment of risk related to rodent carried zoonotic disease? (some examples to explore include):
 1. Animal health
 2. Human health
 3. Ecology
 4. Animal Agriculture
 5. Crop agriculture
 6. Population biology
 7. Virology
 8. Pest management
3. How do you think a risk assessment that is narrowly focused on one of these sectors might be incomplete or have unintended adverse consequences?

Joint Risk Analysis (slide 10)

At this point, introduce the concept of Joint Risk Analysis as a method to bring together information and expertise from multiple stakeholder groups/sectors and to incorporate these components into a collaborative risk assessment process. Inform your students that over the course of the following sessions they will be forming working groups that will serve as risk assessment teams to perform an assessment of a zoonotic disease risk problem.

Reflection

Toward the end of the class provide students with time for reflection. The reflection period will provide an opportunity for them to discuss the challenges and successes that they experienced both individually and as a member of the group. Facilitators may wish to provide a reflection sheet for students to record their reflections.

During the reflection period, the facilitator should move between groups observing for indicators that groups are functioning well and asking open-ended questions to help assess students' understanding of current topics and processes. It is also important to identify and address any misunderstandings students might have.

Example reflection questions include:

1. Describe some strategies that could be used in the process of conducting a Joint Risk Assessment.
2. Share what you think the benefits and challenges to implementing these strategies would be?

Concept and Term Introduction:

During discussions the students should demonstrate understanding of the following terms and concepts:

Risk, Likelihood, Impact, Mitigation, Pathogen, Stakeholders, Zoonotic Disease, One Health

If misunderstandings are evident during discussions, facilitators should help guide learners to correct misconceptions.

Go Further:

This paper may be assigned as follow up reading. Facilitators may choose to provide thought questions for the students to respond to in writing, on classroom discussion boards, or orally in class.

Kelly et al. (2020) Implementing One Health approaches to confront emerging and re-emerging zoonotic disease threats: lessons from PREDICT

<https://doi.org/10.1186/s42522-019-0007-9>

Module 2: Problem-Based Learning

Background

Problem-Based Learning (PBL) is a teaching method in which complex real-world problems are used as the vehicle to promote student learning of concepts and principles as opposed to direct presentation of facts and concepts. In addition to course content, PBL can promote the development of critical thinking skills, problem-solving abilities, and communication skills. It can also provide opportunities for working in groups, finding and evaluating research materials, and life-long learning (Duch et al, 2001).

In this module the students will be introduced to the practice of Problem-Based Learning including the roles and responsibilities of group members and the facilitator.

For more information see: Duch, B. J., Groh, S. E, & Allen, D. E. (Eds.). (2001). *The power of problem-based learning*. Sterling, VA: Stylus.

Opening Questions (Slide 12)

Initiate a discussion on behaviors that contribute to, and detract from, group project success. Use the questions on slide 12 to start the discussion

1. In your experience, what are some behaviors or beliefs that help group projects to be successful?
 - a. Please share your experience with a successful group project.
2. In your experience, what are some behaviors or beliefs that make group projects unsuccessful?
 - a. Please share your experience with an unsuccessful group project.

Experience

Generate the Group Norms for Problem-Based Learning Cases

Based on this discussion, generate and record a list of group norms and ground rules that can be shared throughout the class. You can use slide 13 to record this list during discussion. Some ideas for topics to include in your group norms are provided below. These suggestions are not intended to be read verbatim to the class, but rather can be used to refine your group norms/ground rules document as it is being co-developed with the class.

Group Norms, Ground Rules and Roles were adapted from: Mellema, M., Epstein, S., McSorley, S., Watson, J. University of California School of Veterinary Medicine. Infectious Disease and Immunology VET 413 PBL

Group Norms and Ground rules:

Ideas for group norms and ground rules:

Respect others and support participation by all group members. Allow space for alternative opinions and engage in generative discourse. Follow through on commitments to the group and take personal responsibility for your contributions. Make attendance in class and to out of class meetings a priority.

When working in a group, minimize other distractions. Respect the process of the PBL – take each assignment step by step rather than trying to jump ahead. Respect the role of the facilitator as a guide – don't take it personally if the facilitator does not give you the exact information you request.

This is also an appropriate time to briefly review with students that unauthorized collaboration and plagiarism are considered academic misconduct. Within group collaboration is a necessary part of the process, but students should refrain from sharing their work with other groups outside of specified presentations. Students will need to collect a significant amount of information from previously published work and should utilize fastidious resource organization and citation practices. Students should also be aware that submitting work by the group where one or more group members have not participated is a form of plagiarism. Within group conflicts should be addressed with the facilitator as early as possible to allow for mediation.

Faculty role:

This is also a good time to discuss student expectations of the facilitator. At least initially, students are likely to expect the facilitator to step into a traditional faculty leadership role, providing direction and answers. This, however, is not the role of a facilitator and is therefore worthy of clarification.

Form Working Groups

Assign, or allow students to self-select, groups of at least three and no more than 5 members. Give students some time to become acquainted with their group members.

Assign roles

After a discussion of the traditional roles in a PBL group (Slide 15), students should be encouraged to consider other roles they may want to include in their groups. All roles should then be self-assigned and rotated at each PBL session.

The Chairperson is responsible for the overall functioning of the PBL meeting. They should set an appropriate tone for the group – one that is positive, respectful, and inclusive and make sure that the group stays focused on task and organized in their processes. The Chairperson may also facilitate the delegation of work to other group members and guide the consensus making or compromise making within the group.

The Scribe is responsible for organizing and prioritizing information generated in group discussion. The scribe will also make sure that proper documentation and citation practices are in place. The scribe is not the group secretary, however, and all group members should be actively taking notes or participating in documentation during group activities.

The Timekeeper is responsible for determining an agenda for the group meetings and helping to keep the group on track. Other group members should also be cognizant of time constraints and respectful of the scribe when they remind the group of time constraints.

Other roles may be created by the groups. **If there is consensus within a group to add a role, it should be clearly defined and named.** These additional roles do not need to be incorporated into all groups, but can be shared with the full class and may be adopted at the individual group level if desired by group members.

