

Professional Education, Testing and Certification International Solution Design Document

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July 1, 2018

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Professional Education, Testing and Certification International Solution Design Document

[PEOI](#) Biology

Project Overview

Professional Education, Testing and Certification International is a free university-level online training program that is available to anyone in the world. The organization's mission is to use interconnected learning tools to engage learners in a non-competitive, stress-free way. PEOI is not tied to an existing institution or country. It offers teaching primarily in English, but also in eleven other languages as well as any languages for which there are volunteers who will translate courses. Faculty at PEOI need a chapter of a biology course designed for their online certificate program. Students are especially struggling with the topic of DNA, so this design document details a course that would cover the topic within one week.

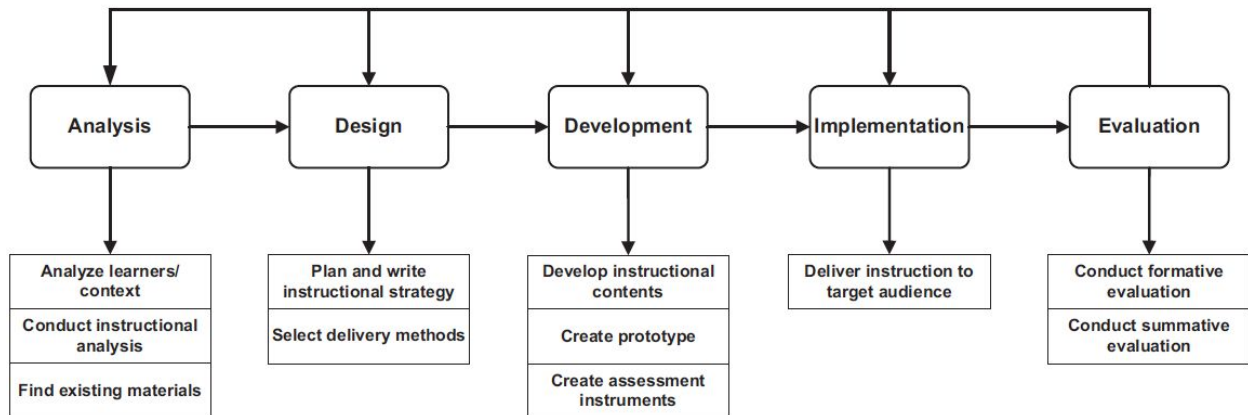
Summary of Analysis

Students at PEOI need a chapter of a biology course created for their online university. Students are especially struggling with the subject of DNA. The learning gap is a lack of knowledge about DNA and its fundamental workings. According to Merlijn Kouprie and Froukje Sleeswijk Visser in *A framework for empathy in design: stepping into and out of the user's life*, the problem of understanding the learner and their experience has a central role in empathetic design. Aasaiya is a 20 year old student of PEOI who has a high school level background in advanced placement biology. He wants to strengthen his understanding of DNA. Aasaiya's experience in the PEOI organization is having taken one PEOI course in the past. The organization was advertised at school as a summer activity for those students wanting to practice for the GRE, and college in general. Aasaiya is a student who likes using eLearning games on websites like Wolfram Alpha and Khan Academy. He says the games keep him engaged longer than a combination of lecture and worksheets, that's why he's taking online courses with PEOI. Aasaiya struggles with the concept of genetics and DNA and is looking to take a course in biology at PEOI in order to earn credits towards a degree next year. Aasaiya fits into the effort of meeting the organizational goal

by maintaining the flow of graduates from the program. He is a mentor for other students who want to go in to biology but lack the expertise they must have before beginning college in the fall. Mentors and volunteers help students prepare for the higher expectations in a university setting.

Instructional Design Model

The broad goal for a week of the PEOI biology course is to educate students about DNA. The goal at the end of the course is for students to identify the mechanisms, terms, and applications of DNA. The solution design model framework I've leveraged to this point is ADDIE (Analyze, Design, Develop, Implement, and Evaluate), where the first step incorporates empathy and learner analysis, which is detailed in the above Summary of Analysis section. This is the phase that helped me get a good sense of what the learner needs. In the Schedule section of this document you will find how the Design and Development components of ADDIE were leveraged. Finally, in the Evaluation Plan area of my design, I explain what I will do to leverage the Evaluate piece of the ADDIE framework.



