

# A Robust e-Portfolio Design Framework in a Technical Communication Teaching Context: A Case Study with 3D Printing Design and Analysis

**Abstract:** e-Portfolio design is a major application that is often used to teach project-based language learning (PBLL) towards self-regulated learning with the purpose of teaching documentation and language production. However, e-portfolio design could be the first major step in the process of documentation with the broader purpose to teach intelligent information management for e-commerce and industry applications. This paper outlines a model for understanding how different information units, and different theoretical understanding of concepts related to the semantic web, and information standardization models could help with better use of an e-portfolio and help better understand how content management systems and delivery portals work. The discussed course has used the 3D printing context as a case study.

**Keywords:** – e-Portfolio, Technical Communication, Information Design

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## 01 Introduction

Project-based language learning (PBLL) and content language integrated learning (CLIL) is increasingly becoming important in EFL (English as Foreign Language) teaching, and technical communication (TC) pedagogy. However, very little emphasis is placed on information design, related analysis, and analytical reasoning as the foundation for language teaching, and technical documentation. E-portfolio provides us with such content design and analysis platform. An e-portfolio is described as a selective and structured collection of information, gathered for specific purposes, and documenting one's accomplishments and growth. These are stored digitally and managed by appropriate software, developed by using appropriate multimedia and customarily within a web environment and retrieved from a website, or delivered by CD-ROM or DVD. The development of e-portfolios should be suited to its purpose and objectives. E-portfolios meet different learning requirements such as assessment, presentation, learning, personal development, multiple owners, and working.

## 02 Objective

For this study, we used an e-portfolio to (a) design and document content for a process in manufacturing – which is 3D printing, and (b) design and document the product components, and the information related to the product components and systems that are to be 3D printed. For (b), we not only looked at the content the e-portfolio owner could put in the portfolio but also looked at the traditional use of the e-portfolio as a basis to explore how the e-portfolio content could be better archived in a schema/framework for more standardized use in industrial and e-commerce situations to deliver information in an intelligent way to designers, technicians, customers, vendors and other concerned parties who need that information. So, the idea is to move beyond the simple use of e-portfolio by students for their own content. The above-mentioned focus led us to the question of should we design the e-portfolio simply as a repository of information units, or should we delve deeper into how e-portfolio could be the first major step towards designing a component content management system (CCMS) that could help design intelligent information units, catering to more robust content access, delivery, and retrieval. This is the new genre in TC where the focus is not on writing/media production for e-portfolio, but structuring information units logically in a way that helps us form the basis for getting the right information at the right time and for the right purpose.

## 03 The Model Course Project

For the first part of this project, the focus was exclusively on the writing components and teaching students how to explain the 3D printing-related procedures (procedural writing). The idea was to explore if students could write short and focused technical reports in a standard website design environment. For the second part of the project, the outlook is more dynamic with an exclusive focus on (1) designing the basic structure of an e-portfolio based on a logical navigational design and (2) designing the e-portfolio in the model of a CMS such that students could be taught how a robust e-portfolio may help conceptually understand intelligent content management and delivery. These two major focuses could exclusively qualify as separate courses.

## 04 Courses

**A. Course # 1 (Project Stage # 1): Designing the Foundations of an e-Portfolio on 3D Printing** – E-Portfolio Assessment Rubric: As part of this project, we used the following rubric and focused on each step interactively in the classroom to measure how students have undertaken the process.

Stages	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
	Define context and goals	Collect artifacts and design	Select specific artifacts and reflect	Organize artifacts and finalize portfolio	Package portfolio and present to appropriate audience

- e-Portfolio Design Steps:**
- Freehand Sketch for the product to be 3D printed
  - Concept Mapping of the procedure – 1st Draft
  - Sketchboarding – 2nd Draft of the procedure
  - Prototyping with CAD
  - 3D Scanning of a physical product with iPad (Sense or iSense scanner, 3D scanning app)
  - Mapping 3D Scanned Model with CAD Model
  - Create Faceted Search Criteria for CDP
  - Website Design