Groups should now self-assign roles. These roles will remain in place for the rest of the current module.

Introduce the Case Study (Slide16 &17) and the Problem (Slide 18)

The students are now ready to be introduced to the Case Study and the Problem they will be addressing in their groups. In the accompanying slides the Case Study provides information on Rift Valley Fever outbreaks in Uganda. Information about the epidemiology and laboratory work done during those outbreaks is provided. Depending on the experience of the students, some explanation of technical terms may be required. The Problem asks students to assess the risk that another RVFV outbreak in Uganda will impact the health of humans, livestock or wildlife. The Problem is intentionally left quite open ended at this stage. As the students familiarize themselves with the pathogen (Modules 3 and 4) and the associated Risk Pathways (Module 5) they will accumulate the information necessary to develop specific risk assessment questions (Module 6) for which they will complete their assessment.

A Note on Creating your own Case Study and Problem

Facilitators are encouraged to present Case Studies and Problems that are relevant to their students. To do so, you need only provide information about a potential source of a pathogen such as RVFV (or others) and then present a problem regarding possibility of an outbreak of that pathogen from the within the source country or not. It is important that the Case Study you provide includes data from actual (not fictionalized) outbreaks, and the Problem is a feasible risk scenario. Keeping the problem broad at the outset is recommended so that the individual groups of students can craft their own specific risk assessment questions. This will reduce the likelihood that groups are all working on the same specific risk assessment question at the same time (see Module 5 for more information on crafting risk assessment questions).

Case Study Development Resources:

An excellent resource for information on which you may base your Case Study and Problem is the Centers of Disease Control outbreak summaries. The link below will take you to a comprehensive set of information for RVF including information on recent outbreaks.

<https://www.cdc.gov/vhf/rvf/outbreaks/summaries.html>

For example, facilitators might choose to use the outbreak of RVFV in Mayotte as the Case Study and the potential spread to the EU as the Problem.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/902415/poa-rvf-mayotte.pdf

Case Study and the Problem-Solving Process

While much of the work that the students will do on this problem will be open-ended, the modules that follow provide a process for executing this risk assessment work that is modeled after the process developed for the JRA-OT. As students execute each step of the process, they will accumulate information and develop skills that will allow them to draw conclusions about the potential risks.

Background information is provided for facilitators only and should not be distributed - although this information is available online and may be discovered by the students during their research. Focusing on the process of the risk assessment versus just the “answer” to the risk assessment problem diminishes the value, somewhat, of facts found online and increases the value of using those facts in a process that is systematic and comprehensive.

Group Questions (Slide 19)

Before embarking on their research and problem solving, students should be encouraged to take a systematic approach. One way to accomplish this is to discuss and discover the types of expertise that would be needed to engage in this activity and the general types of information that will be needed to assess the situation. Facilitators may want to use the questions on slide 19 to start these conversations. Conversations should be conducted within the small groups with students taking their agreed-upon roles.

Information Needs (Slide 20)

Once groups have worked together to brainstorm the types of expertise and information needed to address this problem, facilitators may lead a group discussion where these ideas are shared and recorded. Slide 20 provides a template for recording some highlights of this conversation. This slide could also be reformatted with one box per slide for additional recording space, or without the titles to keep the discussion even more open ended.

Reflection

Toward the end of the class provide students with time for reflection. The reflection period will provide an opportunity for them to discuss the challenges and successes that they experienced both individually and as a member of the group. Facilitators may wish to provide a reflection sheet for students to record their reflections.

During the reflection period, the facilitator should move between groups observing for indicators that groups are functioning well and asking open-ended questions to help assess students' understanding of current topics and processes. Example reflection questions include:

1. Describe how you would compare the role of a PBL facilitator to that of a traditional professor?
2. Share what you think the benefits and challenges to participating in a PBL group may be.
3. Explain how you think information from an array of sources will be useful to this PBL process?

Concept and Term Introduction:

During discussions the students should demonstrate understanding of the following terms and concepts:

Case study, Problem, Chairperson, Scribe, Timekeeper, Facilitator, Consensus, Collaboration

If misunderstandings are evident during discussions, facilitators should help guide learners to correct misconceptions.

At this point, the group should also switch roles (Chairperson, Timekeeper, Scribe, Other) in preparation for the next group task.

Module 3: Pathogens

Background

Rift Valley fever (RVF) is an acute, fever-causing viral disease most commonly observed in domesticated animals (such as cattle, buffalo, sheep, goats, and camels), with the ability to infect and cause illness in humans. The disease is caused by RVF virus, a member of the genus Phlebovirus in the family Bunyaviridae. It was first reported in livestock by veterinary officers in Kenya's Rift Valley in the early 1910s.

In this module, the students will begin to develop a deep understanding of the pathogen responsible for RVF.

For more information on the RVFV see:

Grossi-Soyster, E.N. and LaBeaud A.D. (2020). Rift Valley Fever: Important Considerations for Risk Mitigation and Future Outbreaks.

[doi:10.3390/tropicalmed5020089](https://doi.org/10.3390/tropicalmed5020089)

Opening Questions (Slide 22)

Begin this module with the opening questions provided on Slide 21:

1. Explain what the term 'pathogen' means to you.
2. Describe some things you would need to understand about a pathogen to be able to evaluate the risk of disease events occurring.

Experience

Inform the students that they will be working in their small groups to collect, organize, and present information about the RVFV that will help them in their assessment of the problem presented in module 2. The Group Task is outlined on Slide 23. If necessary, reshare slides 16 and 17 when introducing this task.

Provide the students with class time to work on this task and remind them that they will need to organize and present this information. Presentation format can be open ended, or facilitators can provide some criteria such as limiting presentations to 1-page of text or to no more than 3 slides. Facilitators may want to add presentation criteria to slide 23.

Depending on class time available, students may need to continue collecting and organizing information during out of class time.

Pathogen Model

There are multiple ways to characterize pathogens based on their transmission and interactions with host organisms. In this exercise students may use an existing model – or develop their own model for representing the relevant categories of information. This discovery process is important, so it is recommended that facilitators do not introduce the students to the Chain of Infection until Module 4 after students have completed their independent work.