(Khalil and Elkhider, 2015)

Proposed Learning Solution

PEOI will begin offering a course specifically for biology students that spends a week on the subject of DNA. I will layout a plan for how to solve the knowledge gap between high school and university level biology. The class will prepare them using various e-learning techniques. The course is entirely online so the assignments and assessments will be connected to the PEOI main website. Solution will utilize the six pieces of Bloom's Taxonomy; Remember, Understand, Apply, Analyze, Evaluate and Create. Lectures will use screencasting and video conferencing. A free choice creative project of nucleotides will be introduced on Monday and presented to the class on Friday.

Instructional Objectives

In Kathy Waller's piece called *Writing Learning Objectives* it is explained that the ABCD method helps build stronger objectives. A is the audience or student, B is the behavior or action verb, C is condition for the objective, and D is degree of achievement.

- **Lecture Objectives** - After attending lecture, reading class materials, and passing quizzes students will:
 - Define the term DNA (recall)
 - Build a model of the structure of the DNA molecule
 - This objective is directly aligned with the storyboard in the next section
 - Define key terms associated with DNA and correctly identify the four nitrogen bases that compose DNA
 - Adenine, Guanine, Thymine, Cytosine, Deoxyribose, Phosphate groups
 - Identify four main functions of DNA: replication, encoding, recombination, and gene expression
 - Diagram what a chromosome is/ looks like given a set of lab data (problem-solving)
- **Affective Objectives** - Upon completing the week long chapter on DNA the student will:
 - exhibit behaviors conducive to a safe laboratory environment
 - work on a group project of their choosing that demonstrates their ability to collaborate under time constraints
- **Psychomotor Objectives** - Upon completion of the week's project the students will correctly:
 - Construct a model that reflects the nitrogen base pairs

Solution Storyboard

This storyboard is intended to give potential clients a basic visual reference for the content flow and information architecture. The storyboard is for 30 minutes of instruction/ user interaction. It will serve as a guide for the volunteer teachers. The table is 30 minutes per day of instruction/user interaction. The course is entirely online so the assignments and assessments will all be connected to the PEOI main website. Students are expected to be self-motivated and work independently for much of the course but will receive feedback from peers and volunteers throughout the course. Solution will utilize the six pieces of *Bloom's Taxonomy*; Remember, Understand, Apply, Analyze, Evaluate and Create.

Remember	Understand	Apply	Analyze	Evaluate	Create
Match terms to definitions using multiple choice worksheet created by volunteers using PEOI interface	Interpret reading assignments independently using essay format submitted through PEOI interface	Introduce free choice project on the visualization of DNA and have students create mind-map	State briefly the relation between RNA and DNA	Online review session for exam will be administered via online web conference with Skype, Google, or Zoom	Student free choice projects are presented in a visually original way

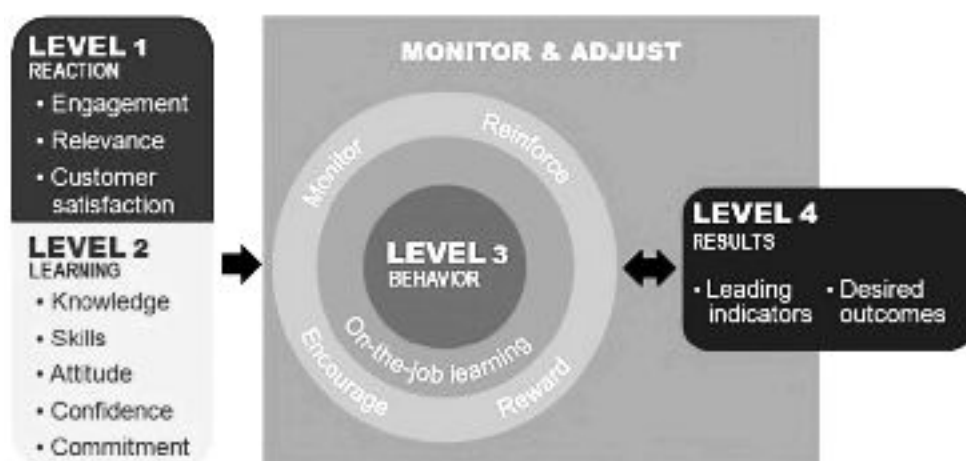
Label DNA components using drag and drop tool built into the PEOI interface	Restate main ideas in discussion forum and feedback is given using method of volunteer's choice	Explain monomers and polymers comparison activity on PEOI interface	Students gather vital information using readings and transcribe into their own words	Debate ethics issues to challenge assumptions using online forum	Projects presented to class using medium of student's choice
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Evaluation Plan

