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**DLT Foundations and Introduction to Dentures**  
**CASTLE**  
**Case Analysis Questions**  
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**What are the Important Classroom Teaching / Learning Issues in this Case?**

**Classroom Scenario**

The Dental Technology program is evaluating communication tools to express each skill ability of laboratory work as the students' progress through the program. The students are not progressing from beginning level, to intermediate level, to expert level of skill competencies. When the students graduate from the program after 2 years of education and training, they need to be at the immediate or on the verge of the expert skill level.

eLumen has been implemented in two program courses. eLumen is composed of multiple evaluation scorecards that are directly linked to the course and program competencies. The evaluation scorecards are rubrics\*\* which are designed to evaluate the students accomplishment (very specifically) and to help the student understand what he or she needs to do to improve his or her laboratory skills.

eLumen allows the instructors and students to follow the students' progression through the Dental Technology Program (the courses that are using eLumen). The instructors can view the scorecards per student or per course, allowing the instructors to see where the students are excelling, progressing nicely, or not progressing sufficiently.

**\*\*Rubric: DT B2.03 Measures Distance, Length, & Volume**

**Description:** The student demonstrates the ability to measure distance, length, and volume in metric and standard units.

**Owner:** Programs - Dental Technology

Levels

0 No demonstrated achievement

1 There are too many extensive mistakes. The student needs to talk to the instructor.

2 The student made 1-2 extensive mistakes in his/her measurements of distance, length, and/or volume in metric and/or standard units. The student needs to talk to the instructor.

3 The student made 3-4 substantial mistakes in his/her measurements of distance, length, and/or volume in metric and/or standard units. The student needs to talk to the instructor.

4 The student made 1-2 substantial mistakes in his/her measurements of distance, length, and/or volume in metric and/or standard units. The student needs to talk to the instructor.

5 The student made 3-4 minor mistakes in his/her measurements of distance, length, and/or volume in metric and/or standard units. The student needs to talk to the instructor.

6 The student made 1-2 minor mistakes in his/her measurements of distance, length, and/or volume in metric and/or standard units.

- 7 The student made 3-4 insignificant mistakes in his/her measurements of distance, length, and/or volume in metric and/or standard units.
- 8 The student made 1-2 insignificant mistakes in his/her measurements of distance, length, and/or volume in metric and/or standard units.
- 9 The student measures distance, length, and volume in metric and standard units correctly (no mistakes).
- 10 The student perfectly measured the distance, length, and volume in metric and standard units.

### Course Information

eLumen is being used in the DLT Foundations course and Introduction to Dentures course. DLT Foundations is the first course in the program and Introduction to Dentures is the first technical course in the program. Both courses are face-to-face courses that use WebCT/CE6 enhancement and have laboratory projects.

### General Learning Outcomes

#### DLT Foundations

- 250.31 Describe the various types of gypsums used in the dental laboratory.
- 250.32 Identify the composition of gypsum.
- 250.33 Describe the physical properties of gypsum.
- 250.34 Describe the classification of gypsum materials.
- 250.35 Describe the methods of caring for gypsum products.
- 250.36 Describe how a dental technician can manipulate gypsum materials.
- 250.37 Practice gypsum manipulation techniques to the gypsum products.
- 250.38 Evaluate poured gypsum models.
- 250.39 Fabricate gypsum models.

#### Introduction to Dentures

- 251.30 The student will be able to relate occlusion rims & record bases.
  - .301 Describe what are occlusal rims & record bases.
  - .302 Describe what the dentist & the lab technician use the occlusal rims & record bases.
  - .303 Describe the purposes of the occlusal rim & record base.
  - .304 Describe and give examples of the types of record bases.
  - .306 Describe the requirements for a record base.
  - .307 List the checklist for the occlusal rim & record base.
  - .309 Describe the process of marking the median line.
- 251.31 The student will be able to list the procedures and fabricate a base plate and occlusal rim for complete dentures.
  - .311 Describe the procedures to fabricate various types of base plates and occlusal rims.
  - .312 Fabricate various types of base plates and occlusal rims.
- 251.32 The student will be able to list the procedures to fabricate a record base and occlusal rim for immediate dentures.
  - .321 Describe the procedures to fabricate various types of base plates and occlusal rims for an immediate denture.

