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A Design Language for Educational Videos in Craftsmanship: Enhancing Learning Experiences for Artisans

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Dedication

I dedicate this work to my beloved family :

To my dear **father**, for his strength, wisdom, and constant support.

To my loving **mother**, whose sacrifices and unconditional love have guided me every step of the way.

To my cherished **grandparents**, whose values and prayers have always been a source of inspiration.

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Table des matières

Table des figures

Liste des tableaux

Abstract

E-learning systems are widely adopted for their flexibility and accessibility, though video production remains the most costly aspect of MOOC creation. To enhance interoperability and avoid content duplication, standards like SCORM and NSL allow instructional designers to efficiently distribute content across platforms. Educational videos and games can be powerful tools for teaching moral values to children. By integrating decision-making scenarios and storytelling, these media promote critical thinking, empathy, and ethical reasoning in a safe, engaging environment. Despite their potential, there is a lack of conceptual frameworks linking moral values, objectives, children's actions, and game structures. This work introduces a methodological framework for teaching values like honesty and empathy through games, demonstrated via a case study. Additionally, this thesis presents $\mathcal{LD}_v$, a domain-specific language for designing animations of craftsmanship learning experiences. $\mathcal{LD}_v$ supports the animation of discrete transformation chains through reusable unit animations, enabling easy adaptation across various modeling scenarios. The approach is implemented via a language workbench and validated through a case study.

Keywords : Animation, Model Driven Engineering, Composition animation, Learning design, craftsmanships, Learning Experiences, Educational Videos.

ملخص

تُعتمد أنظمة التعليم الإلكتروني على نطاق واسع لما توفره من مرونة وسهولة في الوصول، إلا أن إنتاج الفيديوهات يظل الجانب الأكثر تكلفة في إنشاء الدورات الإلكترونية المفتوحة واسعة النطاق .(MOOCs) ومن أجل تعزيز قابلية التشغيل البيني وتفادي تكرار المحتوى، تسمح المعايير مثل SCORM وNSL لمصممي المحتوى التعليمي بتوزيع المواد التعليمية بكفاءة عبر مختلف المنصات. تُعدّ الفيديوهات التعليمية والألعاب أدوات فعالة لتعليم القيم الأخلاقية للأطفال. ومن خلال دمج سيناريوهات اتخاذ القرار وتقنيات السرد القصصي، تُسهم هذه الوسائط في تنمية التفكير النقدي، والتعاطف، والمنطق الأخلاقي، ضمن بيئة آمنة وجذابة. ورغم الإمكانات الكبيرة لهذه الوسائط، إلا أن هناك نقصًا في الأطر المفاهيمية التي تربط بين القيم الأخلاقية، والأهداف التعليمية، وتصرفات الأطفال، وبُنى الألعاب. يقدّم هذا العمل إطارًا منهجيًا لتعليم القيم مثل الصدق والتعاطف من خلال الألعاب، ويُوضّح ذلك عبر دراسة حالة. بالإضافة إلى ذلك، تعرض هذه الأطروحة لغةً متخصصة تُعرف بـ $\mathcal{LD}v$ لتصميم رسوم متحركة لتجارب التعلم الحرفي. تدعم $\mathcal{LD}v$ تحريك سلاسل التحول المنفصلة باستخدام وحدات رسوم متكررة قابلة لإعادة الاستخدام، مما يُسهل تكييفها عبر سيناريوهات النمذجة المختلفة. وقد تم تنفيذ هذا النهج باستخدام منصة تطوير لغات، وتم التحقق من صلاحيته من خلال دراسة حالة.

الكلمات الدالة: الرسوم المتحركة، هندسة مدفوعة بالنماذج، تأليف الرسوم المتحركة، تصميم التعلم، الحرف التقليدية، تجارب التعلم، الفيديوهات التعليمية

General Introduction

"The man who moves a mountain begins by carrying away small stones."
— Confucius

Context and Motivation

Recently, there has been growing interest and demand in developing powerful workbenches and visual editors for learning design in education. These tools assist teachers and educators in designing instructional courses for learners, as they facilitate access from any computer or mobile device. Moreover, they support essential tasks such as verification and validation of the knowledge transfer design, deployment of updates, maintaining multiple versions of a learning design concurrently, and running simulations (e.g. [20, 18, 30, 3]). It also makes contributions to many fields like education and collaborative work. For instance, in smart educational environments, elements from popular culture such as gamified learning activities and micro-learning animations—are increasingly used to encourage behavior change and engagement. These visual and interactive learning designs support personalized education and are accessible on both computers and mobile phones, enabling learners to easily interact with content anytime and anywhere [21, 19, 13].

Problem Statement

Learning Experiences for Artisans has received more attention with its popularity in both academic and industry era [27, 7, 22, 12]. Gesture learning plays a crucial role in craftsmanship education, where physical movements and manual skills are central to mastering a craft. Existing pedagogical resources for gesture learning generally fall into three categories : live demonstrations, real-time assistance, and video recordings. Live demonstrations and real-time assistance provide immediate, context-sensitive guidance but are limited by availability and scalability. Video resources, on the other hand, offer permanent availability and accessibility but often lack interactivity and adaptability.

The recent rise of online education has expanded access to learning but poses specific challenges for craftsmanship training. Unlike purely theoretical subjects, crafts knowledge is transmitted primarily through practical experience. It is a living knowledge that is difficult to formalize and explain explicitly. This experiential nature makes explaining and sharing learning experiences challenging because it heavily relies on direct observation and hands-on practice.

Tracking, monitoring, and analyzing practitioners' learning experiences during problem-solving has thus become more complex in online and digital environments. Practitioners' problem-solving processes typically involve multiple iterative steps, and focusing solely on their final attempts fails to capture the rich learning trajectory. To truly understand and support practitioners' behavior, it is essential to log and analyze intermediate attempts throughout the learning process.

Contribution

As we said before, the purpose is to introduce a scenario-based animation for the chain of Learning Experiences for Artisans whose execution (exe_{trans}) can be seen as a play-engine (exe_{UAs}) to produce discrete behavior animation. First, to assist the user in acquiring the big picture of more complex scenarios and understanding the process immediately. Second, encapsulating a complex animation scenario as combinations of fundamental animating primitives in sequential mode ($\oplus$) or parallel mode $\otimes$ to represent the chain without any knowledge of implementation or technology details, so if one needs to change the learning experience, it suffices to change the animation. In this paper, we presented a (Domain-Specific Language) called $\mathcal{LD}_v$ for designing animations of discrete behavior (e.g. location of an object, visual aspects, multiple modes of moving objects) according to the different stages of the learning experience. We suggest an $m : n$ relationship that links all elements of an animation divided into discrete steps or unit animations (UAs) with smaller sub-transformations (UTs).

