Course: Virtual teacher program capstone
Assignment 1: Collaborative project
Name: Klaas Joris Schut

Part 1: Overview

Subject matter: TRIZ (creativity & problem solving methodology)

Title of the module: The 40 inventive principles

Description of the learners and their needs: Learners are students in year 5 of Dutch pre-university education. The age of the learners is 15-18 with the majority being 16-17. This course is taught as part of the Research & Design class. In this class student develop solutions for real clients and their problems in the technical (for example engineering, biomedical and product development) domain. This course is taught before students start with their final project for this course (comparable to a Bachelor/Master thesis but on a highschool level). This course is aimed at the need of students to develop their ability to generate creative solutions.

Mode of delivery: Fully online

Activities and mode of instruction: Activities in this module include web-lectures, reading material, discussions, practice assignments and an assessment.

Part 2: Objectives

The learners …

1) Can formulate a given problem in terms of one of the principles formulated contradiction matrix[1].
2) Can use the contradiction matrix to select the one or more appropriate (depending on the problem) inventive principles[2].
3) Can generate 3 or more ideas for a problem when using the (appropriate) inventive principles.

Part 3: Technology and tools

Synchronous and asynchronous tool used:

As synchronous tool an online demonstration will be facilitated to show how the tools of the module (contradiction matrix and inventive principles) work. In this demonstration a real-world problem will be addressed and solved using the above tools. Students will be prompted to answer questions and are free to ask questions during the session. For this demonstration a teleconferencing program such as Skype or Hangout will be used.
As asynchronous tool video lectures, readings and practice assignments will be used. Video lectures and

[1] The contradiction matrix is a tool used in TRIZ.
[2] Inventive principles are a tool used in TRIZ

reading materials provide students with the theory of the module while practice assignments will allow them to get hands on experience with the tools in a low stakes environment. To facilitate this, a LMS will be used to manage the content. This LMS will need to support video lecture, digital resources, discussion forums and assignments.

Use of the tools by the student: Students will view the video lectures, participate in discussion forums and the demonstration, practice the practice assignments and do the teacher graded assignment. Students are familiar with these tools as they have used them in previous classes.

Justification of the tools and their link to the course objectives: The tools used are linked to the objectives in a way that the theory needed is transferred through the lectures and the reading material, demonstration is provide though the demonstration, practice is facilitated through the practice material and question possibilities are provided through the discussion forum and demonstration.

Potential challenges and ways to avoid them: Practical challenges involve the creation of the lectures due to the lack of technical skill of the instructor. However, support from the educational institution is available and the instructor is willing to learn new skills. Secondly, due to the varies ways students can learn (lectures, readings or practice) students might get lost in the LMS. This challenge will be overcome by providing clear instructions on the modules home page (similar to the 'start here' page in Coursera courses).

Part 4: Differentiated instruction

Ways to account for differences between learners: Differences between students will be addressed by providing the information in the module in different format. Besides the video lectures, reading material and external material will be provided. As the population does not include students with special needs and are more or less similar in terms of cognitive ability (due to the Dutch educational system), catering for different learning styles is sufficient.

Necessary accommodations: Modifications that need to be made to cater the different learning styles is that all materials need to be presented in different formats. This requires extra work on the side of the staff.

Part 5: Community building

Method of communication between students and teaching staff: Students and staff will communicate in 3 ways: discussion boards, during the live (online) demonstration and by mail. Discussion boards will be used to facilitate discussions between students and between students and staff. To facilitate discussion the staff will structure the forum and provide one or more threads that deal with specific issues of that week. The online demonstration will be used to demonstrate the key techniques that students need to master. During this demonstration students can directly ask the instructor questions regarding these techniques. E-mail can be used by students to contact the staff about specific issues such as technical problems or personal problems which are less suited for the forum.

Social media use: Twitter will be used to provide students with examples of TRIZ use by posting links to articles and web pages. Recent polls show that about 80% of the student population uses Twitter. To allow students who do not use Twitter to be able to access these materials as well a dedicated thread in the discussion forums will be opened. All the examples posted on Twitter feed will be posted as well.

Strategies to foster instructor presence: Instructor presence is achieved in two ways: through the live (online) demonstrations and by providing an active presence in the forums. The live (online) demonstrations will provide direct interaction between the students and staff. This will take place on a weekly basis and will allow the instructor to clarify any content related questions students may have. Active presence in the forum will ensure by dedicating 30 minutes at the day by the instructor to monitor and participate in the forums.

Degree of facilitation: Communication among students is facilitated setting a minimum number of post each student has to make in order to pass the course. These posts will not contribute to the grade of the student but are a prerequisite for passing. In the video lectures the instructor will direct students to the forums (in particular those that include student questions regarding the practice problems). Further, an active presence of the instructor in the forum will facilitate the use of this interaction tool.

Part 6: Assessment

Method of assessment: Two types of assessment will be used in this module: practice problems (self-assessed) and graded problems (assessed by the instructor). Practice problems will help the students by providing them with practice materials for the various steps that are involved in using the contradiction matrix and the 40 inventive principles (formulate the problems in terms of one of the principles involved in the matrix, selecting the appropriate principles using the contradiction matrix and generating ideas based on one of the principles). For each of the steps several practice problems (with answers) are available. Students can discuss these problems in a dedicated thread in the discussion forums. For the graded problems students will be presented a case in which they have to apply the steps practiced in the practice problems. Several versions of this problem exist to reduce the occurrence of fraud. Students will be provided with a grading rubric upfront to make them aware of the criteria they will be assessed upon.

Link to learning goals: The practice problems are strongly tied to the leaning goals as they all refer to a specific step of the use of the contradiction matrix and the generation of ideas.

Design of further instruction: The assessment will provide opportunities for further instruction in 2 ways: practice problems will result in discussions on the discussion forum and errors in the teacher graded assessment will be incorporated in an office hour video. Errors made by students will initiate discussions on the discussion forum. Here, students can post questions they have after attempted the practice problems. These can then be answered by fellow students (improving their understanding of the content) or by the instructor. The results of the teacher graded assignments will be used in the office hours video of the next week. In this video the teacher will discuss things that went well and that could be improved. By doing this students can learn from their mistakes and improve their future performance.