## Relevant Laboratory Learning Outcomes

### DLT Foundations

- 250.37 Practice gypsum manipulation techniques to the gypsum products.
- 250.48 Fabricate a wax box and plaster block.
- 250.49 Fabricate a wax rectangle.
- 250.85 Construct an acrylic custom tray.
- 250.86 Construct a shellac baseplate.

### Introduction to Dentures

- 251.312 Fabricate various types of base plates and occlusal rims.
- 251.343 Articulate edentulous models on a semi-adjustable articulator.
- 251.644 Flask, pack, and process complete dentures displaying safe and proper handling of materials and equipment.
- 251.824 Polish a complete denture while safely operating equipment.
- 251.913 Repair flange on a broken denture.
- 251.933 Reline a complete denture.

## Learning Issues

- Communicating to the students to improve their laboratory skills.
- Students understanding the levels of skill competencies.

## Current Situation

Currently the program uses various laboratory projects to enhance cognitive understanding and psychomotor skills of dental materials and techniques to fabricate various types of prostheses. In DLT Foundations, the students are asked to fabricate a wax rectangle out of baseplate wax. The students are developing skills on how to hold their instruments, soften material with heat that will melt if too hot, measuring, and waxing techniques. They have 4-6 hours of laboratory time to finish the project. Some of the students have good understanding of the requirements, good hand-to-eye coordination, and are able to complete the project levels adequately. While a few of the students are challenged to master the hand-to-eye coordination, find it difficult to apply the cognitive concepts, and do not complete the project adequately. The rest of the students fall somewhere in the middle of the group, with their hand-to-eye coordination, and understanding of the requirements for each project.

Hand-to-eye coordination can be improved in all students that are willing to learn. The strategies used to teach hand-to-eye coordination include the instructor demonstrating the skill then have the student repeatedly practice the skill, have the instructor work with the student (one-to-one) directly demonstrating and correcting the student, and explaining why the skill is preformed in this manner.

The assessments used to evaluate the wax rectangle project include watching the skills being perform as he or she fabricates the wax rectangle and evaluate the finished wax rectangle with specific requirements.

The teaching / learning problem is to have all the students comprehend that they start at the beginning skill level and they have to proceed to the immediate skill level as

they progress through the program. Many students find a comfortable skill level and do not willing work towards the next skill level.

All five of the CREOLE meta-goals are relevant for the student to succeed in the Dental technology field. In DLT Foundations, the Goal 1 acquires and retains content, successful in the course. By the time, the students' start Introduction to Dentures Goal 2 and Goal 4 become motivated to succeed are extremely important. Goals 1 are still critical to success, but the students need to start problem-solving and making connections into other areas of Dental Technology. Goal 5 is obtained when the students take their advance studies courses.

In the Classroom Research textbook by K. Patricia Cross, chapter 2 is indicative of many of the students' characteristics. They enter the program knowing very little or nothing about Dental Technology and have to learn a new language and sometimes a new way to learn the require cognitive and psychomotor knowledge and skills. In the beginning, the students lack the self-confidence to complete the projects on their own and require the instructor to guide and praise them to build up their self-confidence.

The new language the students are learning (new vocabulary and basic concepts) serve as the foundation for the next course they take in the program. The students have to figure out (understand) each new concept, so they can build upon that knowledge and start to make connections between old and new information as they proceed through the program.

The Schema Theory states, "That new information is more easily understood and retained when it can be related to existing knowledge held by the learner" (Dross, 1996, P38). By the time the students are in the Introduction to Dentures course, they are using previously learned information and connecting that information to the newly learned information. The first and second levels of the schema are developed. The first level of the schema is when the information is first learned. The student gradually develops the second level. The second level "provides the framework for and determines the nature of understanding" (Cross, 1996, P39). The third level of the schema is normally developed during the second year of the program. At this level, the students are able to go beyond the basic framework, and start determining the nature of their understanding of the principles learned in DLT Foundations.

### **What Teaching / Learning Strategies Might be Helpful?**

The interventions the instructor will apply will be to ask the students to review their eLumen scorecards and give the instructor feedback for one semester. Do they understand what their instructor wants from them? Do they understand what is required of them to move to the next skill level? Is the eLumen evaluation scorecard helpful?