Data collection plan, revision cycle strategy, and the plan to communicate results are also found in this section. For the revision of this course and the plan to communicate results of the evaluation we'll use a series of online questionnaires. The method will use to determine this solution's effectiveness is detailed in the tables below. Ongoing adjustments to the program can be made throughout the course at the instructor's request depending on how fast the students advance. After completing formative evaluations, students submit them through the online PEOI portal and they go directly to the volunteer instructor. Due to the short duration of the DNA chapter of the biology course, only two formative evaluations will be given two days apart.

The purpose of evaluating the learning solution is to check student understanding of the parts and functions of DNA. The data collection method will be an online formative evaluation quiz that will be described below, and the analysis plan is to administer a summative evaluation with the final project on the visualization of DNA structure using the rubric. The summative evaluation will be shared with the PEOI administration and the volunteer instructor. We'll know if the program was effective if evaluation shows that it was well-received, and key information was learned. We will use the data from each semester to improve the class for both the volunteer instructor and the students. Four levels of evaluation are included in the plan and the structure is defined by *The New World Kirkpatrick Model* (Kirkpatrick, 2015).

THE NEW WORLD KIRKPATRICK MODEL



The plan for revision is executed during evaluation level 3, behavior, and will be assessed using the formative evaluation survey mid-training. Level 3 involves monitoring and adjusting the plan and

examines behavior of participants, providing them with encouragement and rewards. Questions related to how participants are enjoying the program and whether they are learning key information will be included in order to determine the degree to which participants can apply what they've learned. The indicator of program success will be active execution and monitoring of processes and systems that reinforce, monitor, encourage, and reward performance.

Evaluation Schedule

Tues	Weds	Thurs	Fri
One-to-one formative evaluation survey	Small group formative evaluation survey	Summative evaluation of reaction and learning	Summative evaluation of behavior and results

Plan for Communication of Results

Day	Method
Tuesday	<ul style="list-style-type: none"> Conference between instructor and designer about one-to-one formative evaluation results
Thursday	<ul style="list-style-type: none"> Email update on the formative evaluation results from the small group discussion
Friday	<ul style="list-style-type: none"> Discuss online presentation of course projects and summative evaluation results through teleconference

Formative Evaluations

One-To-One		
Clarity	Impact	Practicality
Were the lessons covered on Monday and Tuesday clear?	Were the lessons helpful in reaching the goals of this class?	How practical is the project given the one week to complete it?

Small Group			
Clarity	Impact	Practicality	Attitude
Did you understand what you were supposed to learn?	Were the materials related to the objective of the course?	Were there enough practice exercises?	Was the lesson interesting?

What are you still unclear about?	Did the survey help aid your understanding of the course topic?	Can you see yourself outside of class using any of the skills you've learned?	Did you receive sufficient feedback?
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Summative Evaluations

Reaction	Learning	Behavior	Results
The objectives were clear to me. 4 = very clear, 3 = mostly, 2 = ok, 1 = not clear at all.	Identify the four nitrogen bases that compose DNA, and state four main functions of DNA.	Could you use the skills you've gained in PEOI outside of this course and how?	Are you confident in your ability to explain what you've learned to someone else?