Our design language $\mathcal{LD}_v$ is an extensible and customized kernel that captures the possible interactions needed to represent the complex behaviors of DSLs and assists in the animation composition process through combinations of fundamental animating primitives. Primarily, $\mathcal{LD}_v$ is employed to express semantics in an animated manner, ensuring that an animation carrying the respective visual information corresponds to a learning experience model. Further mapping of graphical elements, visual variables, and animation expressions are introduced through information objects (e.g. *rectangle*, *line*) and operations by manipulating the visual variables (e.g. *background color*, *line size*, *line type*). We implement this framework as a plugin to help designers/researchers create successful animation model products aligned with their learning experience manifests. The correctness of an animation is affected by the extent to which target transformation rules are fulfilled, although animation provides ways of using $\mathcal{LD}_v$ in collaborative work.

$\mathcal{LD}_v$ can be utilized to explain the logic behind each experience before writing it, ask developers whether their plan is sound without focusing on syntactical aspects, point out possible logical errors (e.g. missing expressions or ordering issues), and support a collaborative process where one developer draws the plan in animation form and another codes it. Finally, we hope that our paper will encourage other educators to use the notation for teaching purposes. We also show an example of reusing different bricks of our DSL, by considering a case study.

Thesis Organization

Our thesis is organized as follows. In Chapter 1, we discuss the Transferring Practitioner Learning Experiences . In Chapter 2, we discuss the Instructional Learning Design ans analyzing of a case study. In Chapter 3, we present our proposal. In Chapter 4, we implement our framework to demonstrate its applicability. Finally, the master thesis concludes and outlines directions for future work in Chapter 5.

Chapitre 1

Transferring Practitioner Learning Experiences

■ If you are unable to understand the cause of a problem it is impossible to solve it.. ■— Naoto Kan1

1.1 Introduction

In an economic context characterized by increasing instability and competitive intensity, the use of collective reflection mechanisms on past experiences, meaningful capture, and evaluation of efforts invested in learning are the means that an organization must learn to survive. *Learning* is the acquisition of know-how, that is, the process of acquiring practices, knowledge, skills, attitudes, or cultural values through observation, imitation, trial, repetition, and presentation [32, 6, 25, 16]. It contrasts with, while complementing, teaching whose goal is primarily the acquisition of knowledge through study, exercises, and assessments.

For psychology inspired by *behaviorism* [40, 23, 35, 36], learning is seen as the association between an externally provoked event (stimulus) and an appropriate reaction by the subject, causing a change in behavior that is persistent, measurable, and specific, or enabling the individual to formulate a new mental construction or revise a prior one [23].

Organizational learning and change constitute an essential source of competitive advantage. Numerous studies have focused on learning issues in order to characterize the different change processes an organization may undergo. This notably involves precisely defining the criteria for a true learning organization.

In this section, we will first define *organizational learning* and describe what a learning organization is. Then, we will introduce and explain the notion of individual learning to clearly differentiate it from organizational learning. Finally, we will conclude by presenting different ways of conceiving organizational learning. In this chapter, we will study the basic concept that forms the core of corporate memories, which is knowledge. We will present some definitions of knowledge to better understand this notion, its nature, the forms under which it can be found in enterprises, followed by its life cycle and dimensions. In addition, will also cover in this chapter the notion of reuse, which is often discussed in the field of corporate memories since the very goal of these memories is the reuse of knowledge. We will present some definitions of reuse, its objectives, as well as some of its characteristics, including reusable components and another concept called case-based reasoning.

1.2 Knowledge notion

1.2.1 Definition of Knowledge

Several definitions of knowledge are given by various authors. Below, we present some of them, knowing that there is no standard definition for knowledge.

According to G. Balmisse :

Data, information, and knowledge are three related terms often used in the same context to sometimes designate the same thing. However, these terms cover very different realities.

Data	**Information**	**Knowledge**
Raw values without context. *Example : 100g of olive oil, 40°C.*	Data with meaning and context. *Example : 100g of olive oil heated to 40°C for soap mixing.*	Experience-based understanding. *Example : Olive oil at 40°C mixes well with lye to make smooth soap.*

FIGURE 1.1 – Illustration of the distinction between Data, Information, and Knowledge in an artisan learning context.

The following diagram is a linear hierarchical representation of knowledge (see Figure 1.2) :

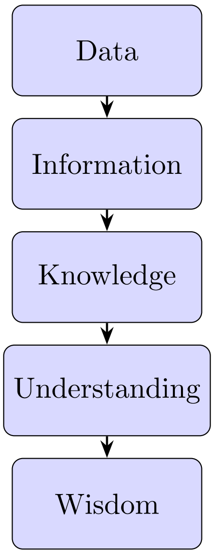


FIGURE 1.2 – Linear Hierarchical Representation of Knowledge

1.2.2 Classification of Knowledge

We distinguish three classes of knowledge [29, 26, 10] :

— **Classification by articulation :** Distinguishes between explicit knowledge and tacit knowledge. Explicit knowledge is easy to formalize and codify in documents, whereas tacit knowledge is very difficult to formalize as it belongs to mental models such as experience, skills, and trade secrets.

— **Classification by possession :** Distinguishes between individual knowledge and collective knowledge. Individual knowledge is created and acquired by an individual, whereas collective knowledge is created through interactions among individuals in work communities.

— **Classification by psychology :** Counts four types :

1. “*Knowing that*” : Declarative knowledge, consisting of knowing all the rules and concepts of a domain.
2. “*Knowing how*” : Procedural knowledge, generally corresponding to know-how.
3. “*Knowing when*” : Conditional knowledge, relating to the conditions necessary for an action to be performed.
4. “*Knowing why*” : Causal knowledge, which is knowing the reasons.

Example :

Type of Knowledge	**Example in Artisan Education**
Knowing that	Understanding that different types of wood (e.g., oak vs. cedar) have distinct properties.
Knowing how	Being able to carve a decorative pattern using traditional hand tools.
Knowing when	Knowing the right moment to apply varnish after wood preparation.
Knowing why	Understanding why slow drying prevents cracks in clay pottery.

TABLE 1.1 – Types of Knowledge in Artisan Education

1.2.3 Forms of Knowledge in Enterprises

Ikujiro Nonaka and *Hirotaka Takeuchi*, two Japanese experts in knowledge management, distinguish two forms of knowledge : *tacit knowledge* and *explicit knowledge* [1].

Tacit Knowledge

Tacit knowledge is the knowledge possessed by an individual. It is not formalized and is difficult to transmit. It represents skills, experience, intuition, trade secrets, and tricks of the trade acquired and exchanged through internal and external exchanges within the company. Tacit knowledge is the most important form for initiating the creation of new knowledge.

Explicit Knowledge

Explicit knowledge is formalized knowledge that can be transmitted through reusable documents. It represents information about processes, projects, clients, suppliers, etc. In other words, these are documents that can be captured, i.e., collected and/or scanned, and shared by an information system.