The instructor wants the students to understand what they need to do to move to the next skill ability level and to understand their strengths and weaknesses.

The behaviors the instructor wants to see in the students are increase motivation and participation for their learning.

What the instructor wants to do differently is allow the students a greater opportunity for understanding and growth. Using the eLumen evaluation scorecard and having the students actively review their personal scorecard for each project will give the ability for additional understanding and growth.

The eLumen evaluation scorecards are constantly reviewed and edited to correctly reflect the actual outcomes. Rubrics are created in depth; most rubrics in eLumen are 10 points long or smaller. The Dental Technology rubrics start at 10 points and can go as high as 30 points. This gives the instructor the ability to accurately evaluate each aspect of the project.

The classrooms activities describe in the Classroom research textbook that are relevant include Classroom Assessment Techniques (CAT), and concept mapping.

The classroom activities from CREOLE are relevant and include active learning, the instructor gives assignments, and the student is forced to locate and use information material off campus, or assign “doable tasks that learners can engage in a self-directed and self-initialing fashion” (Modular 1 Chapter 4, 2004, P. 34).

### **What learning Theories Might Support or Inform These Teaching / Learning Strategies?**

- Information processing theory and cognitive science propose that transfer of knowledge “is best viewed as an active, dynamic process rather than a passive product of a particular set of learning experiences” (Oliver, 2004, P.1). the students are able to realize that new situations are similar to existing or old situations that they learned and now apply that learned information to the current situation.
- Modal model of memory theory applied example of drill and practice allow the students to repeatedly practice skills (Oliver, 2004, P.30). Practicing skills repeatedly allows the students to improve their skill abilities and confidence.
- Social, situated learning theory proposes that students can learn by observing and modeling other’s behaviors (Oliver, 2004). All skills are first taught by observation (the instructor demonstrates first) and then practiced by the student.
- Weiner’s attribution theory examines the place of control related to the student’s ability and effort (Module 2 Chapter 2, 2004). Some students like a challenge and push themselves harder, while other students do not like difficulty and reduce their efforts to a more comfortable level.

### **What Research Questions and Hypotheses Does this Case Raise that Might be Further Investigated in a Classroom Research Project?**

The instructor is attempting to discover if the students understand the different skill ability levels and are they progressing through the different skill ability levels as they proceed through the Dental Technology Program.

#### **Hypothesis and Research Questions**

- Does having each student review his or her scorecard on eLumen help his or her understanding of the different skill ability levels?
- Does having each student review his or her scorecard on eLumen help his or her understanding where he or she is at on the different skill ability levels?
- Does having each student review his or her scorecard on eLumen help his or her understanding what he or she has to do to improve his or her skill ability to go to the next level?

### Classroom Data

Classroom data that may help the instructor to formulate her hypothesis and research questions include written surveys of students to see if they are using eLumen, observe students as they work on laboratory projects to see if they are improving their skill abilities, and evaluating finished projects from various courses to see if they are improving from DLT Foundations to Introduction to Dentures.

### **What Classroom Assessment Data Could be Collected to Test Out These Research Questions or Hypotheses?**

#### Data Collection Methods

- Surveys and ratings by the students on the quality, interest level, and helpfulness of eLumen.
- Observations methods by instructor to observe for skill ability improvement from DLT Foundations to Introduction to Dentures.
- Evaluate finished laboratory projects using the eLumen scorecards, and then comparing the similar and/or same skill competences used in DLT Foundations and Introduction to Dentures.

### Sampling Size

Preferably, use the entire class as the sample. A ratio of 15 students for all laboratory courses have been maintained in accordance to our accreditation standards. The accreditation agency (American Dental Association) maintains that a ratio of 15 students to 1 instructor for all laboratory courses.

### Classroom Assessment Techniques (CAT)

CATs do not presently apply in the laboratory. The instructor is currently developing methods of using concept mapping when fabricating prosthesis.

### Surveys

Written surveys investigating the frequency of students viewing the eLumen evaluation scorecards, understand the eLumen evaluation scorecard, and did the eLumen evaluation scorecard help them improve their skill abilities.