Course Scoring Rubric

Criteria	Excellent	Good	Poor
Results	Summative test score of 80% or above	Summative test score of 60-80%	Summative test score below 60%
Behavior	Students applied learned course skills	Students mostly applied skills or lessons	Students did not apply skills or lessons
Learning	High degree of participation	Moderate degree of participation	Little or no participation
Reaction	High degree of engagement in lessons	Moderate degree of engagement	Student was not engaged in lessons or project

Assumptions

An organizational assumption being made is that students will have access to their own tools for communication such as a computer. Another is that they will have the self-motivation it takes to follow through with an online course. Finally, it is being assumed that PEOI will have enough people volunteer that they have a teacher for every subject. The following assumptions regarding this solution design have been communicated and agreed upon by students, PEOI staff, and UN volunteers:

- Volunteers and students have access to a computer, internet, webcam, and mic for online communication.

- PEOI will collaborate with local partners to provide needed access and technology for volunteers that do not have ready access.
- PEOI will provide access to subject material on previous successful classes to help in the implementation of this proposed solution.
- PEOI administrators will provide ongoing support and resources needed to ensure the volunteer instructors are successful in implementing this design plan.

Schedule

Here I've mapped out the schedule for developing the entire learning solution. Dick and Carey emphasized the importance of using systematic plans in designing instruction. The components of the system include the teacher, learner, instructional materials, and learning environment. I have planned the schedule for the development of the instructional materials. The Dick and Carey model includes the following steps (Khalil & Elkhider, 2016):

- Identify instructional goals
- Conduct instructional analysis
- Identify entry behaviors and learner characteristics
- Write performance objectives
- Develop criterion-referenced test items
- Develop instructional strategy
- Develop and select instructional materials
- Develop and conduct formative evaluation
- Develop and conduct summative evaluation

Ultimately I utilized a combination of the Dick and Carey model and the ADDIE framework; Analyze, Design, Develop, Implement, and Evaluate. I deconstructed the design phase of ADDIE into its components as suggested by Dick and Carey. First make assessments, choose a course format, then outline an instructional strategy. During the analysis phase students can demonstrate if they know the content, which helps solidify the assessment first. Then, I select a course format or delivery system. This is the medium in which information will be presented. In this case, the students are spread out across several continents. Since these students will be tested online they'll be learning with all online lectures, readings, discussions, and projects. Time commitment for PEOI volunteers, including training, is approximately 10-12 hours over a period of 4 weeks.

Time Frame	Part of the Design Phase	Approx. Hours	Who's Responsible?	Solution	Outcome
7/2/18 - 7/13/18	Assessment (Part 1)	60 - 80	-PEOI staff -Volunteer recruits from UN -Designer -PEOI student	-Develop Rubric -Create quiz and exam -Identify the group's learning, knowledge, or skill	-Project schedule set -Volunteer instructor selected -Project established with and approved by PEOI

			volunteer if available	gap -Learn how to integrate materials with PEOI website	-Assessments developed
7/16/18 -7/27/18	Format (Part 2)	50 - 70	-PEOI staff -Designer	-Develop prototype for online training modules utilizing PEOI website -Organize selection of supplemental learning materials such as optional readings or worksheets on Khan Academy	-Prototype created for eLearning class -Preliminary corrections processed -Format decided upon -Prototype of class goes live for beta testing
7/30/18 - 8/17/18	Strategy (Part 3)	20 - 40	-Designer -Instructor	-Sort feedback from beta testing -Make corrections to module -Final bugs identified and fixed	-Feedback incorporated into the course -Completed final draft of learning modules on PEOI website -Implementation of strategy complete

Communication Plan

The first stage of design development would require a direct meeting with the organization via teleconference or video conference. Meetings the instructional designer (ID) are to take place via chat or video conferencing on a weekly basis. Applying the Dick and Carey instructional design approach, a schedule between stakeholders can be efficiently arranged.