1.2.4 Knowledge Life Cycle

In their work, I. Nonaka and H. Takeuchi hypothesize that knowledge is created from interactions between tacit and explicit knowledge. Thus, four modes of transfer can be identified (Figure **??**) :

— **Socialization : Tacit to Tacit :** Socialization represents the process of transmitting tacit knowledge. This involves transmitting mental models or technical skills that can occur without verbal exchange. The transmission of know-how generally occurs through observation, imitation, and especially practice and experience. Socialization is favored by the environment.

— **Externalization : Tacit to Explicit :** Externalization represents the process of converting tacit knowledge into explicit knowledge, in the form of concepts, models, or hypotheses. Modeling a concept often results from dialogue exchanged between individuals.

— **Combination : Explicit to Explicit :** Combination is a process that creates explicit knowledge by restructuring a set of other explicit knowledge acquired through different communication channels. Networks, which are links that an individual weaves between different explicit knowledge of the organization, favor combination.

— **Internalization : Explicit to Tacit :** Internalization is the process of converting explicit knowledge into tacit knowledge. Often, this is a learning process supported by documents, manuals, etc. Learning allows an individual to acquire new knowledge or skills through study or experimentation.

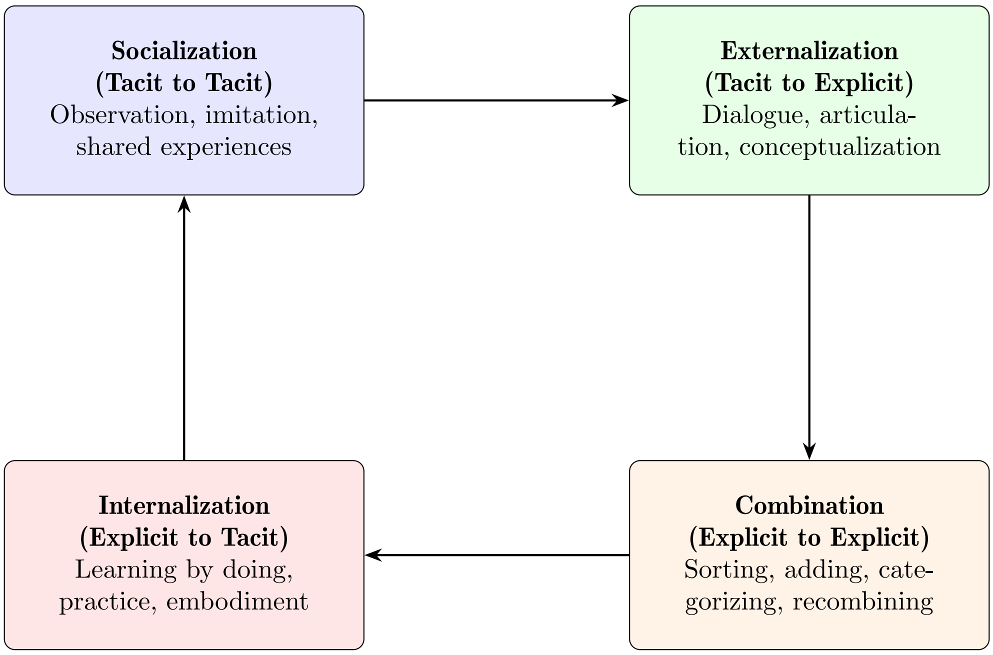


FIGURE 1.3 – SECI Model : The dynamic process of knowledge transformation

1.2.5 Knowledge Management

Knowledge management (KM) is a set of processes aimed at leveraging organizational and human skills by creating a learning culture [**<empty citation>**]. Knowledge management consists of managing intangible capital in the same way as material assets.

Michel Grundstein, in his document "Knowledge and Competency Management : Towards a Reference Model (MGKME)," identified four generic processes of knowledge management. These processes are :

— **Localization Process :** Identify, locate, and map knowledge.

— **Preservation Process :** Acquire, model, formalize, and store knowledge.

— **Valorization Process :** Access, disseminate, share, and exploit knowledge.

— **Updating Process :** Evaluate, update, enrich, and standardize knowledge.

1.3 Reuse notion

In this section, we introduce the notion of reuse.

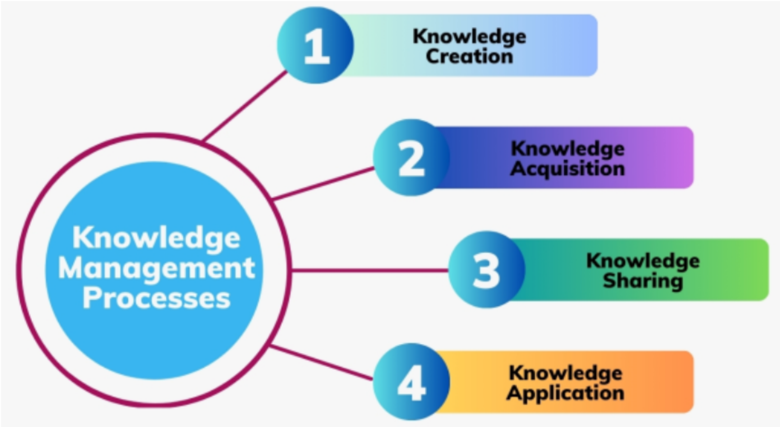


FIGURE 1.4 – The four knowledge management processes, adapted from [Grundstein, 2006][**<empty citation>**]

1.3.1 Definition of Reuse

To reuse or re-purpose is to extend the life of an object by repairing it or assigning it a new place. The object retains its original function. *For example* : reusing printed papers as drafts, reusing packaging as storage containers [24].

In the context of corporate memories, reuse means "using one or more existing resource components to create new components with minimum search and adaptation time, and especially less than that required to build new components offering the same functionalities [38]."

1.3.2 Objectives of Reuse

The objective of reuse is to increase the productivity of processes by providing a level of quality equivalent to or better than that in processes carried out without any reuse [28].

The main objectives of reuse are essentially :

— Saving time and resources by reusing solutions and resources (that may be adapted) which have already been used to solve similar past problems.

— Avoiding repetitive and tedious work to improve productivity.

— Avoiding errors made in the past.

1.3.3 Characteristics of Reuse

This section presents notions related to reuse, such as reusable components and case-based reasoning.

1.3.4 Reusable Components

Definition of a Reusable Component

Anguswamy Reghu defines a reusable component as "'any known element, already used, judged to be of interest by a community within a domain, and especially possessing particular characteristics allowing it to be used again in other contexts"' [2].

By element, they means any description of a real-world object, process, rule (in the regulatory sense), or knowledge element. The interest of the reusable component lies in the fact that this component :

— Is considered generic enough to be used in different situations.

— Has particular characteristics that allow easy adaptation to needs.

— Knowledge about this element is sufficiently mastered by a large population of the domain (standard element).