### Evaluations

eLumen is created of evaluations scorecards that are composed of multiple rubric skill competences that each student will be evaluated on. The other evaluation methods used is observing the students while working in the laboratory.

### Other Relevant Data

- Does the student have a learning disability?
- General characteristics of students.
- Reasons why students left the program.

### Compare Students' Performance to Previous Student Performance

The instructor will compare the students' performance in DLT Foundations to Introduction to Dentures.

### Compare Experimental Group Performance to a Control Group

No, each course is only taught once a year and the instructor has only been using eLumen for a year.

### Analyze the Data

- Compare the same or similar skill competencies in DLT Foundations and Introduction to Dentures for each student.
- Tally the results of the written survey.
- Compare the skill competencies results to the results of the survey.

### Conclusion

#### eLumen Evaluation Scorecards

The Class of 2008 have completed DLT Foundations course and Introduction to Dentures course during their first semester of Dental Technology Program (Fall 2006). The instructor used the eLumen evaluations scorecards to evaluate the students' abilities, to see if the students understood the different skill ability levels, and show improvement from DLT Foundations to Introduction to Dentures. The two courses had four competencies / rubrics in common: DT A4.06 Measures & Weighs Materials, DT A4.04 Demonstrates Manipulation of Waxes, and DT A4.08 Demonstrates Manipulation of Acrylic. The last competency / rubric to be evaluated combines DT A2.03 Finishing Acrylic, DT A2.03 Acrylic Polishing, and DT A4.1 Demonstrates Manipulation of Abrasives.

Ten out of the fourteen students that started the Dental Technology Program finished both courses.

DT A4.06 Measures & Weighs Materials, DT A4.04 Demonstrates manipulation of Waxes, and DT A4.08 Demonstrates manipulation of Acrylic rubrics each showed a 20% improvement, 80% equivalent, and 0% no improvement.

The combined rubrics (each dealing with abrasives in some form) DT A2.03 Finishing Acrylic, DT A2.03 Acrylic Polishing, and DT A4.1 Demonstrates Manipulation of Abrasives showed a 30% improvement, 20% equivalent, and 50% no improvement. In the no improvement category, two of the students have left the program. They were unable to meet the standards of the program. Two the students have shown dramatic improvement that was not recorded in the eLumen evaluation scorecards. The last students have shown a small improvement when working with abrasives.

Overall, there was a 22.5% improvement, a 65% equivalent, and a 12.5% no improvement of skill ability from DLT Foundations course to the Introduction to Dentures course.

#### eLumen Student Survey

Nine students took the eLumen Student Survey. The survey consisted of 11 questions and space to write additional comments. The following questions dealt with using the eLumen program and their results:

- The instructor provided adequate directions to access and understands the eLumen program.
  - 100% strongly agree or agree, while 0% disagree or strongly disagree

- I had no problems accessing my eLumen account.
  - 100% strongly agree or agree, while 0% disagree or strongly disagree
- I liked the fact that I could access my eLumen account and read my evaluation on the same day the clinic or lab was schedule.
  - 89% strongly agree or agree, while 11% disagree or strongly disagree
- It was easy for me to print my eLumen evaluation scorecard.
  - 67% strongly agree or agree, while 33% disagree or strongly disagree

The students had no difficulty in using the eLumen program. The program is student and instructor friendly.

The following questions asked if the student understood the evaluation scorecards and their results.

- My eLumen evaluation scorecard was easy for me to understand.
  - 78% strongly agree or agree, while 22% disagree or strongly disagree
- It was easy for me to understand my scores on the eLumen evaluation scorecard.
  - 78% strongly agree or agree, while 22% disagree or strongly disagree
- It was easy for me to understand the eLumen Evaluation Criteria, on which my scores were based.
  - 78% strongly agree or agree, while 22% disagree or strongly disagree
- The eLumen comments helped me improve my clinic or lab performance.
  - 78% strongly agree or agree, while 22% disagree or strongly disagree
- The feed back provided on the eLumen scorecard helped me identify areas for performance improvement.
  - 89% strongly agree or agree, while 11% disagree or strongly disagree
- The fact that I could access my eLumen account on the same day the clinic or lab was schedule helped me improve my performance for the next clinic or lab.
  - 89% strongly agree or agree, while 11% disagree or strongly disagree

Overall, the students understood and were able to use the eLumen evaluation scorecard with little difficulty. Three of the students being evaluated did not use eLumen regularly. They chose not to participate in the eLumen program. Two of the three students have left the Dental Technology Program.