### B. Course # 2 (Project Stage # 2): An e-Portfolio in the Model of a Content Management System

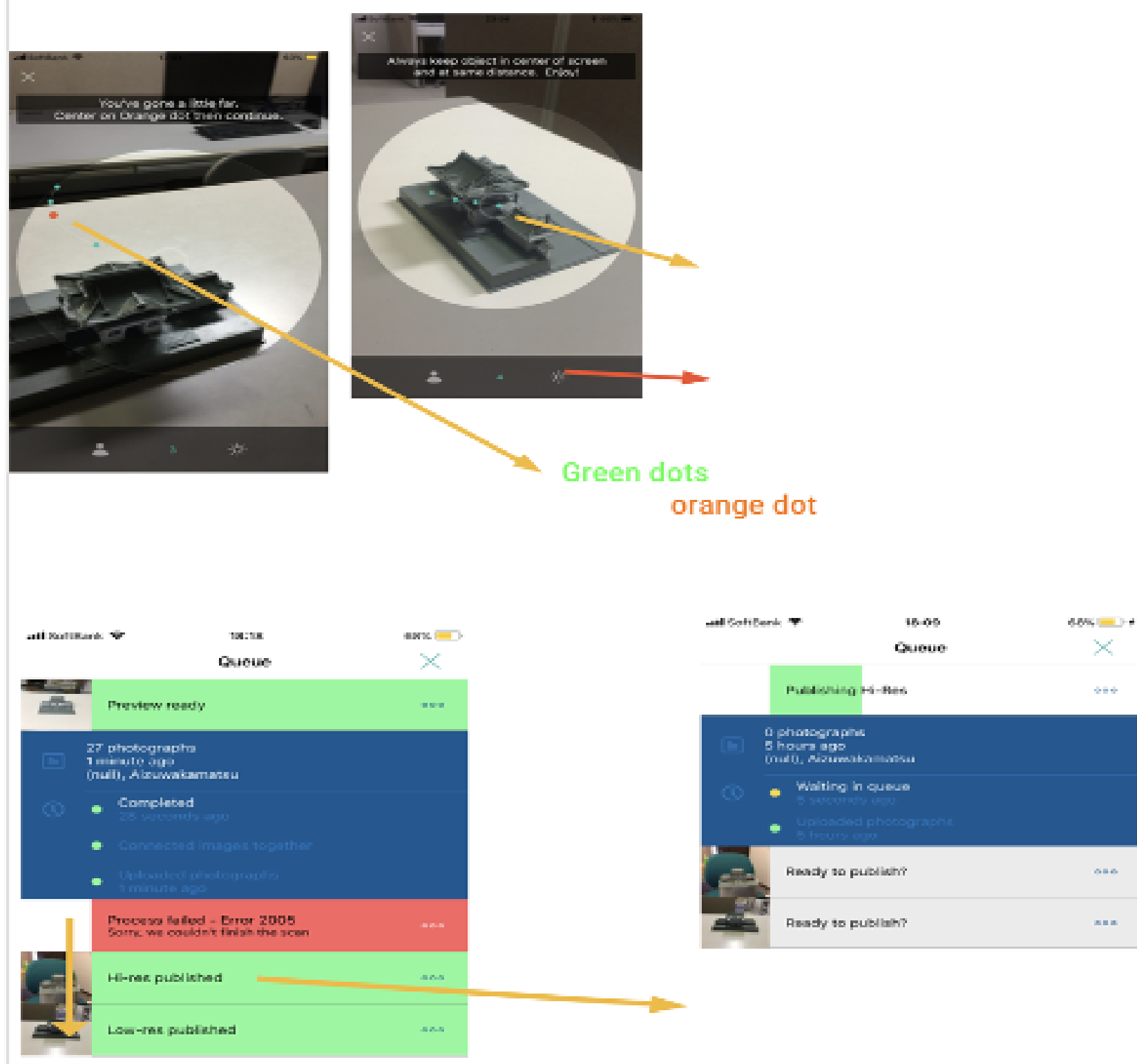
Martijn van den Broeck mentioned that a Content Management System (CMS) is not just the backbone of the e-portfolio, it is the beating heart. It keeps the portfolio alive and that's crucial. The portfolio designer, depending on the purpose of the e-portfolio, doesn't just want to get visitors, but also returning visitors. Visitors will only return if they expect new content and productive interaction. So, choosing a CMS is important, and more important is choosing the right CMS. It will directly impact the design of the e-portfolio. So, we want to see an e-portfolio as not just a digital collection, but a collection that facilitates the learning of intelligent information access. This specific orientation of the course has not yet been taught. This planned course allows us to explore the major features of a CMS and CDP, with the idea to understand the basic design of an e-portfolio (on the topic of 3D printing) in the context of e-commerce or production floor coordination in the industry. Visitors to a CMS modeled e-portfolio could be customers, engineers, repair and maintenance staff, etc. With the purpose of standardizing the components of the e-portfolio, we can use XML files as the storage format of the e-portfolio. For this particular course, we need to think about e-portfolio with componentization – e-portfolio identified into components, making it more reusable and easily rearranged. The components could be learning data including learning goals, learning works, evaluation marks, etc. We can further repurpose or expand the scope of such componentization of information units with the discussion of metadata-based information design models including semantic web, RDF/RDFS schema, ontology creation, web ontology language (OWL), and other related concepts. Many companies are now adopting semantic web technologies for commercial use. We can expand the scope of discussion of information management in the e-portfolio using faceted search, variant management, version management, and PI-Classification system. Such discussion helps better understand information standardization efforts in the e-portfolio.