1.4 Corporate Memory

Generally, a corporate memory is a data structure that stores artifacts and allows users to publish and select them. The repository includes different types of models and data : process models, code, processes, documentation, experimental and simulation data, test

1.4.1 Definition of Organizational Learning

Being a strategic and sensitive asset for the organization, several definitions recorded by different scientists and researchers exist in the literature. These definitions are as numerous as the fields that use organizational learning.

According to *Basten Dirk* and al [5], there is a three-point consensus around the notion of organizational learning : first, alignment with the environment, which involves the adaptation of the organization to its environment ; second, the sum of individual learnings within the organization ; and third, the strategy and structure adopted by the organization.

The International Development Research Centre in Canada defines organizational learning as "‘the capacity of an organization to accumulate knowledge from its own experience, to disseminate this knowledge to its members throughout the organization (and not only to one person or isolated group), to reflect on it and use it as a basis to design planning and programming activities, to adapt and to face change. A learning organization is an organization that encourages all its members to learn and continuously transform itself.’"

Many other definitions can be cited from various researchers.

1.4.2 Definition of a Learning Organization

A "‘*learning organization*’" is a company that wisely builds structures and strategies to increase and maximize organizational learning. The concept of a learning organization has become popular because organizations want to be more capable of adapting to change [5]. Learning is a dynamic concept highlighting the continuously changing nature of organizations. The focus gradually shifts from individual learning to organizational learning. Learning is essential for individual growth ; it is also important for organizations.

Individuals are part of the organization, and they must establish the forms and processes necessary to enable organizational learning to facilitate change. Three types of learning are distinguished for a learning organization : (i) Single-Loop Learning, (ii) Double-Loop Learning, and (iii) Triple-Loop Learning.

1.4.3 Single-Loop Learning

This occurs when errors are found and corrected and the organizations continue their policies and goals. A single-loop learning can be equated with activities that add to the knowledge base or specific skills or routines of the firm without changing the fundamental nature of the organization’s activities. Single-loop learning is also referred to as “low-level learning” by FIOL and LYLES, “adaptive learning” or “coping” by SENGE, and “non-strategic learning” by MASON [14].

1.4.4 Double-Loop Learning

This occurs when, in addition to detecting and correcting errors, the organization questions and modifies its existing norms, procedures, policies, and objectives. Double-loop learning involves changing the knowledge base or organization-specific skills or routines.

Double-loop learning is also called “high-level learning” by FIOL and LYLES, “generative learning” or “learning to increase an organization’s capabilities” by SENGE, and “strategic learning” by MASON. Strategic learning is defined as “a process by which a company understands its environment in ways that expand the range of objectives it can pursue or the range of resources and actions available to it to address those objectives [4].

1.4.5 Triple-Loop Learning (called ”Learning about Learning”)

Learning that involves reflection on how learning itself occurs. It questions the context, culture, and methods of learning. Meta-learning means improving the way an organization learns, not just what or why. For instance, The team reflects on whether they have effective mechanisms for detecting problems and whether they foster a learning culture [37].

Table 1.2 shows the distinctions between Single-, Double-, and Triple-Loop Learning in terms of questions asked, scope, and examples.

Table 1.2 – Comparison of Single-, Double-, and Triple-Loop Learning

Type	Question Asked	Scope	Example
Single-Loop Learning	“Are we doing things right ?”	Actions	Fixing errors without changing goals.
Double-Loop Learning	“Are we doing the right things ?”	Goals & Assumptions	Changing strategies or questioning decision criteria.
Triple-Loop Learning	“How do we decide what is right ?”	Learning Processes	Reflecting on the learning system or learning to learn.

1.5 Knowledge Capitalization in a Learning Organization

This occurs when organizations learn how to carry out single-loop and double-loop learning. The first two forms of learning will not occur if organizations do not realize that learning must happen. Being aware that ignorance motivates learning (Nevis et al., 1995) means identifying learning orientations or styles, and the processes and structures (facilitating factors) required to foster learning. Nevis et al. (1995) identify seven different learning styles and ten different facilitating factors influencing learning. For example, one facilitating factor identifies the gap between the actual result and the targeted performance. This awareness makes the organization recognize that learning must occur and that the appropriate environment and processes must be created. It also means recognizing that prolonged periods of positive feedback or good communication may block learning.

1.5.1 Knowledge Creation

Knowledge creation according to NONAKA essentially relies on the distinction between explicit knowledge and tacit knowledge [39]. According to the conventional model of knowledge creation, the knowledge cycle starts with data, which, once sorted and organized, transforms into information, and once put into context, this information transforms into knowledge. The diagram below illustrates this model (Figure 1.5).

Table 1.3 shows DIKW hierarchy illustrated in the context of agriculture.

WisdomInformed action (e.g., ”Irrigate in July”)

KnowledgeInterpreted information (e.g., ”Low rainfall reduces yield”)

InformationContextualized data (e.g., ”Average July temp : 23°C”)

DataRaw facts (e.g., ”23°C”, ”200 kg”)

FIGURE 1.5 – The conventional model of knowledge creation

Level	Description	Example (agriculture)
Data	Raw, unprocessed facts	*”23°C”, ”15 mm rainfall”, ”200 kg”*
Information	Organized data with context	*”Average temperature in July was 23°C”*
Knowledge	Interpreted information with experience	*”In July, 23°C and 15 mm rainfall reduce crop yield”*
Wisdom	Judicious application of knowledge for action	*”Irrigate in July to maintain yield”*

TABLE 1.3 – DIKW hierarchy illustrated in the context of agriculture

According to J.L. ERMINE, knowledge drives the creation of new survival strategies [<**empty citation**>]. The stage of knowledge creation is often accompanied by updating and enriching existing knowledge [33]. This is what knowledge capitalization entails. Michel GRUNDSTEIN revisited the problem of knowledge capitalization and characterized it through five facets, showing their interactions [11]. This issue is represented in the figure below (Figure 1.6).

1.5.2 Detailed description of the knowledge capitalization process

Identification : It involves identifying the crucial knowledge, that is, the knowledges (*explicit knowledge*) and know-how (*tacit knowledge*) necessary for decision-making processes and the execution of core business activities. These must be identified, located, characterized, economically valued, and prioritized.

Preservation : This concerns the problems related to preserving knowledge : it must be acquired from knowledge holders linked to the domain, i.e., business experts, modeled, formalized, and stored.

Valorization : This concerns the enhancement of knowledge, making it available for the development and expansion of the organization — i.e., accessible to everyone according to security and confidentiality rules, disseminated, shared, and combined to create new knowledge. Note the significant contribution of ICT in this valorization phase.

