IDT605 ID Project Management: Sequence and Analysis Document

Submitted in partial fulfillment of the requirements for the degree of

Master of Science in Instructional Design and Technology (MSIDT)

By

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To

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Table of Contents

Project Component Sequence

Measures of Performance

Measures of Performance (MOP) will define what the expected, single result of the project will be (Baca, 2007). The MOP is made up of two parts, the driver and the restriction, The driver states the goal the project must achieve, specifically the outcome or results. Drivers like learning objectives are measurable. The restriction expresses what must not happen when trying to achieve the driver. Restrictions also need to be measurable.

The scope of this project is to develop dental radiography training. The focus of the training is 1) taking radiographs of all tooth types in the dog and cat, 2) taking radiographs with a minimum of technical errors, 3) prepare participants to start performing full mouth radiographs on anesthetized patients in the workplace.

Driver. Take diagnostic dental radiographs of all tooth types in a dog 50% of the time.

Driver. Take diagnostic dental radiographs of all tooth types in a cat 50% of the time

Restriction. Correcting technique errors should not take more than three attempts.

Restriction. By the end of the four-hour classroom training.

Project Preliminary Scope

The preliminary scope statement defines the purpose of the project. The statement will cover the organization, risks, cost, schedule, technology, and resources needed to reach completion (Fageha, 2016). The scope of this project is to train veterinary medical and surgical staff to take digital dental radiographs of the dog and cat.

Objectives.

1) Development of practical skills and techniques for taking dental radiographs using the proper positioning of the digital sensor. Learning to take dental x-rays in the dog and cat has a steeper learning curve than when learning to take them on people due to differences in oral anatomy.

2) Improve the assessment and diagnosis of pathology. The participant is required to understand what constitutes a diagnostic dental radiograph. Producing radiographs that are diagnostic before the veterinarian reads them expedites the procedure.

Constraints.

1) The project will not enable the participant to master taking dental radiographs of the dog and cat.
2) The project will not cover anesthesia for the dental patient.
3) The project will not cover procedures for studies of the skull, sinuses, or the temporomandibular joint.
4) Due to state laws on x-ray safety, the project is not intended for training staff members younger than 18 years of age.

Assumptions. The project will be completed in 30-90 days

Product Organization. The project will be managed by the Academy of Veterinary Dental Technicians (AVDT). It will include Veterinary Technician Specialists in Dentistry (VTS-Dent) and external stakeholders chosen by the AVDT.

Deliverables. This document will describe the objectives of the current training program used by VT Dental Training. Within the overall course, the document will also cover the current course units and their timing needs.

Scope of Course

Goal. The goal of this course is to provide dental radiograph training to veterinary staff. Developing practical skills that last past the training event will efficiently integrate dental radiograph capabilities into the dental service of a veterinary clinic.

Target Audience. The target audience will be a combination of credentialed veterinary technicians, certified veterinary assistants, and on-the-job trained staff. The staff members will either be currently performing dental procedures or the in the process of being trained to perform dental procedures. In some cases, veterinarians will participate in the training.

Design Time/Milestones. Performance analysis and an analysis of the target audience for each training assignment will be completed in two weeks. The objectives will be written to address the needs found in the performance analysis and the target audience analysis. Material development will take two weeks. A beta test and pilot of the project will bring the development of the completed design in two months.

Delivery

Content. The content of this project will cover dental radiography products, information, and positioning techniques researched through current veterinary dental literature. Materials and graphics will also be compiled using current veterinary literature. Content and materials for this

project will be designed following the AECT Professional Code of Ethics to avoid copyright and privacy infringement and avoid any cultural or socioeconomic bias.

Method. The core delivery will be in two sessions – pre coursework and face-to-face sessions. The pre-course work will be delivered in an online classroom. The purpose of the pre-coursework is to prepare the participant for the face-to-face training session.

The online course will be monitored and assessed by the assigned trainer for technical issues with delivery and issues experienced by the user. Data will be collected and analyzed once a group has completed a session. Revisions to the software and delivery will be made before the next group begins the online course.

The face-to-face session will be taught in the requesting clinic by the assigned trainer. The face-to-face classroom is the best choice because the learning will require the participant to interact with the material physically. The purpose of the session is to provide skill building through interaction with course materials and the trainer. The delivery of the face-to-face course will provide a condensed review of the pre-course work, and then the participants will be given activities to perform. Each activity will be demonstrated by the trainer. The participants will then repeat the activity. The participant's performance of each activity will be assessed and measured by the level of success required by the objectives.

Questions to Consider. Can we safely perform an audience analysis using a survey during the pre-coursework? The data would provide the trainer with much-needed information about the learning needs of the participant. The data is helpful in making content and material decisions.