## 05 Course Stages

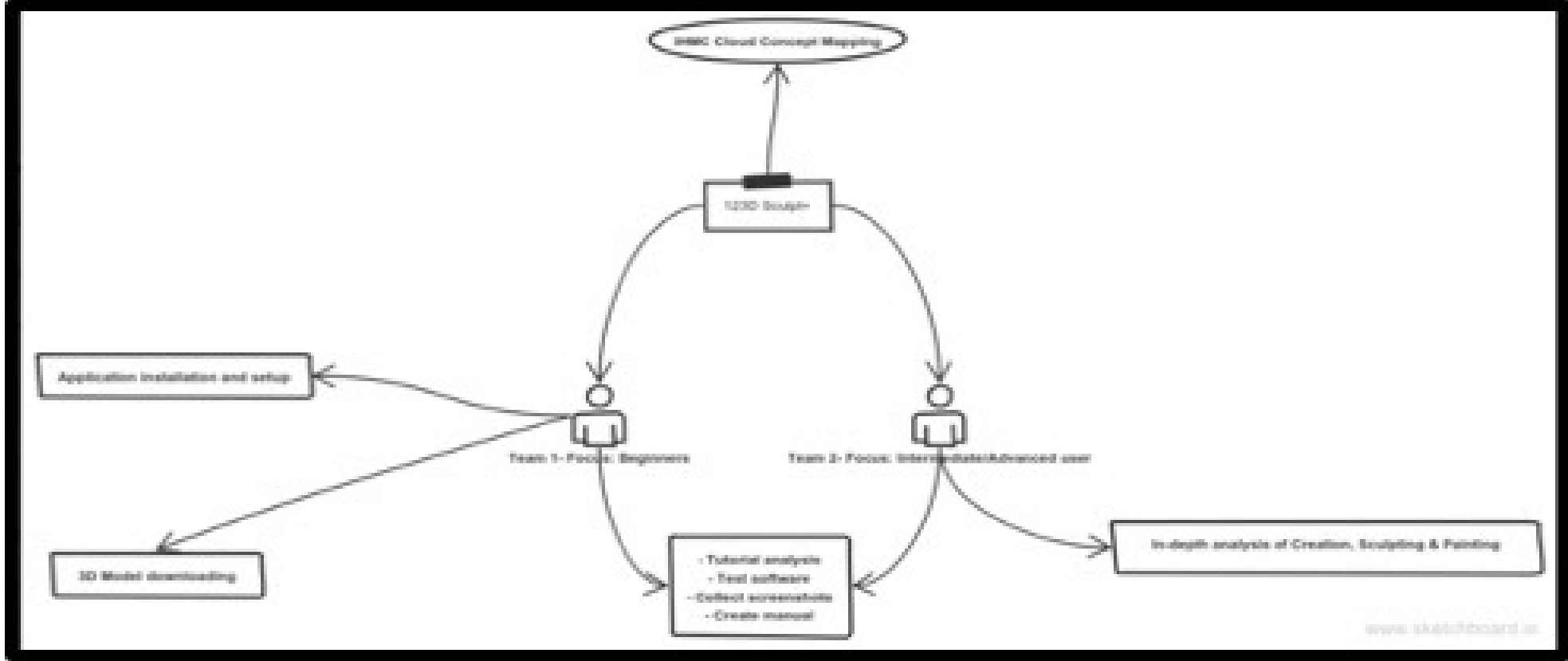
**1st Stage of the Course:** The course could start with students developing a website based on various major topics in 3D printing, and then creating different navigation structures to enrich information access on the website, either with information based on course # 1 or with links to external information from other web-based sources. The basic concepts related to CMS and CDP including XML-based programming, single sourcing, DITA information models – could be discussed at a basic foundational level.

**2nd Stage of the Course:** The above discussion may then be followed up with an in-depth analysis of how the navigational structure for the second iteration of the 3D printing website could include a robust faceted search criterion for customers, vendors, etc., to better access the information units.