Event	Team	When	Method
Project launch meeting	Designer, volunteer teacher, and PEOI staff	7/9/18	Zoom web conference
Status updates	Designer, volunteer teacher, and PEOI staff	Ongoing	Email
Blog	Designer and PEOI staff	Wednesdays	Weebly site
Announcements	Designer	Fridays	Weebly site
Advertising	PEOI staff	Monthly	Social media
Budget	Designer and PEOI staff	Monthly	Google Sheets

Urgent matters	Designer, volunteer teacher, PEOI staff, and students	As needed	Email and phone
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Summary

As a free college I wanted to support the efforts of Professional Education, Testing and Certification International and their online training program that's available to anyone in the world. I believe by implementing the above solution, I can support the organization's mission to use interconnected learning tools to engage learners in an informal way. PEOI is not tied to an existing institution or country, and that's what makes it so unique. Students can earn credit towards a transfer degree, or earn certificates to add to their resume. UN Volunteers who translate courses into the twelve languages offered at the institution, have been tremendously helpful in the success of PEOI thus far. Faculty at PEOI now have a design solution for a tough subject in biology, DNA.

References

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Appendix

[Learner Persona](#)

PEOI Professional Education, Testing and Certification International

Applying The Merlijn Kouprie & Froukje Sleeswijk Visser Four Phases of Empathy

- **Discovery** (*entering the learner's world*) – What is his/her background? What experience does he/she have in the organization and/or field? What's unique about their specific reality?
 - Aasaiya is a 20 year old student of PEOI who currently lives in Pretoria and holds a seasonal position at The Sefako Makgatho Health Sciences University. Aasaiya wants to independently study biology between high school and college so he's prepared for university. He plans on taking the Medical College Admission Test next fall for application to Northern Ontario School of Medicine, because it's where his preferred professors teach. Aasaiya's experience in PEOI is having taken several courses the previous summer, so he knows how they are structured. Aasaiya enjoys using games on websites like WolframAlpha and Khan Academy. He says the games keep him engaged longer than a combination of lecture and worksheets. Aasaiya struggles with the concept of DNA and is looking forward to taking a course in biology at PEOI to refresh his memory.

- **Immersion** (*wandering around the learner's world and taking his/her point of reference*) – What is the learner's role in the organization? How does he/she fit into the effort of meeting organizational goals?
 - Aasaiya has always loved the subject of biology and knew he wanted a career in it someday. PEOI helped him realize that being a doctor was what he wanted to work towards. He now mentors students and trains other volunteers in his spare time. He is an asset and a resource to his peers in the program, and really thrives on problem-solving.
 - Aasaiya fits into the effort of meeting the organizational goal by maintaining the flow of graduates from the program. By helping them with their homework and quizzes he is a mentor for other students.

- **Connection** (*resonating with the learner*) – What is happening with the learner? What is his/her specific performance, knowledge, and skills gap? How is it impacting his/her daily performance?
 - Aasaiya is self-motivated to gain skills he needs to build a career in genomics. His specific knowledge gap is the structure of DNA and its workings since his high school science classes did not cover it to his satisfaction. Aasaiya hopes to learn the language to articulate his understanding of DNA components so he can be prepared for questions on the MCAT. The skills and knowledge he seeks are in the areas of genomics and stem cell research. Aasaiya sees the medical field as a world of possibilities. He knows that each day, powerful tools for medical technological advancements are being invented and the field of medicine is one full of job security. He knows that if he has access and the right guidance to use available online schooling and networking tools, he could change lives. Proper guidance on DNA basics and access to medical labs are the main obstacles to his goals.

- **Detachment** (*leaving the learner's world and designing with learner's perspective*) – What learning solution would respond to the learner's needs? What are the advantages and disadvantages of each learning solution? What are the potential consequences of each solution?

- Aasaiya will benefit most from fast-paced, informal online training. Screencast classroom demos with group activities are the learning solutions that would best respond to Aasaiya's needs since he collaborates so well with others. Instructor guidance and peer feedback is critical to keeping it more open, structured, and relevant. Successful training methods thus far have included training with volunteers and online connections between students and subject matter experts from around the world.
- The advantage of Aasaiya learning from screencast classroom training is that the educator is able to provide real life examples and activities that are relevant to him. The disadvantage of the learning solution is that hands on activities aren't an option with online course work.
- The potential consequence of the solutions is that hands on learning activities and live demos. E-learning offers many benefits including ease of access, wide reach, cost-effectiveness, and personalization. The drawback of e-learning is that instantaneous help may not available every time the student might need it.