Should there be a pre-test to assess whether a participant requires the pre-coursework? An option could be put in place to skip the course units and take the quizzes. An additional component is requiring the participant to submit one or a series of dental radiographs to prove competency. To add this additional component would require additional objectives and performance requirements to be developed which would require additional time.

What if a participant is not able to complete the pre-course work before the face-to-face session? There will be a review of the pre-coursework during the face-to-face. The participant could complete the quizzes that they would normally take online at the end of the review.

Objectives

Program. At the end of the program, the participant will be able to properly implement the procedures required to take dental radiographs on a dog and cat.

Supporting. At the end of the program, the participant will be able to: (1) identify oral anatomy structures in the dog and cat (2) identify and explain the parts and function of the dental x-ray generator (3) follow the procedures required when practicing dental x-ray safety (4) correctly place the digital sensor for each dental x-ray position (5) correctly angle the tube head to the sensor to produce an image of the tooth that is the correct length (6) identify technique errors on a dental radiograph, and (7) correct technical errors on a dental radiograph.

Training Materials. Training materials to be developed for the program include:

- Authoring system
- Test development software

- Media and graphics
- Dental models
- Dental x-ray generator
- Dental x-ray digital sensor and corresponding software
- Learning Management System (LMS) or Learning Content Management System
- Printed Materials
- Demonstration models
- Video clips
- 3D Simulation

Evaluation

Online Pre-Coursework. Assessment measurements will be taken after each lesson unit in the pre-coursework online session. Participants will be quizzed on their knowledge of multiple-question. The quiz is accessible until the participant has attained a score of 100%.

Face-to-Face Class Session. Assessments will be taken after the participant has attempted the scheduled activity. Measurements will be taken by the trainer using direct observation following the rubric criteria. Feedback will be verbally given to the participant after each activity.

Participant Feedback. Participants will be given the opportunity to share feedback on their experience with both the online coursework and the face-to-face session. Data from the participant feedback will be analyzed and used to make improvements to both course levels.

Table 1
Content Scope and Sequence

Unit Name	Core Professional Skills	Objective	Participant Activities	Assessment(s)
Level 1 Online Pre-Course Unit 1: The Oral Anatomy of the Dog and Cat				
Unit 1 Section 1: Oral Anatomy of the Dog	Correct identification of the oral anatomy of the dog ensures correct placement of the digital x-ray sensor plate	Identify the oral anatomy structures of the dog.	1. Review the diagram showing the oral anatomy of the dog. 2. Watch the video anatomy demonstration.	Complete the Unit 1 Section 1 quiz at completion. Take the quiz as many times as needed until a result of 100% is reached.
Unit 1 Section 2: Oral Anatomy of the Cat	Correct identification of the oral anatomy of the dog ensures correct placement of the digital x-ray sensor plate.	Identify the oral anatomy structures of the cat. Watch the video anatomy demonstration.	1. Review the diagram showing the oral anatomy of the cat. 2. Watch the video anatomy demonstration	Complete the Unit 1 Section 1 quiz at completion. Take the quiz as many times as needed until a result of 100% is reached.
Unit 2: Charting the Oral Cavity Using the Modified Triadan Numbering (MTNS)				
Unit 2 Section1 – Using the MTNS in the dog.	The MTNS labels dental x-ray images. Completion of this	Label a dog dental chart using the MTNS.	1. Review the labeled dog dental chert	Complete the Unit 2 Section 1 Quiz at completion. Take the quiz as many times as needed

	unit will ensure the images will be labeled correctly when the participant uses the dental x-ray software.		2. Watch the demonstration video: "The Modified Triadan Numbering System in the Dog."	until a result of 100% is reached.
Unit 2 Section 2 _ Using the MTNS in the cat	The MTNS labels dental x-ray images. Completion of this unit will ensure the images will be labeled correctly when the participant uses the dental x-ray software.	Label a cat dental chart using the MTNS.	1. There are differences in the numbering order when compared to the dog. 2. Review the labeled cat dental chart. 3. Watch the demonstration video: "The Modified Triadan Numbering System in the Cat."	Complete the Unit 2 Section 2 Quiz at completion. Take the quiz as many times as needed until a result of 100% is reached.
Unit 3: Radiograph Equipment	Knowing the structure and function of the dental radiograph generator shows that the participant can fully and confidently operate the equipment.	Identify the parts of the dental x-ray generator Describe the function of each part of the dental x-ray generator.	1. Review the Powerpoint presentation: "Components of the Dental X-ray Generator." 2. Watch the video demonstration: "Components of the Dental X-Ray Generator."	Complete the Section 3 quiz at completion. Take the quiz as many times as needed until a result of 100% is reached.

Unit 4: Radiation Safety in Dentistry	Radiation is a hazardous substance in veterinary clinics. Radiation safety needs to be practiced to keep staff members safe while they are taking dental x-rays.	Describe the steps necessary to practice dental x-ray safety	1. Review the infographic: "Dental X-ray Safety." 2. Watch the Powerpoint presentation: "Dental X-Ray Safety	Complete the Section 4w quiz at completion. Take the quiz as many times as needed until a result of 100% is reached.