Reflection

Toward the end of the class provide students with time for reflection. The reflection period will provide an opportunity for them to discuss the challenges and successes that they experienced both individually and as a member of the group. Facilitators may wish to provide a reflection sheet for students to record their reflections.

During the reflection period, the facilitator should move between groups observing for indicators that groups are functioning well and asking open-ended questions to help assess students' understanding of current topics and processes. It is also important to identify and address any misunderstandings students might have.

Example reflection questions include:

1. Share some of what you have discovered about the pathogen responsible for Rift Valley Fever virus.
2. Explain some characteristics of this virus and their connections to One Health?

Concept and Term Introduction:

During discussions the students should demonstrate understanding of the following terms and concepts:

Pathogen, disease transmission, zoonotic disease, vector, virus,

If misunderstandings are evident during discussions, facilitators should help guide learners to correct misconceptions.

At this point, the group should also switch roles (Chairperson, Timekeeper, Scribe, Other) in preparation for the next group task.

Module 4: Characterizing Rift Valley Fever Virus

Background

An effective way to organize this information is to develop a Chain of Infection for the pathogen. In the previous module, students were asked to collect and organize information about the RVFV. In this Module facilitators will introduce the Chain of Infection as a model for characterizing pathogens and will co-create a Chain of Infection for RVFV with the students. Working through this process as a group will ensure that students have correct and complete foundational knowledge about the RVFV upon which they will base their risk assessments.

For more information on the Chain of Infection see:

<https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section10.html>

Opening Questions: Slide 25

Begin the session with the opening questions provided:

1. When collecting and organizing information about RVFV, what were some of the categories of information you decided to include in your model?
2. Were there categories of information you decided to leave out of your model? Why or why not?

Experience

The class and the facilitator will now co-create a Chain of Infection for RVFV. Working through each of the categories of the Chain of Infection, invite students to contribute to and discuss a set of information to complete each link in the chain. Discuss the definition of each link in the chain (slides 26-32) and then use the blank diagram on slide 33 to fill in the information specific to RVFV. The information included in the final diagram should be student generated through consensus.

Provide class time for the groups to revisit their Pathogen Models and revise as necessary. Note: it is not necessary that groups abandon their original models only that they make sure their models include all the categories of information included in the Chain of Infection. After students have had a chance to review their models, engage the whole class in a reflection discussion.

Reflection

Toward the end of the class provide students with time for reflection. The reflection period will provide an opportunity for them to discuss the challenges and successes that they experienced both individually and as a member of the group. Facilitators may wish to provide a reflection sheet for students to record their reflections.

During the reflection period, the facilitator should move between groups observing for indicators that groups are functioning well and asking open-ended questions to help assess students' understanding of current topics and processes. It is also important to identify and address any misunderstandings students might have.

Example reflection questions include:

1. Discuss what you see as the strengths and weaknesses of the Chain of Infection model.
2. Share any categories of information you decided to include in your model that are not included in the Chain of Infection model.

Concept and Term Introduction:

During discussions the students should demonstrate understanding of the following terms and concepts:

Chain of Infection, susceptible host, portal of entry, modes of transmission, portal of exit, reservoirs, infectious agent.

If misunderstandings are evident during discussions, facilitators should help guide learners to correct misconceptions.

At this point, the group should also switch roles (Chairperson, Timekeeper, Scribe, Other) in preparation for the next group task.

Module 5: Risk Pathways

Background

Risk pathways describe the logical movement sequence of the hazard from its source to its infection of the host of interest. The entire risk pathway for most zoonoses includes the route by which the pathogen encounters the population of interest, through its spread in animals and into humans (or other hosts), and potentially back into animals. This includes animal transport, human animal interactions, vector interactions, potential exposures/infections in other species and wildlife, and border crossings. Including all points in a logical sequence allows understanding of the events and processes along each pathway.

Risk Pathways are communicated using diagrams that resemble flow charts. These diagrams outline all possible pathways that the pathogen might travel via animal to animal, vector mediated, animal to human, human to human, and human to animal transmission.

Much of the information students will need to create their Risk Pathways is included in their Pathogen model. Additional contextual information will be needed and can be researched independently. All biologically possible pathways should be included at this stage. Assessing the likelihood of the pathways will happen at a later stage in the process.

Opening Questions: Slide 36

Open this session with a set of discussion questions. You may use those provided on slide 35.

1. Explain what the phrase 'risk pathway' means to you.
2. Describe how you think context and sequence might be important in defining risk pathways.

3. Describe what you imagine a risk pathway diagram might communicate? How might it be presented visually.

Experience

If possible, provide all groups with white boards or flip chart paper and a set of different colored markers for their group work. Present the Group Task slides (36 and 37) and provide time in class for the groups to begin working on the assignment.

The students will be creating three separate Risk Pathway diagrams with the end point for each being an infected human, infected livestock, or infected wildlife. There will be overlap between these diagrams and the end points of one diagram will be steps in the pathways for other diagrams. The goal is for the students to work out a way of clearly distilling and communicating these processes.

Decide how you would like the groups to present their Risk Pathway Diagrams for submission. Options range from hand drawn diagrams on flip chart paper, photos of diagrams on white boards, or digital diagrams created in PPT or using other graphic display tools. You may want to add these criteria to slide 37.

Depending on class time available, information can be collected and organized during class time or as homework. Final products should be submitted prior to the next class with enough time for you to review.

Risk Pathway Diagram

There are multiple ways to diagram Risk Pathways. An effective way to organize this information is to develop a flow chart that identifies the following:

Modes of transmission within Uganda country. Examples should cover all potential modes of transmission between sources and susceptible hosts. Examples (not an exhaustive list) include:

- a. Contact via bodily fluids between infected livestock and host livestock on farms, while herding, or in live markets (livestock to livestock)
- b. Contact via bodily fluids between infected livestock during animal care (livestock to human)
- c. Ingestion of infected meat or milk products (livestock to human)
- d. Contact with meat from infected animals at slaughter or processing (livestock to human)
- e. Vector transmission between infected livestock and host livestock (livestock-mosquito-livestock)
- f. Vector transmission between infected livestock and wild ruminants (livestock-mosquito-wildlife)
- g. Vector transmission between infected livestock and humans (livestock-mosquito-human)

Students may initially experience some frustration with the open-ended nature of this task. This discovery process is important, so it is recommended that facilitators refrain from providing explicit examples or answers to the students. Rather it is recommended that facilitators guide students back to using their resources, namely the information provided in the Case Study, the Problem, the Pathogen Model and the Group Task instructions and collaborate within their groups to create their own solution.