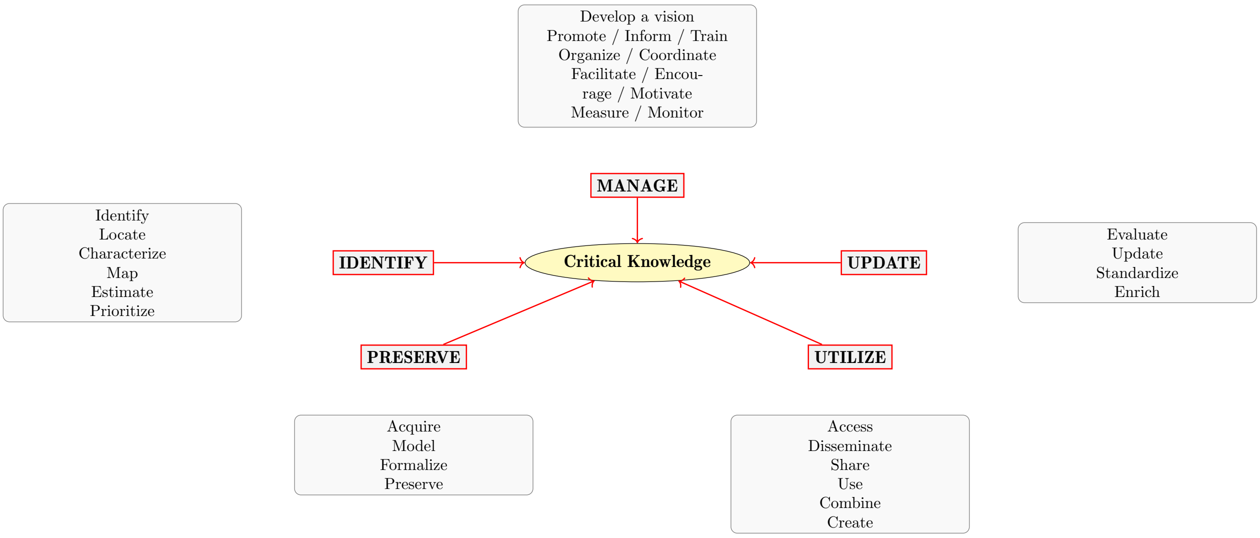


FIGURE 1.6 – The problematics of knowledge capitalization in organizations

Updating : Knowledge must be kept up to date by evaluating, updating, standardizing, and enriching it continuously based on feedback, creation of new knowledge, and the integration of external knowledge.

Management : This involves the interaction between the previously mentioned facets. Knowledge management sits here, encompassing all managerial functions aimed at addressing knowledge capitalization challenges as a whole. This requires aligning knowledge management with organizational strategic directions, raising awareness and encouraging all organizational actors, organizing and steering activities and specific processes towards better mastery of knowledge, fostering favorable conditions for cooperative work, encouraging knowledge sharing, developing indicators to monitor and coordinate actions, measure results, and assess the relevance and impact of these actions.

1.6 Objectives of Knowledge Management

The strategic importance of knowledge assets forces company leaders to define objectives related to knowledge management. Among these objectives, Serge ARIES lists :

- Optimization of individual and collective performance.
- Better visualization of activities and their complexities.
- Improvement of formalizations (technical repositories, documents...).
- Improved information at the workplace.
- Better circulation of information (top-down, bottom-up, transversal).
- A quality management approach.
- Optimization of processes by developing, preserving, and sharing know-how.
- Providing a competitive and strategic advantage.

The stakes concerning the preservation of knowledge assets cited by the same author include :

- Managing retirements.
- Preparing for strategic change.
- Integrating personal organization.
- Becoming more competitive, especially vis-à-vis competitors.
- Reconfiguring company activity.

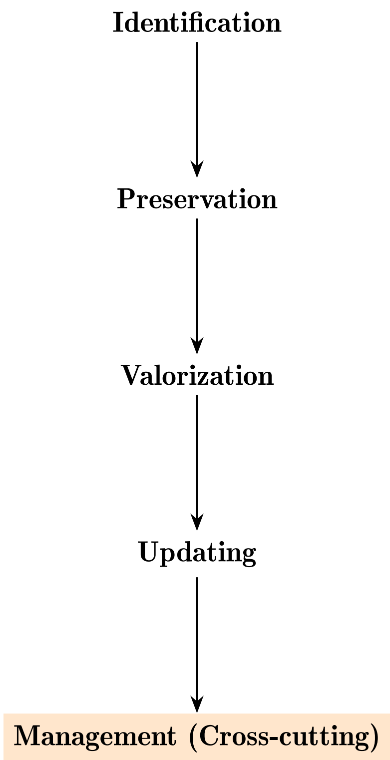


FIGURE 1.7 – Knowledge Capitalization Process

1.7 Knowledge Management System (KMS)

In this section, we introduce the notion of the Knowledge Management System (KMS).

1.7.1 Definition

Knowledge Management Systems are defined as classes of Information Systems dedicated to organizational knowledge management. That is, they are systems based on information technologies developed to support and improve the processes of creation, storage, retrieval and identification, transfer, and integration of knowledge [**AlaviLeinder2001**].

1.7.2 KMS functionalities

Based on the work of the European Knowledge Management Forum (Forum, 2001) [**<empty citation>**] and Staniszkis (2003) [**<empty citation>**] , KMS functionalities can be grouped into six categories, illustrated in the figure below (Figure 1.8) :

— **Domain Ontology :** Concerns knowledge representation. It can be implemented through ontologies, taxonomies, concept trees, semantic networks, or any other means to represent knowledge.

— **Content Repository :** Deals with how knowledge will be stored and preserved. Technical means such as databases or file systems can be used. The volume and growth of organizational knowledge are important parameters to consider when implementing this function.

— **Knowledge Propagation :** Allows users to access and share knowledge via the KMS. Mechanisms such as indexing or full-text search are very useful to support this feature.

— **Content Integration :** Involves integrating existing organizational knowledge, for example in the form of document libraries. This reuse of knowledge improves the overall quality of

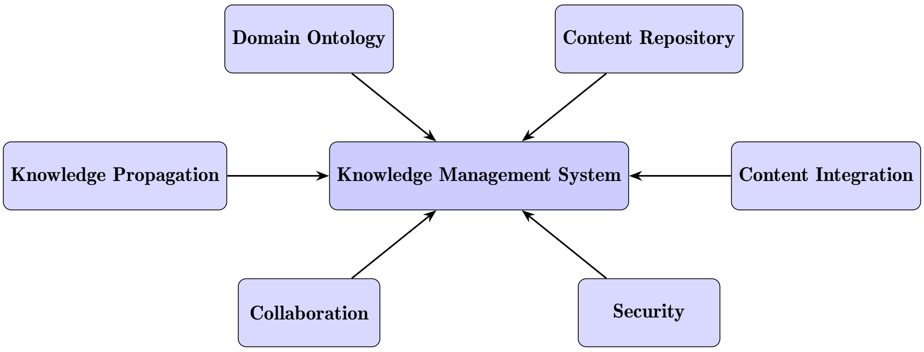


FIGURE 1.8 – Functional architecture of a KMS

KMS content and facilitates communication by referring to a commonly shared knowledge base.