Unit Name	Core Professional Skills	Objective	Participant Activities	Assessments
Level 2 Face-to-Face Training Session				
Unit 5: E-Learning Review	Confirms the participants have completed the Level 1 online pre-course		1. Take the Unit 5 quiz	Complete the Unit 5 quiz at the beginning of the face-to-face session
Unit 6: Troubleshooting the Radiographic Image The trainer will provide a lesson on the components of the dental image.	Teaching the participants how to evaluate a finished image improves their troubleshooting skills and improves outcomes.	Identify the solutions to technical errors found on the finished dental radiograph.	1. The participant will explain the components of a diagnostic radiograph. 2. Given a specific location to radiograph, the participant will point to the requested location on the dental model.	Participant performance will be measured using direct observation and a checklist.

			3. Presented with the completed radiograph, the participant will analyze their result for positioning correctness and technical errors.	
Unit 7: Sensor Placement **A trainer demonstrates the placement of the sensor for each view.**	Proficiency will demonstrate the participant is confident navigating the oral cavity. Proficiency will demonstrate the participant recalls the steps of the demonstration and understands the interrelationship between correct tooth identification and placement of the sensor.	Identifying the appropriate tooth or teeth, set up the correct location of the sensor.	1. The participant will verbally justify the best position of the sensor plate to obtain the requested radiograph. 2. The participant will position the plate in the dental model.	Participant performance will be measured using direct observation and a checklist.

Unit 8: Tubehead Angulation **The trainer demonstrates the correct angulation of the tube head for each view.**	The tube head is angled to produce an image of the tooth that is the same length as the tooth itself.	Confirming the correct placement of the sensor, set up the correct angulation of the tube head.	1. The participant will select the correct angle using the protractor on the tube head. 2. The participant aligns the tube head over the sensor.	Participant performance will be measured using direct observation and a checklist.

Project Component Analysis

Content Sequencing

Sequencing arranges the content so that the participant can meet the objectives effectively and efficiently. Two sequencing methods were investigated and assessed to ascertain which method would best suit this project. The first sequence is Learning- Related Sequencing. Learning-Related Sequencing is a strategy based on five student learning concepts (Morrison, 2013):

Identifiable prerequisites	Identifiable prerequisites a learner must master before demonstrating a more difficult task.
Familiarity	Teach something familiar or known before teaching the unknown.
Difficulty	The difficulty is determined by the fineness of the discrimination the learner must make. This is measured by how quickly the procedure is executed and the amount of cognitive processing required to complete the procedure.
Interest	Stimulate and engage the learner by using topics that would be of interest.
Development	Sequence according to developmental theory.

The second sequencing method investigated is Task Expertise Sequencing. This sequencing method follows the elaboration theory is used to teach tasks using a simplifying conditions method (Morrison, p. 130). The simplifying conditions method requires that tasks be taught beginning with the simplest task and incrementally increase the difficulty of the tasks. Simpler tasks are taught early in the sequence and more complex tasks later in training.

Van Merrienboer and Merrill (2018)took this theory further and found that integrating the participant's knowledge skills and abilities with the skills they are learning during the training will allow the transfer of the new material to new problem situations. When you update knowledge, skills, and abilities, they don't fade away once the learner has completed the training. Updating knowledge, skills, and abilities cause a transfer of learning. As technology becomes more complex, the related tasks required to learn the technology become more complicated. The training increases from just learning the steps to learning how to solve problems and think creatively to adjust to the challenges of the task. Van Merrienboer calls this "complex learning" (p. 2). The holistic design approach attempts to integrate the potential challenges of the task as each step is taught. To increase long-term knowledge and problem-solving skills, Learning-Related sequencing would be the most prudent for my project.

For this project, Elaboration Sequencing Theory aligns well. Elaboration Sequencing Theory arranges the content specifically for learners that are developing skills to learn a task. The process moves in a stair-step motion by starting from concrete to abstract as the tasks become more difficult. One can see an example of this concept in the Revised Bloom's Taxonomy which has asserted that teaching happens at both a knowledge and a cognitive level

(A model of learning objectives, 2018). Metacognitive Knowledge was added to the levels to recognize the cognitive processes that take place when a learner is performing a task as the steps become more complicated (Krathwohl, 2002); (Owen Wilson, 2016).

In Kratwohl's (2002) paper on revising Bloom's Taxonomy, there are examples of taxonomy tables. Taxonomy Table is a two-dimensional table that places the Knowledge dimension on the vertical axis, and the Cognitive Process dimension forms the horizontal axis (pp. 216-217). Course objectives are classified in the Taxonomy Table in one or more cells that corresponds to the categorizing cell. The Taxonomy table analyses the unit objectives and provides an indication of the complexity of knowledge and cognitive processes involved.