When reviewing Risk Pathway Diagrams, proficiency grades can be utilized to assess the completeness of the work using the criteria outlined above as a model. For example, highly proficient work would

include 3 separate Risk Diagrams each clearly presenting the potential transmission pathways for human, livestock or wildlife infection endpoints.

The example of a Risk Pathway Diagram from the JRA-OT is provided on slide 39. ***Do not share this slide with the students until they have completed their independent work.***

Reflection

Toward the end of the class provide students with time for reflection. The reflection period will provide an opportunity for them to discuss the challenges and successes that they experienced both individually and as a member of the group. Facilitators may wish to provide a reflection sheet for students to record their reflections.

During the reflection period, the facilitator should move between groups observing for indicators that groups are functioning well and asking open-ended questions to help assess students' understanding of current topics and processes. It is also important to identify and address any misunderstandings students might have.

Example reflection questions include:

1. Share your progress on your Risk Pathway diagram. What challenges, if any, have you encountered so far?
2. How has the Chain of Infection helped inform your Risk Pathway development?
3. What types of additional information (beyond that included in the Chain of Infection) have you chosen to include in your Risk Pathway diagram?

Concept and Term Introduction:

During discussions the students should demonstrate understanding of the following terms and concepts:

Risk pathway, Risk Pathway Diagram, modes of disease transmission, sequence and context (as they relate to defining risk pathways).

If misunderstandings are evident during discussions, facilitators should help guide learners to correct misconceptions.

At this point, the group should also switch roles (Chairperson, Timekeeper, Scribe, Other) in preparation for the next group task.

Go Further:

This paper may be assigned as follow up reading. Facilitators may choose to provide thought questions for the students to respond to in writing, on classroom discussion boards, or orally in class.

Islam, K. et al. (2020) An assessment on potential risk pathways for the incursion of highly pathogenic avian influenza virus in backyard poultry farm in Bangladesh

<https://pubmed.ncbi.nlm.nih.gov/33281343/#&gid=article-figures&pid=figure-1-uid-0>

Module 6: Risk Assessment Questions

Background

Following the completion of the Risk Pathway Diagrams, the students may begin to feel a bit overwhelmed by the sheer number of potential avenues by which a disease outbreak may occur. During the risk assessment process, it is not feasible to simultaneously evaluate each of the potential pathways in detail so risk assessment teams must formulate specific risk assessment questions to ensure that the next steps of the process can be achieved practically and will generate information that will be relevant to stakeholders.

According to the process outlined in the JRA-OT appropriate risk assessment questions are written using the general format of: **“What is the likelihood and impact of...?”** and includes clarifying information from several specific categories.

The outline below is a modified version of the JRA-OT categories.

What is the likelihood and impact of:	
WHAT	Outcome (illness, death, abortion, etc.)
WHY	Pathogen
WHERE	Location (district, township)
WHO	Population (goats, cattle, sheep, adults, children, farmers, butchers, etc.)
WHEN	Timeframe (in the rainy season/in the dry season)
HOW	Source of Exposure (live animal market, water source, slaughterhouse, on farm etc.)

Opening Questions: Slide 41

Have the students form into their groups and retrieve their Risk Pathway diagrams before beginning this session. Once students are settled, begin with the following opening questions.

1. Looking at your Risk Pathway diagrams, how would you describe the array of risks you identified?
2. Explain how you might use your Risk Pathway diagrams as a resource in risk assessment.
 - The students should arrive at the conclusion that they will need to go further with the identified risks but may not recall/know the specific language of risk assessment at this time. That is ok as these terms will be introduced in the exercise that follows.
 - The goal of these questions is to allow the students to realize that the breadth of the risks identified in the pathway diagrams is significant and that up to this point in the process we have only identified the possibility of risks, not their impact or likelihood or

the contexts in which these risks could occur. To efficiently move forward with the more in-depth assessments we need to narrow in on more specific risk questions.

Experience

To help the students move forward with their assessment work, they will be presented with a continuation of the Problem. After the opening discussion, present the information on slide 42. Students have been asked to evaluate a specific risk scenario involving the by the Ugandan Ministry of Health.

Note: the details of the scenario may be modified given the initial Problem you presented for your class.

Then present the Group Questions on slide 43. **These questions should be worked through in the small groups and not led as a whole group discussion by the facilitator.**

1. Explain how you think the Risk Pathway diagrams will be useful to the task you have been asked to accomplish.
2. In what ways are the Risk Pathways not suitable for this task? Explain.
3. What additional information do you believe would be needed to continue with the problem? Explain.
4. Describe what you believe the next steps might be in the risk assessment process.

From this discussion, the groups of students should begin to discover that the risk pathways, while informative, are too general to be very useful in generating risk assessments that will be actionable and that they will need to use the context of the Problem to generate more specific risk assessment questions that relate to the Risk Pathways.

Next, present the Group Task on Slide 44.

Working in groups, students are given the task of developing a specific risk assessment question.

The goal of crafting risk assessment questions is to identify a specific context for their risk assessment such that the results of the assessment will be useful to their stakeholders.

The students should focus on the Karamoja region of Uganda. Facilitators may find this map useful in orienting themselves to the area.

<https://reliefweb.int/map/uganda/sub-regions-uganda-12-may-2020>

Students will need to do some background research on the Karamoja region, the districts within the region and the Karamojong. Their research should allow them to identify aspects of the geography, lifestyle, livelihood and customs that may make this population vulnerable to an RVFV outbreak.

Facilitators may find these articles useful in orienting themselves to the population:

<https://minorityrights.org/minorities/karamojong-and-related-groups/>

<https://www.kideponationalpark.com/information/the-karamojong/>

Note: Students should be able to readily access these sources (and others) on their own during their research process.