— **Collaboration :** Implemented through tools providing spaces for exchange and sharing of knowledge. Messaging, groupware, workflows, discussion forums, or videoconferencing are some of the technologies used to ensure this functionality.

— **Security :** A critical function for any KMS. Like any information system, a KMS must implement security mechanisms such as user authentication, digital signatures, encryption, etc.

1.7.3 Challenges of Organizational Learning

The following diagram summarizes the roles of organizational learning (see Figure 1.9) :

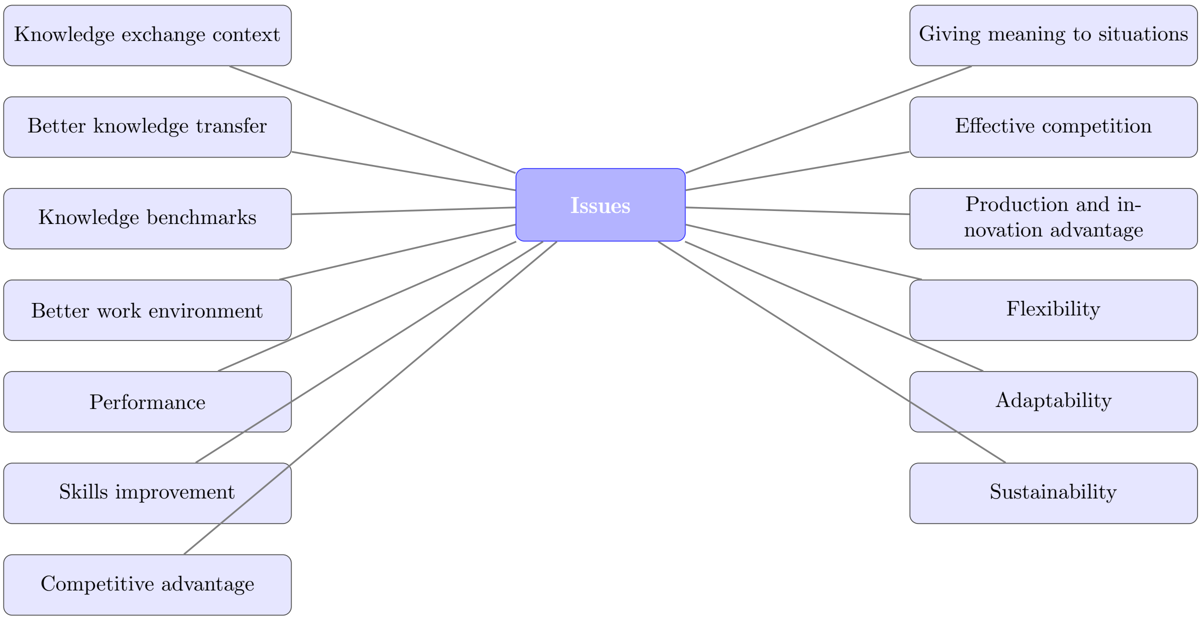


FIGURE 1.9 – The key issues related to knowledge in organizations

1.8 Conclusion

In the first part of this chapter, we explored several definitions of knowledge, its typologies, and some associated concepts. Knowledge is not simply data or information ; rather, it results from a certain process of transforming them. Knowledge is closely related to knowing, know-how, and competence. The total knowledge acquired by an individual constitutes their knowing. The application of this knowledge within the context of their activity constitutes their know-how, and the individual's ability to perform an action using, in addition to other resources, their knowledge, knowing, and know-how constitutes their competence. Knowledge can be either implicit or explicit, static (i.e., *declarative*) or dynamic (describing processes), and it can be individual or collectively shared among a group of people. The second part of this chapter was devoted to presenting the notion of reuse, through definitions and related concepts. Reuse consists of employing existing components that have been used previously to solve problems similar to the current one. The reused object is called a reusable component and can be of different types. Another characteristic related to reuse is case-based reasoning. This concept allows adapting solutions from past problems, or cases, to solve new similar cases. In the next chapter, we will present the analysis and design of our project.

Chapitre 2

Instructional Learning Design

■ *Life is precious as gold that loses its time loses a treasure ...* ■
—Henri Loevenbruck

2.1 Introduction

This chapter explores how meaningful learning experiences are shaped by both the learner's context and the instructional environment. It introduces the concept of learning design as a structured approach to organizing activities that foster knowledge, skills, and attitudes. Special emphasis is placed on applying these principles to hands-on, culturally embedded domains such as artisan education.

2.2 Bloom's Taxonomy

Bloom's Taxonomy is a hierarchical classification of learning objectives that supports educators in designing learning activities that encourage higher-order thinking. The revised version (Anderson & Krathwohl, 2001) includes six cognitive levels :

1. **Remembering :** Recall facts and basic concepts.
   Example : List the planets in the solar system.
2. **Understanding :** Explain ideas or concepts.
   Example : Describe the process of photosynthesis.
3. **Applying :** Use information in new situations.
   Example : Solve a problem using a known formula.
4. **Analyzing :** Draw connections among ideas.
   Example : Compare and contrast two political systems.
5. **Evaluating :** Justify a stand or decision.
   Example : Assess the validity of an argument.
6. **Creating :** Produce new or original work.
   Example : Write a short story using literary elements.

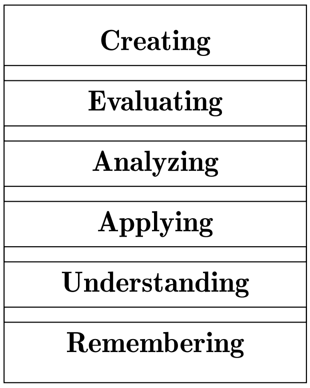


Figure : Visual hierarchy of Bloom's Taxonomy

Common Verbs Used in Each Level

This table presents the six cognitive levels of Bloom's Taxonomy, each associated with commonly used action verbs. These verbs help educators articulate clear learning objectives and assess student performance at each level.

Level	Common Verbs
Remembering	List, Define, Identify, Recall, Name, Recognize
Understanding	Describe, Explain, Summarize, Interpret, Classify, Compare
Applying	Use, Implement, Execute, Solve, Demonstrate, Apply
Analyzing	Differentiate, Organize, Attribute, Compare, Contrast, Examine
Evaluating	Judge, Critique, Defend, Justify, Argue, Assess
Creating	Design, Construct, Develop, Compose, Formulate, Invent

2.3 Instructional Learning Design

We have found several definitions of Learning Design in the literature. Below, we present three common and widely cited definitions :

Definition 1 (Learning Design - Koper, 2006)**.** *Learning Design is a formal specification that describes the teaching-learning process in terms of roles, activities, and environments, independent of any specific pedagogical approach. It allows the modeling and sharing of learning experiences in a reusable and interoperable way.*

Definition 2 (Learning Design - Conole, 2013)**.** *Learning Design refers to the process of planning, structuring, and representing learning activities, informed by pedagogical theory, to support effective and innovative teaching practices. It aims to guide educators in making deliberate and reflective design choices.*

Definition 3 (Learning Design - Dalziel, 2008)**.** *Learning Design is the description of sequences of learning and teaching activities that achieve specific educational goals. It focuses on representing these sequences in a structured and shareable format to enhance pedagogical practice and collaboration.*

2.4 Learning Experience and Learning Design Theory

2.4.1 Understanding Learning Experience

Definition 4 (Learning Experience)**.** *A **learning experience** refers to the totality of events, interactions, activities, and environments through which a learner engages to acquire knowledge, develop skills, and shape attitudes. It encompasses both formal and informal elements and is influenced by the learner's goals, context, and the instructional design.*

A **learning experience** encompasses all the interactions, activities, content, and contexts through which a learner engages in order to acquire knowledge, develop skills, and form attitudes. In the context of artisan education, this involves hands-on practice, observation of experts, and reflective engagement with cultural and technical knowledge.