The objectives for this project were classified in the Revised Bloom's Taxonomy Table. The results show that in the online course the objectives are classified as lower order thinking skills. These results make sense because the online course is preparatory with basic skills being taught. As we move into Units 6, 7 and 8, the participants are in the face-to-face session. The face-to-face session is hands-on which require higher order thinking skills. Table 2 shows the outcome of the classification.

Table 2

Dental Radiology Training Taxonomy Table

The Cognitive Process Dimension						
The Knowledge Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual Knowledge						
Conceptual Knowledge				Unit 6	Unit 6	
Procedural Knowledge	Unit 4		Unit 6,7	Unit 6,8	Unit 6	
Metacognitive Knowledge	Unit 1.2,3,5,6					

Relevant Factors

Social and Cultural Characteristics

A common link between the certified/credentialed staff and the clinic trained staff is hands-on training. According to an American Veterinary Medical Association survey, veterinary technician and veterinary assistant programs, medical and clinical skills are taught hands-on, and the student must perform the skill hands-on to complete the program (AVMA, 2018). Clinic trained staff are also trained hands-on either by a staff veterinarian, nurse, or veteran staff member. Medical and clinical skills are limited to those procedures performed in that hospital. Hands-on training is the mainstay of learning skills in a veterinary practice. For this project, it makes sense that any training in this medical field requires a hands-on component to be engaging and have an effect on retention of skills.

The participants will be from the same veterinary clinic. In the clinic setting, it is best not to have one person be in charge of learning a new skill. If that person becomes sick or leaves the clinic, they will have no one who can perform that skill. Training multiple participants will avoid a disruption to the dental service.

Instructional Environment

In the traditional learning environment, the experience is passive when the instructor presents the content, and the student recalls it later. Vakhtina noted that when the experience is active, there is increased interaction between student and teacher (Vakhtina, 2015). The increased interaction will be necessary for this project to instill complex learning. Complex learning will occur when the trainer starts with the demonstration and checks for the basic procedural skills. The increase in difficulty comes in two phases. The first phase is the addition of steps to the task as we move from Unit 6-8. The second phase comes when the participant has

to recall the steps, perform the steps and then assess their work. The process is now using higher order thinking skills which increase cognitive function. This theory is corroborated with Butler's research that found that active training increases audiovisual associative recognition as the student physically interacts with the course content (Butler, 2013).

Environmental Factors

Environmental factors are taken into consideration when designing the learning environment. Morrison (2012) mentions that an analysis of the learning environment is required to ensure it provides the most benefit to the participant. The training program plan is a hybrid course combining a self -directed online classes as a preparation for the face-to-face, hands-on class where the experiential learning takes place.

The face-to-face course will take place in the treatment area of the veterinary clinic. The atmosphere in the treatment area can range from being chaotic if the clinic does not close while the training is taken place to quiet and focused if the clinic is closed for the training. When performing the training when the treatment area is active, it is imperative that the trainer keeps the training group together to maintain participant focus. Training equipment needs to be set-up ahead of time and kept close-at-hand to keep the training moving smoothly and efficiently. Table 3 looks at the considerations when choosing components of the learning environment for this project.

Table 3

Instructional Environment Analysis

Phase of Training	Environmental Factor	Considerations
Online Pre-Course Work	Online platform. Students will navigate through this course using self-instruction.	1. M-Learning – the course needs to be accessible by the student on

		laptop/desktop, cell phone or tablet. 2. Navigation- links to the course components need to be implemented. 3. Prototype – once the online course is completed, find volunteers to test the prototype and give feedback. 4. Certificate of completion needs to be printable or downloadable as a pdf file.
Phase of Training	**Environmental Factor**	**Consideration**
Face-to-face training	Lighting. The oral cavity requires illumination to help the participant visualize where to place the sensor and tube head.	1. The surgical lighting on the dental table is used to illuminate the oral cavity. 2. The light can be a mounted ceiling unit or a mobile unit.
	Noise	1. Training will take place in a treatment area to accommodate 1-10 staff members. 2. In some circumstances, the treatment area will be in use by staff members not participating in the training. Request that music is turned off and ancillary staff keeps the noise level down to a minimum.
	Temperature	1. The temperature is adjustable upon request of the clinic management.
	Room layout	1. The training takes place in the clinic treatment area. Specifically,

		around the treatment table where the dental procedures are performed. 2. A second table or counter holds the laptop with the dental software connected to the sensor. The equipment is within hands reach of the dental treatment table. 3. A seated waiting area will be provided that is six feet away from the treatment table to prevent radiation exposure. 4. A third table will be located in the seating area. The trainer's laptop sits on this table for the presentation.

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