Allow time for group discussion and collaboration as they work to craft their risk assessment questions. Visit with the small groups as they work, and ***if groups are struggling you may guide them to think about the Who, What, Where, Why, When and How approach - but do not reveal the question structuring process of the JRA -OT.***

With some time remaining in the class period, ask each group of students to share their risk assessment questions on a white board or flip chart paper. If the class is large with many groups, you can complete this exercise in several groups of groups rather than as a full class.

Group Discussion

1. Compare the questions shared by each group and describe any themes or similarities you notice.
 - a. Students may want to circle, underline or use color to indicate similarities across the questions.
2. Compare the questions shared by each group and describe any differences you notice.
 - a. Students may want to circle, underline or use color to indicate similarities across the questions.
3. The next steps of the discussion will depend on what the student's have discovered about writing specific questions. The goal is for them to discover that they will need to hone their questions to be specific about time, location, population, outcome and source. Bring the conversation back to the stakeholder's perspective...what will they need to know to best prepare for risks in their communities?
4. As the discussion is nearing an end, introduce the (modified)question development rubric from the JRA-OT. Discuss the components of the rubric that were included in the students' questions, and those that were not.

Have the students self-check their three assessment questions against the JRA-OT rubric and re-write them using the color-coded approach.

Examples of risk assessment question using these categories:

What is the likelihood and impact of **nomadic herders** in **the Moroto district** becoming **critically ill** from **exposure to RVFV during cattle drives** in the **rainy season** and the **dry season**?

What is the likelihood and impact of **goat herds** in the **Abim district** experiencing **high rates of spontaneous abortions** from exposure to **RVFV at water sources** during the **rainy season** and the **dry season**?

Reflection

Toward the end of the class provide students with time for reflection. The reflection period will provide an opportunity for them to discuss the challenges and successes that they experienced both individually and as a member of the group. Facilitators may wish to provide a reflection sheet for students to record their reflections.

During the reflection period, the facilitator should move between groups observing for indicators that groups are functioning well and asking open-ended questions to help assess students' understanding of current topics and processes. It is also important to identify and address any misunderstandings students might have.

Example reflection questions include:

1. Describe the process your group used to craft a risk assessment question. What was challenging about this process?
2. Describe connections or differences you noticed between the way you organized your risk assessment question and those of other groups.
3. Describe connections or differences you noticed between the way you organized your risk assessment question and the structure provided by the Joint Risk Assessment tool?

Concept and Term Introduction:

During discussions the students should demonstrate understanding of the following terms and concepts:

Stakeholder, outcome, location, source, timeframe, population (as they pertain to the crafting of risk assessment questions).

If misunderstandings are evident during discussions, facilitators should help guide learners to correct misconceptions.

At this point, the group should also switch roles (Chairperson, Timekeeper, Scribe, Other) in preparation for the next group task.

Module 7: Qualitative Risk Assessment

Background

Now that the students have identified specific risk questions, they are ready to carry forward with their risk assessment process. The next steps in the process is determining what types of additional information they will need to make their assessments of likelihood, collecting said information, and then using the information to conduct a qualitative risk assessment.

The types of information the students will need at this stage will largely relate to the Karamoja region and the Karamojong people. Data may include population statistics, environmental conditions, and the epidemiology of the virus. For example, students may seek out information pertaining to the specific location they have identified in the risk assessment question pertaining to human and animal population estimates, locations of large farms, nomadic herding traditions, commonality of home butchering, populations of wild ruminants, proximity of wild ruminants to population centers, weather, seasonality and mosquito life cycles. They may also seek out information from outbreaks in other locations to determine how the virus behaved in those circumstances and what outcomes were recorded. Much of this information will be available online from government or university sites or in the academic literature. In addition, students are encouraged to reach out to experts on campus or at universities in the region they are researching for additional guidance or input.

The students should focus on the Karamoja region of Uganda and may want to collect information about neighboring areas as necessary (other regions in Uganda or the border area with Kenya, for example).

Documentation of information gathering is essential. Students will need to keep excellent records of sources of information in addition to the facts gathered and their interpretations/analysis. This component of the project will require significant out of class time for research and writing as well as in class time for discussion, analysis and synthesis of information. Facilitators may require specific forms and modes of documentation practice and if so, this should be shared with students during this lesson.

The JRA-OT uses a qualitative approach to estimating likelihood and impact. As such, each risk assessment question is evaluated using available information to determine the chance of the situation in the risk assessment questioning happening (likelihood) and the how bad the consequences would be if the situation were to occur (impact). This module will focus on estimating likelihood. Module 8 will focus on impact assessment.

Opening Questions: [Slide 47](#)

1. In reviewing your finalized risk assessment questions, describe what you believe could be the next steps in the risk assessment process.
2. In the context of your risk assessment question, what does the term likelihood mean to you? Explain.
3. Explain the types of data you will need to assess the likelihood of the outcome defined in your risk assessment questions.

4. Describe any challenges you foresee with making estimates of likelihood.

Experience

After the opening questions, groups should form and all students should have access to their Pathogen Characterization Model, their Risk Pathway Diagrams, their Risk Assessment Questions and any supporting information they have collected on the population, location or context for their risk assessment question. Students should also have access to flipchart paper or a white board and markers.

Present the Group Discussion prompt on Slide 48. **Note: facilitators may rewrite this prompt to reflect local conditions.** The students will not be answering this question directly, they will be using this prompt to map out a process for estimating likelihood.

Ask the groups to come up with a process for using qualitative assessment to estimate the likelihood of the event. Emphasize that they need not actually go through the process of making the estimation, but that they are to outline how they would go about the process and what information they would need to do so.

Reflection

As the groups are working on their process, facilitators should move between groups and may use the following questions to assess student progress. This is also an opportunity to identify and address any misunderstandings students might have.

1. How are you approaching developing a qualitative assessment process?
2. Explain the process you have developed so far.
 - a. How, if at all, did you incorporate your Risk Pathways and Risk Assessment Question into the process?
3. How would you communicate likelihood of this event to your stakeholders?