Effective learning experiences should :

— Align with the learner's background, needs, and goals.

— Incorporate both theoretical and practical dimensions.

— Foster active participation and engagement.

— Encourage reflection and knowledge construction.

2.4.2 Designing Learning with Learning Design Theory

Definition 5 (Learning Design)**.** *Learning Design is the structured process of organizing learning activities, content, and tools to achieve defined educational goals.*

Learning Design Theory provides structured approaches for planning and delivering learning experiences. It helps educators organize content, select appropriate activities, and integrate tools that support specific learning outcomes (e.g ; [8, 15, 31]).

Key principles in designing learning using this theory include :

1. **Define Learning Objectives :** Clearly articulate what learners should know or be able to do after the experience.
2. **Select Learning Activities :** Choose activities (e.g., demonstrations, practice tasks, group discussion) aligned with the objectives.
3. **Organize the Sequence :** Structure the learning path from simple to complex or from observation to independent practice.
4. **Support Reflection :** Include opportunities for learners to reflect on what they have learned and how it applies to their context.
5. **Integrate Assessment :** Plan formative and summative assessments to monitor and support learning progress.
6. **Contextualize with Tools and Resources :** Use relevant tools (manuals, videos, peer interaction) tailored to the domain (e.g., woodworking, pottery).

2.4.3 Example in Artisan Learning

Consider a learning unit on traditional ceramic glazing :

— **Objective :** Learn how to apply glaze to pottery to achieve specific effects.

— **Activity :** Watch a demonstration, then practice under expert supervision.

— **Reflection :** Discuss differences in glaze outcomes and document observations.

— **Assessment :** Produce a final glazed piece and explain the technique used.

This structured approach ensures a meaningful and sustainable learning experience that combines explicit knowledge (glaze types, techniques) and tacit knowledge (timing, hand movements).

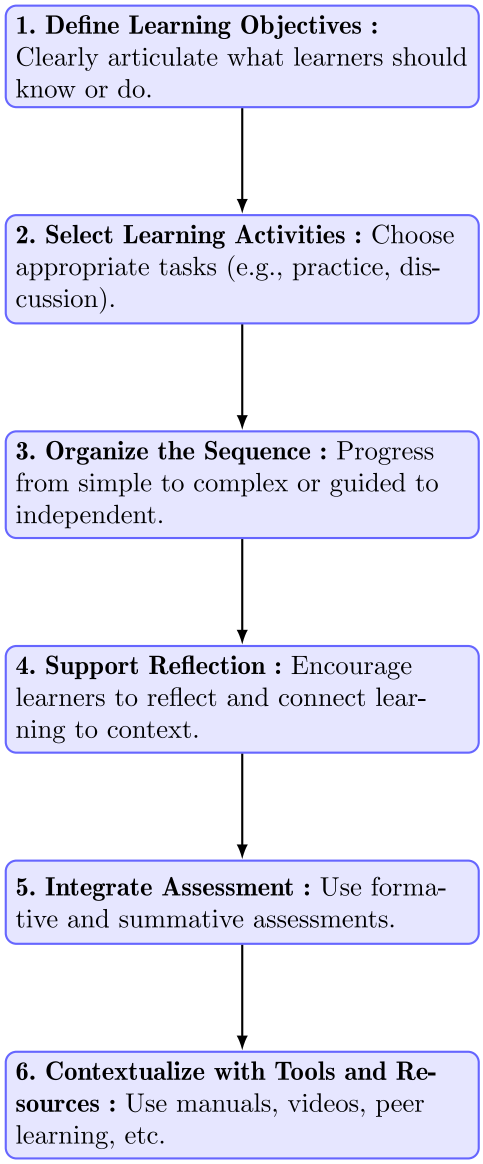


FIGURE 2.1 – Key principles in designing learning using Learning Design Theory

2.4.4 Theory and Example

To better understand how Learning Design Theory guides educational practice, especially in artisan learning contexts, Table 2.1 summarizes key components of the theory alongside illustrative examples.

Table 2.1 – Learning Design Theory Applied to Artisan Learning

Learning Design Principle	**Example in Artisan Learning**
Define Learning Objectives	Learn how to apply traditional ceramic glaze to achieve different artistic effects.
Select Learning Activities	Watch expert demonstration of glazing ; practice glazing with feedback.
Organize the Sequence	Start with observation, then scaffold guided practice, and finally independent experimentation.
Support Reflection	Learners discuss glaze outcomes, record differences, and share insights with peers.
Integrate Assessment	Evaluate final glazed piece and ask learners to explain their glazing choices.
Contextualize with Tools and Resources	Provide access to sample glazes, tools, expert videos, and local pottery examples.

2.4.5 Decision Tree for Instructional Learning Design

Designing effective learning experiences often requires structured decision-making. The decision tree in Figure 2.2 illustrates how educators or designers can choose instructional strategies based on learner profiles, context, and learning goals.

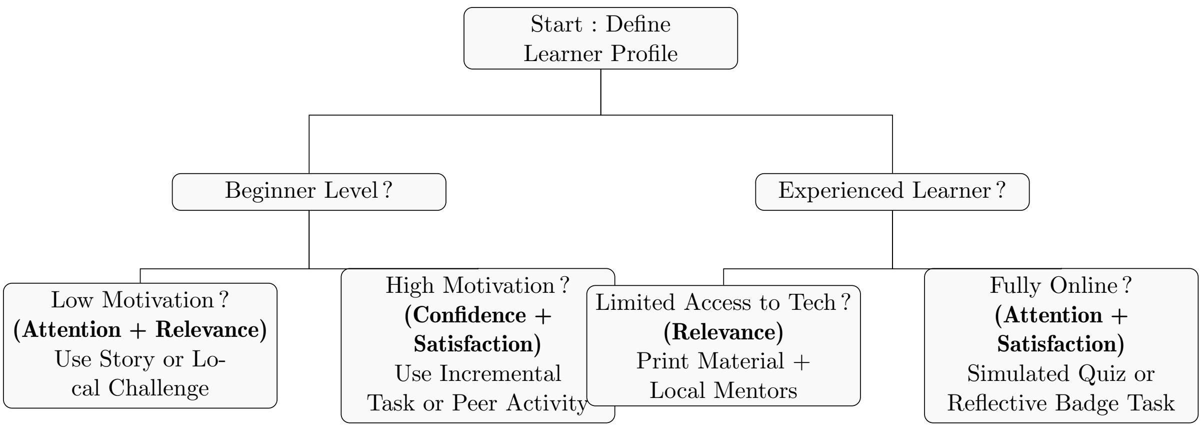


Figure 2.2 – Instructional Learning Design decision tree aligned with ARCS motivation model : **Attention** (capture interest), **Relevance** (connect to learner's context), **Confidence** (support success), and **Satisfaction** (reinforce value). Keywords shown in each node represent which ARCS component(s) the instructional strategy addresses.