The survey also asked if the students for their next course would prefer to have their evaluations done with eLumen. The results were 66.6%strongly agree or agree, while 33.4% disagree or strongly disagree.

In the additional comment space, students wrote that they like the eLumen program and would like to have the eLumen program in other courses. The students like the feedback and the encouragement in writing.

The eLumen Student Survey overall was in favor of the eLumen program 85% strongly agree or agree, while 15% disagree or strongly disagree. The students thought the eLumen evaluation scorecards help them to understand and improve their skill ability.

### General Characteristics

The Class of 2008 started out with two males and twelve females, one student was married, and three students had children at home. Two of the fourteen students were international students and English was their second language. One of the

international students spoke and understood English adequately, while the other student did not. The international student who did not speak or understand English very well has left the Dental Technology Program. Also two of the students have confirmed learning disabilities, both students require extra time to take exams and one student utilizes books on CD.

The Dental technology students are extremely visual and hands on learners. Many of the students have a difficult time in writing notes and concentrating on lecture at the same time. The courses move at a very fast rate and the students can easily fall behind. The instructor (starting with this class) gave the students 95% of the note (in power point format) to the students, so they can concentrate more on the lecture discussions. The students were slow to ask questions in the beginning of the DLT Foundations, but as the course progress the students asked more questions and participated in class discussions. Some students do not like to ask questions in class or have a difficult time formulating and speaking the question (in English) in front of everyone. To help these students the instructor has started using the Muddiest Points, a CATs tool, one to two times a week. Each Muddiest Point is worth 5 points (In class activity points); the students can write down their questions or concepts that are not clear to them. Then the instructor explains each question in writing and talks about the questions in class. This has helped the students understand the material and stay current with the course. Muddiest Points also show the instructor where the students are having a difficult time understanding the material and the instructor needs to recover the material.

The students who used eLumen worked / tried harder on the next project, they also started communicating more with the instructor by asking questions often (in the laboratory). The students are staying focus, even when they are frustrated with the project, they keep trying (extremely important). With each project the students complete, they are improving in skill ability. In addition, these students are staying after class to work and come in to work during open lab time.

The students who did not use eLumen did not communicate as much with the instructor; they asked very few questions in lab. A few students did not attend class everyday, while others did. These students did not usually stay late to work or did not come in to work during open lab time. Their skill ability improved very slowly.

#### Hypothesis and Research Questions Supported or Not Supported

- Does having each student review his or her scorecard on eLumen help his or her understanding of the different skill ability levels?
- Does having each student review his or her scorecard on eLumen help his or her understand where he or she is at on the different skill ability levels?
- Does having each student review his or her scorecard on eLumen help his or her understanding what he or she has to do to improve his or her skill ability to go to the next level?

The results from the eLumen evaluation scorecards and eLumen Student Survey show that there is improvement and the students understand what they have to do to improve his or her skill ability. The actual improvement was only 22.5%. the instructor thought the percentage would be higher (closer to forty percent). There is room for improvement within the student body, refining the eLumen evaluation

scorecards, and expanding the eLumen program into other Dental technology courses.

The instructor plans to follow these students through the entire Dental Technology Program and complete another comparison between Introduction to Dentures course and Removable Prosthodontics course, to see if the students further develop their skill abilities and achieve the next skill ability level. The eLumen program will be expanded to additional courses in the Dental Technology Program.

References

CREOLE: Creating Optimum Learning Environments, Modular 2 Chapter 2, U.S., Department of Education, 2004.

Cross, K. Patricia and Steadman, Mimi Harris. Classroom Research. Jossey-Bass Publishers: San Francisco, CA, 1996.

Oliver, Kevin Ph.D., Palloff, Rena M. Ph.D., & Pratt, Keith Ph.D. CREOLE: Creating Optimum Learning Environments, Modular 1 Chapter 4, U.S., Department of Education, 2004.