Concept and Term Introduction:

During discussions the students should demonstrate understanding of the following terms and concepts:

Terms: Likelihood, Qualitative assessment

Concepts:

1. Each stage in the risk pathway diagram presents a point at which we can evaluate likelihood.
1. Each stage in the risk pathway diagram needs to be put into the context of the culture, traditions and livelihood of the Karamojong people.
2. Qualitative risk assessment requires assigning a category of risk to each stage in the risk pathway given the contextual information.
3. The categories need to be defined so those using the risk assessment understand their meaning.
4. Ranking of low, medium, high or scaling of 1-5 (for example) are potential ways to represent risk categories.
5. An overall estimation of likelihood requires consideration of the likelihood of each stage of the risk pathway and an interpretation of the combined likelihood of events.

If misunderstandings are evident during discussions, facilitators should help guide learners to correct misconceptions.

Whole Class Discussion

Share slide 49 with the class. This is the Likelihood estimation criteria from the JRA-OT.

1. Describe what you think are the strengths of this approach?
2. Describe what you think are the weaknesses of this approach?
3. Explain what you think are the advantages and disadvantages of assessing cumulative likelihood of an outcome as compared to assessing likelihood at each stage of the Risk Pathway?

At this point make it clear that the students do not need to model their likelihood assessment criteria or categories directly after the JRA-OT. They may choose to use it, or they may create and use their own model as long as their model is qualitative, descriptive and readily interpretable by stakeholders.

Group Work (in class or out as time permits)

Share slide 50.

Using the process developed in the Covid-19 thought exercise, information from the JRA-OT criteria document, and any additional sources or approaches they choose to incorporate, students will provide a complete qualitative assessment of the likelihood that the event described in their risk assessment question will occur. Their findings* should include a comparison of risks in rainy and dry conditions. Students will prepare a document that describes and explains their findings in narrative format including graphical elements as necessary. Students will clearly describe all data used to support their findings and cite all sources.

****Facilitators may add additional information on the format, requirements, timing and submission process for these documents.***

Go Further

This paper may be assigned as follow up reading. Facilitators may choose to provide thought questions for the students to respond to in writing, on classroom discussion boards, or orally in class.

Jori, F. et al. (2009) A qualitative risk assessment of factors contributing to foot and mouth disease outbreaks in cattle along the western boundary of the Kruger National Park

https://doc.oie.int/dyn/portal/digidoc.xhtml?statelessToken=6SzOORRnHDpi_LCs2tEeDeFmUz_Qwq2H_QbKuFfG122g=&actionMethod=dyn%2Fportal%2Fdigidoc.xhtml%3AdownloadAttachment.openStateless

Module 8: Qualitative Impact Assessment

Background

As mentioned in the previous module, the JRA-OT process includes qualitative assessment of impact. Impact is defined as and the how bad the consequences would be if the situation were to occur.

In the context of the JRA-OT, impact is assessed at the population level, rather than the individual level. So, for example, if the outcome in question is that an individual person contracts RVFV, the individual impact is measured by the severity of the disease while the population impact of that event is extrapolated based on potential effects on the health system, economy or environment. In this exercise, the area of concern for impacts will be focused on **regional population health and socio-economic impacts for the Karamojong people**.

Opening Questions: Slide 52

1. In the context of your risk assessment question, what does the term impact mean to you?
2. Describe the different domains that could be considered when assessing impact.
3. Explain the types of data you will need to assess the impact of the outcome defined in your risk assessment questions.
4. Explain how you might use the process you developed for estimating likelihood to complete a qualitative assessment of impact.
5. Describe any challenges you foresee with making estimates of impact.

Experience

After the opening questions, groups should form and all students should have access to their Pathogen Characterization Model, their Risk Pathway Diagrams, their Risk Assessment Question, their Likelihood Estimate, and any supporting information they have collected on the population, location or context for their risk assessment question. Students should also have access to flipchart paper or a white board and markers.

At this point, the group should also switch roles (Chairperson, Timekeeper, Scribe, Other) in preparation for the next group task.

Present the Problem outlined on slide 53 and Group Task on slide 54.

Based on their experience from last module, students should be somewhat comfortable with the idea of developing a process for assessing impact qualitatively before actually completing the assessment. At a timely interval, facilitators may pause group work for a discussion.

Reflection

As the groups are working on their process, facilitators should move between groups and may use the following questions to assess student progress. This is also an opportunity to identify and address any misunderstandings students might have.

1. Can you share how you approaching developing a qualitative impact assessment process?
2. How, if at all, did you incorporate your Risk Pathways and Risk Assessment Question into the process?
3. Share your thoughts on how you would communicate impact of this event to your stakeholders?

Concept and Term Introduction:

During discussions the students should demonstrate understanding of the following terms and concepts:

Terms: Socio-economic impacts, health impacts

Concepts:

2. **Impact assessment requires knowledge of local conditions and should be sector-specific (health, agricultural economics, tourism, etc.).**
3. **While likelihood assessment involves evaluation at each stage of the Risk Pathway, impact assessment is more geared toward the overall outcome and its potential effects on the sector of interest.**
4. **Impact assessment involves a degree of uncertainty.**
5. **The culture, traditions and livelihood of the Karamojong people all influence impact assessment.**

If misunderstandings are evident during discussions, facilitators should help guide learners to correct misconceptions.

Share slide 55 with the class. You may want to provide this as a handout for readability. It can be found on page 43 of the JRA-OT guide. See: <https://www.who.int/initiatives/tripartite-zoonosis-guide/joint-risk-assessment-operational-tool>

This is the Impact estimation criteria from the JRA-OT.

1. Describe what you think are the strengths of this approach?
2. Describe what you think are the weaknesses of this approach?
3. What do you notice about the similarities and differences between the likelihood estimation model and the impact estimation model?

Share Slide 56

This is the Risk Assessment Matrix from the JRA-OT.

1. How do you think this matrix would be used to communicate information about a risk assessment question?
2. How would you use this matrix to communicate multiple likelihood estimates (for example for each stage of the Risk Pathway) or multiple impacts (for example health or socio-economic impacts)?