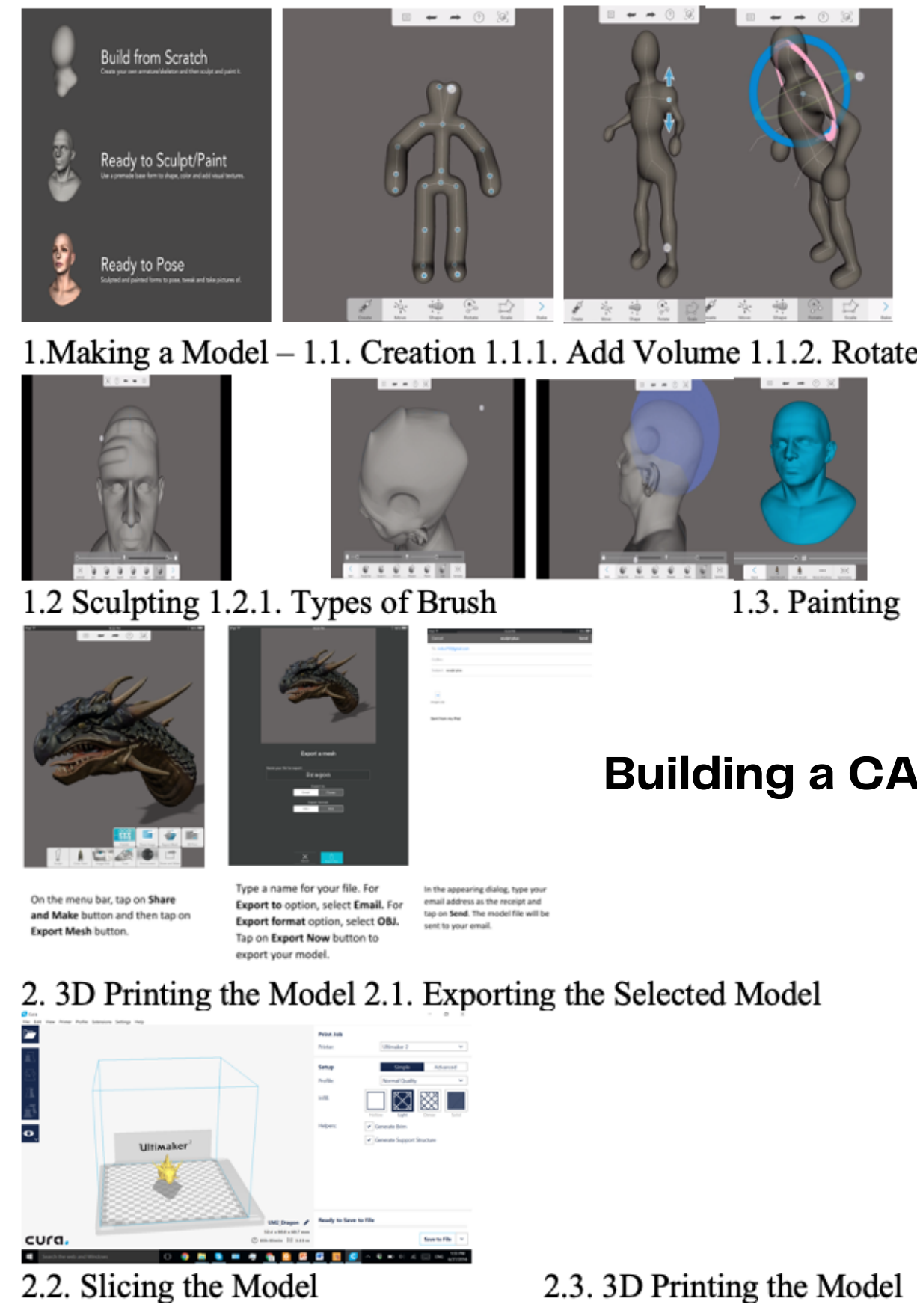
**3rd Stage of the Course:** A discussion of a robust e-portfolio must differentiate between the tasks related to the 3D printing of a product (the process), versus understanding the product itself. The third stage of the course could focus on the product itself, which will lead to a better understanding of the contextualized product-specific 3D printing process.



**Screenshot: An Attempt to Understand 3D Scanning Content and Create Faceted Search Criteria in the Website**



**A Basic Mind Map on 3D Printing Information Unit Design**



## 05 Conclusion

Designing an e-portfolio in a complex 3D printing context is challenging. 3D printing from design conceptualization to execution (final printing), and then on to marketing the models as a 3D printing company involves various kinds of content management and delivery challenges, for different kinds of customers, vendors, suppliers, maintenance personnel, etc. The first challenge is to design a robust e-portfolio based on the basic information units. The challenge is also about writing the basic procedures and information units on the website along with necessary illustrations and links. Increasingly, colleges and universities are using e-portfolios as an alternative assessment tool at the class and program level. Some learning management systems have built-in e-portfolio tools that educational institutions can use as a starting point. But in an academic context, we need a clearer understanding of the purpose of the e-portfolio initiative and how it could be repurposed with a wider scope.