



Protection Self-Training Modules- Fundamental

Overview

The U.S. Power and Energy Engineering Workforce estimate that over the next five years, roughly one-half of engineers from the power and energy industry will retire or leave.

To address the forecasted shortage of protection engineers, the training modules will provide an opportunity for motivated individuals to acquire knowledge and skills to accelerate the acquisition of the experience necessary to make protection design decisions that ensure the power system is safe, reliable, and secure. This project aims to develop the first of eight self-training protection modules. The modules will provide a means to transfer knowledge of protection systems using a structured self-study program.

**Protection
and Control
Interest Group**

**Published:
September 2021**

How to use this research

The training modules can assist new and existing utility personnel in preparing their technical protection skills.

- Engineers can apply the material to current and upcoming protection technology and control strategies
- They can explore educational methods required to ensure that current knowledge of protection is maintained
- By implementing these new methods, they will also be able to transfer the knowledge down to future generations of protection engineers

Key questions Addressed

- What are the fundamental protection concepts and system components required to ensure safe, secure, and reliable power systems?
- What are the relevant protection industry standards?
- What is the per-unit system, and why is it used in power systems?
- What are protection relays, their types, and their operations?
- What are protection zones?
- What are electrical faults, and how to calculate them?
- What is PSCAD simulation, and how can it be used to enhance protection knowledge?

Research Summary

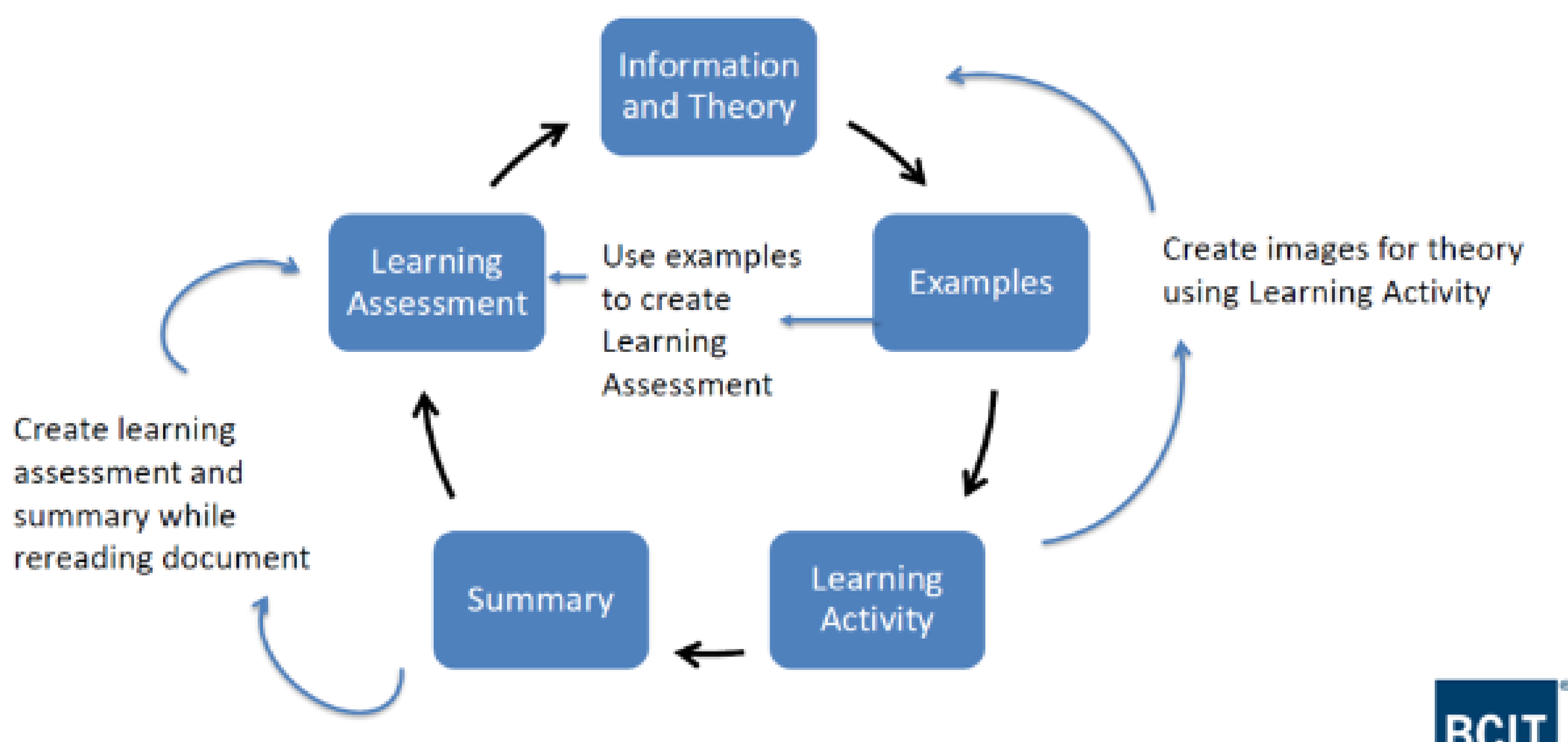
The project facilitates self-learning for students and utility engineers/technologists who are new to protection and control but have some background in electrical engineering. This was done by providing supporting documentation for various protection and control topics.

The introductory training module sets a foundation for future training modules and includes ten submodules covering protection fundamentals such as an overview of power system protection, key protection and system components, AC signal sources, protection zones, relays, drawings and designations, the per-unit system, and fault calculations.

The main chapters cover an extensive literature search, the results of a user survey, a high-level functional specification, and a business case approach for the implementation of online condition monitoring systems.

The report provides self-assessment components for each of the ten sub-modules, PSCAD simulation files and exercises as well as a final exam, to ensure knowledge gain and transfer.

Methodology/Structure



About CEATI Research

CEATI facilitates the planning and implementation of collaborative R&D projects among its electric utility members. This approach enables members to solve shared challenges and maximize their return on investment.

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CEATI Protection and Control group members can access the report [here](#).

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