At this point make it clear that the students do not need to model their impact assessment criteria or categories directly after the JRA-OT. They may choose to use it, or they may create and use their own model as long as their model is qualitative, descriptive and readily interpretable by stakeholders. They

may use the JRA-OT matrix for presentation, but they are encouraged to come up with their own ideas for how multiple likelihood estimates and multiple impact estimates can be represented using a matrix or other graphical approach.

Group Work (in class or out as time permits)

Students will generate a complete qualitative assessment of the impact that the event described in their risk assessment question will have should it occur. The assessment should include their impact assessment criteria and categories as well as a matrix or other graphical representation of both likelihood and impact estimates. The report should also include a narrative of their findings* including a discussion of both regional health and socio-economic impacts and graphical elements as necessary. Students will clearly describe all data used to support their findings and cite all sources.

*Facilitators may add additional information on the content, format, requirements, timing and submission process for these documents.

Go Further

This paper may be assigned as follow up reading. Facilitators may choose to provide thought questions for the students to respond to in writing, on classroom discussion boards, or orally in class.

Chengula, A. et al. (2013) Socio-economic impact of Rift Valley fever to pastoralists and agro pastoralists in Arusha, Manyara and Morogoro regions in Tanzania

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3825084/>

Module 9: Climate Change Challenge

Background

Climate is thought to represent a threat toward emerging risk areas for RVF epidemics globally. Climate change projection reports for Uganda predict a rise in temperatures between 1 – 1.8 degrees Celsius over the next 25-80 years. The majority of models also predict variable magnitude of precipitation increase throughout Uganda.

<https://climateknowledgeportal.worldbank.org/country/uganda/climate-data-projections>

Changes in temperature and precipitation have the potential to shift risk scenarios for Rift Valley Fever Virus for the Karamoja region and throughout East Africa. Risks may shift due to environmental conditions impacting mosquito habitat and breeding, availability and location of water sources and changing grazing corridors, conflict over access to water resources, shifts in farming practices, and more.

In this application activity, students will revisit their risk assessment reports on likelihood and impact and provide commentary on how the Ugandan Ministries of Health should consider these reports in the context of global climate change.

The following resources may help facilitators become more familiar with the interaction between climate change and RVFV risk.

World Bank Group (2021) Climate Risk Country Profile Uganda

https://climateknowledgeportal.worldbank.org/sites/default/files/2021-05/15464-WB_Uganda%20Country%20Profile-WEB%20%281%29.pdf

Mweya, C. et al. (2017) Climate Influence on Emerging Risk Areas for Rift Valley Fever Epidemics in Tanzania

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5508887/>

Vaida, B (2019) Researchers study Rift Valley fever as climate change expands risks

<https://healthjournalism.org/blog/2019/01/researchers-study-rift-valley-fever-as-climate-change-expands-risks/>

USAID (2014) AN OVERVIEW OF CLIMATE CHANGE AND HEALTH IN UGANDA

https://www.climatelinks.org/sites/default/files/asset/document/Uganda%2520CC%2520and%2520Health%2520Overview_CLEARED.pdf

Opening Questions: Slide 58

1. Explain your understanding of the difference between weather and climate.
2. Explain your understanding of the types of impacts climate change will have on average temperatures and weather events.
3. Explain your understanding of the types of impacts climate change will have on animals, people and the environment.

Experience

After the opening questions, groups should form and all students should have access to their Pathogen Characterization Model, their Risk Pathway Diagrams, their Risk Assessment Questions, Qualitative Risk Assessment reports and any supporting information they have collected on the population, location or context. Students should also have access to flipchart paper or a white board and markers.

At this point, the group should also switch roles (Chairperson, Timekeeper, Scribe, Other) in preparation for the next group task.

Present the Problem on Slide 59.

Climate change is projected to increase temperatures and impact water availability across Uganda, with some areas expected to experience flooding due to increased intensity of rainfall (central and southern regions), as well as the continued aridity and increased frequency of droughts for others (north, northeastern, west and southwestern regions). Key sectors such as, agriculture, health, water resources, wetlands, and forests are vulnerable to these climate change impacts in Uganda. These changes may also alter risk profiles for Rift Valley Fever Virus.

Group Task

Groups are tasked with adding an addendum to their risk assessment reports which will provide the Ministry of Health with the information they need to understand how the likelihood and impacts may be affected by the effects of climate change.

Students should evaluate each component of their assessment and provide commentary as to how the effects of climate change on temperature and precipitation could modify the identified risks and shift their likelihood or impact (positively or negatively) over the next 50 years.

The report addendum should include a discussion of how temperature and precipitation changes may change the likelihood of the risk they assessed as well as any potential effects on regional health and socio-economic impacts. Students will prepare a document* that describes and explains their findings in narrative format including graphical elements as necessary. Students will clearly describe all data used to support their findings and cite all sources.

*Facilitators may add additional information on the format, requirements, timing and submission process for these documents.

Reflection

As the groups are working, facilitators should move between groups and may use the following questions to assess student progress. This is also an opportunity to identify and address any misunderstandings students might have.

1. Can you share how you approaching developing a qualitative impact assessment process?
2. How, if at all, did you incorporate your Risk Pathways and Risk Assessment Question into the process?
3. Share your thoughts on how you would communicate impact of this event to your stakeholders?
4. Share your ideas on how you could communicate both likelihood and impact simultaneously to stakeholders?

Concept and Term Introduction:

During discussions the students should demonstrate understanding of the following terms and concepts:

Terms: Socio-economic impacts, health impacts

Concepts:

- 6. Impact assessment requires knowledge of local conditions and should be sector-specific (health, agricultural economics, tourism, etc.)**
- 7. Impact assessment involves a degree of uncertainty.**
- 8. Qualitative impact assessment that is scaled in line with qualitative likelihood assessment can help stakeholders interpret findings.**
- 9. The culture, traditions and livelihood of the Karamojong people all influence impact assessment.**

Deliverable

The Draft Risk Assessment Report should be completed by students prior to starting Module 10. As such, facilitators should provide students with formatting requirements, deadlines and submission instructions at the end of Module 9. Facilitators can decide if they want to review/assess the Draft Risk Assessment Report at this point or after the final version is completed following Module 10.

The DRA report should include narrative and graphical elements including:

- a. Pathogen Model
- b. Risk Pathways
- c. Risk Assessment Question
- d. Likelihood Estimates
- e. Impact Estimates
- f. Likelihood and Impact Assessment Graphic
- g. Climate Change Addendum
- h. Supporting documentation and references

Module 10: Communication

Background

Following the completion of the Risk Assessment report, the JRA-OT shifts focus to communicating the findings with stakeholders. In this module the class will identify important stakeholder groups and craft oral presentations to communicate the findings of their risk assessment. Then, small groups will present their Risk Assessment oral presentations to the full class and the audience members will play the roles of stakeholders who ask generative questions.

Opening Questions: Slide 62

1. In addition to the Ugandan Ministry of Health, describe any other groups you believe risk assessments of these nature would benefit.
2. Explain the types of questions or concerns your stakeholders might have about your findings.

Students should discuss the fact that in addition to the Health Ministry multiple groups may be represented as stakeholders in this process including (but not limited to): cattle owners, herdsmen, butchers, local health officials, local doctors, veterinarians, animal handlers, local leaders, and spiritual/religious leaders. In addition, they should have discovered that the information in the report may need to be communicated differently depending on the stakeholder audience.

Experience

Group Task: Slide 63

- The Ugandan Ministry of Health has requested that your team present your findings to a meeting of stakeholders.
- Your presentation should be targeted at local officials, local health care workers, pastoralists and other representatives of the Karamojong people.
- Your presentation should clearly convey the risk assessment question you researched and inform your audience as to the associated likelihood and impact estimates.

Oral Presentation

Groups create oral presentations encapsulating the content of their Draft Risk Assessment Report. Presentation format is at the facilitator's discretion, but it is recommended that time/length limits be imposed and that display tools such as PPT or Google Slides be utilized.

On the determined presentation date, groups will each present their findings to the full class. Audience members will be serve as stakeholders and will be responsible for asking generative questions. At the end of each presentation, facilitators will select audience members to ask questions of the presenting group. **Audience members should identify the stakeholder group they are representing when asking their question.** All students should take notes during the oral presentations.

Reflection

Following the group presentations, groups should gather for reflection. The reflection period will provide an opportunity for them to discuss the challenges and successes that they experienced both

individually and as a member of the group. Facilitators may wish to provide a reflection sheet for students to record their reflections.

During the reflection period, the facilitator should move between groups observing for indicators that groups are functioning well and asking open-ended questions to help assess students' understanding of current topics and processes. It is also important to identify and address any misunderstandings students might have.

1. Describe any themes you noticed across the presentations with respect to likelihood and impacts associated with the risk assessment questions.
2. Describe any themes you noticed across the presentations with respect to the questions posed by the stakeholders.

Concept and Term Introduction:

During discussions the students should demonstrate understanding of the fact that risk assessment communication needs to be crafted intentionally to reflect the needs and perspectives of the stakeholders. They should also begin to identify common themes across the risks that have been presented by all groups and should begin to make connections between risk assessment and risk management.

Module 11: Risk Mitigation

Background

In this final module, each group will develop a set of risk management options based on their evaluation of **all** risk assessment presentations. The goal is for each group to develop a set of strategies that they determine will be most effective in addressing the risks that present the highest likelihood and potential impact.

Risk management options include on both short- and long-term strategies that take into consideration the local conditions and resources as well as current and future environmental factors. For RVFV these options will include infection prevention strategies at the level of vectors, livestock, wild animals, humans and their interactions. They may also include strategies such as vaccination programs, surveillance programs, education or social programs to reduce behavioral risks.

Opening Questions: Slide 65

Following the reflection period, students should engage in a discussion of the following questions in their small groups:

1. Share what the phrase “risk mitigation” means to you.
2. Explain what you believe to be the difference between short-term and long-term risk mitigation strategies.

Experience

Present the Problem: Slide 66

1. The Ministry of Health has tasked you with developing a comprehensive set of risk mitigation strategies that will benefit stakeholders.
2. Each group will propose 2 strategic categories that address top concerns.
3. Strategies should address your risk assessment question and also connect to the risk assessment questions presented by your peers.
4. Strategies should take into consideration the questions of the stakeholders as well as the environmental, social and economic conditions of the Karamoja region.
5. For each category provide a short-term solution, a longer-term solution and a climate change consideration.
6. Your explanation of the strategies may be generalized and do not need to include specific steps of action.
7. Write up a summary of your risk mitigation options and add it to your final report.

Slide 67 presents an example of Risk Mitigation strategies from the JRA-OT. This may be shared with students once they have had time to identify their risk strategies in their groups.

Reflection

As the groups are working, facilitators should move between groups observing for indicators that groups are functioning well and asking open-ended questions to help assess students’

understanding of current topics and processes. It is also important to identify and address any misunderstandings students might have.

Facilitators may use the following questions to assess student progress:

1. Can you share how your group approached the task of selecting mitigation strategies?
2. Explain how you the strategies you selected connect to your risk assessment question as well as to the risks other presented.
3. What are some of the challenges you have experienced in developing mitigation recommendations?
4. How are the local conditions and culture impacting your strategy development?

Concept and Term Introduction:

During discussions the students should demonstrate understanding of the following terms and concepts: **Risk mitigation, short-term risk management, long-term risk management, stakeholders**

Final Deliverables:

A final version of the Risk Assessment Report should be completed by each group. In addition, it is recommended that each student complete a final reflection on their own experience as well as their evaluations of group members and the course material.

1. Final Risk Assessment Report including narrative and graphical elements:
 - a. Pathogen Model
 - b. Risk Pathways
 - c. Risk Assessment Question
 - d. Likelihood Estimates
 - e. Impact Estimates
 - f. Likelihood and Impact Assessment Graphic
 - g. Climate Change Addendum
 - h. Risk Mitigation Strategies
 - i. Supporting documentation and references
2. Final Reflection
 - a. Self-assessment
 - b. Group member assessment
 - c. Course assessment