2.5 Introduction to the ARCS Model

The ARCS model is a motivational design model developed by John Keller. It helps educators and instructional designers make learning more engaging by addressing four key components [17] :

- **Attention :** Capturing learners' interest.
- **Relevance :** Connecting content to learners' goals or experiences.

— **Confidence :** Supporting belief in their ability to succeed.

— **Satisfaction :** Reinforcing learning through success and reward.

Learner Motivation → Attention → Relevance → Confidence → Satisfaction

FIGURE 2.3 – Flow of motivation using the ARCS model.

2.6 Applying ARCS in Learning Design

Here, we try to apply the ARCS model in learning design through an example.

2.6.1 Capture Attention

Use surprising facts, real-world problems, or stories. *Example : Start with a short video showing a farmer's dilemma about planting time.*

2.6.2 Ensure Relevance

Show the learner how this lesson will help solve a real-life challenge. *Example : Link climate data to the learner's region.*

2.6.3 Build Confidence

Use small, scaffolded steps and give supportive feedback. *Example : Provide a worksheet to guide soil analysis.*

2.6.4 Support Satisfaction

Highlight progress and results. *Example : Share a before/after success story and give a digital badge.*

2.7 Example : Module Design for Female Artisans (Embroiderers)

Table 2.2 presents how the ARCS model can be applied to design a learning module for female artisans, particularly embroiderers. Each component is paired with practical techniques and learning activities tailored to their context.

Component	Example Technique	Tool / Activity
Attention	Showcase of intricate embroidery from local region	Short inspirational video clip
Relevance	Embroidery patterns inspired by cultural heritage	Interactive pattern selection or story-based task
Confidence	Guided stitch-by-stitch tutorial	Illustrated step guide or hands-on demo video
Satisfaction	Display of learner creations or client feedback	Certificate of completion or photo sharing board

TABLE 2.2 – ARCS-aligned elements in a learning module for female artisans

2.8 Course Description

This course introduces sustainable agricultural practices adapted to local environmental conditions. It helps learners plan and implement strategies such as crop rotation, organic fertilization, and water conservation techniques.

2.8.1 Learning Objectives

By the end of this course, learners will be able to :

— Identify key sustainability issues in local farming

— Apply crop diversification strategies

— Manage soil and water resources efficiently

— Monitor and reflect on their farming practices

2.8.2 Module Design : Week 1 – Introduction to Soil Health

Learners are introduced to the concept of soil health and how it affects crop productivity. The module combines video explanations, local case studies, and reflection quizzes.

2.8.3 ARCS-Aligned Learning Design

Component	**Applied Strategy**
Attention	Opening video showing real local farms affected by poor soil
Relevance	Quiz that connects soil types with crops common in learner's region
Confidence	Step-by-step activity to test soil pH using kitchen materials
Satisfaction	Forum where learners post photos of their soil test results and receive badges

Designed for integration in Moodle with H5P interactive content, weekly forums, and mobile-friendly layout.

2.9 Context and Our Work Positioning

In our study, we collaborate closely with the *Chambre de l'artisanat et des métiers de Tiaret*[1], a local institution dedicated to promoting and supporting traditional craftsmanship in the Tiaret region. This organization plays a crucial role in coordinating training programs, preserving artisanal know-how, and supporting craftsmen and women in rural and urban areas. Its mission aligns with our objectives to document and enhance artisan learning practices through digital tools. The institutional partnership ensures that our approach is grounded in real-world challenges and local needs. Through this collaboration, we gain access to experienced trainers and valuable insights into the transmission of tacit knowledge within the artisanal sector.

1. `https://tiaret.mta.gov.dz/fr/chambre-de-lartisanat-et-des-metiers/`

FIGURE 2.4 – Illustration of artisans

2.9.1 Trainer Profile Analysis

Table 2.3 presents Bloom's taxonomy levels with common action verbs that guide the formulation of learning objectives.

TABLE 2.3 – Bloom's Taxonomy-Inspired Data Collection : Problems and Proposed Solutions

Data to Collect	**Problems**	**Solutions**
Age : Distribution by age group	Lack of generational diversity among trainers	Encourage participation across age groups to enable intergenerational knowledge transfer
Experience level : Years in the profession	Variability in experience ; some trainers lack formalization of their knowledge	Standardize the transmission process for better accessibility to beginners
Craft type : Specialty	Some specialties are underrepresented	Identify missing specialties and promote their inclusion in training
Geographical area : Location	Disparities between rural and urban zones ; access difficulties in rural areas	Use distance learning to reach remote trainers
Knowledge transfer methods	Primarily oral and practical transmission, hard to formalize	Use video demos, explanatory sheets, and digital tools to facilitate knowledge transfer
Digital tool proficiency	Low digital skills among trainers	Offer training in digital tools (cameras, video editing software, etc.)

2.9.2 Challenges Faced by Trainers

Table 2.4 summarizes key challenges faced by trainers and corresponding pedagogical and technological solutions.

Table 2.4 – Key challenges and corresponding pedagogical and technological solutions

Problems	Solutions
Tacit knowledge difficult to transmit	Use multi-angle videos, slow-motion sequences, explanatory sheets, and audio commentary from the trainer
Lack of familiarity with digital tools	Provide training on tech tools, support in structuring and recording educational videos
Massification and distance teaching	Modularize courses, create online forums and interactive sessions to manage large learner numbers

2.9.3 Learner Profile Analysis

Table 2.5 provides an overview of the main learner characteristics and challenges to inform the design of tailored training strategies.

Table 2.5 – Overview of Learner Characteristics, Challenges, and Adapted Training Strategies

Data to Collect	Problems	Solutions
Learner type : Beginner, intermediate, advanced	Difficulty adapting content to different levels	Offer pathways adapted to each level with prerequisites and progressive modules
Learning objectives : Career change, skill improvement, traditional learning	Diverse goals risk course standardization	Provide courses tailored to different goals (career change, improvement, ancestral knowledge)
Access constraints : Equipment, internet, availability	Difficult access to videos in rural areas or with time constraints	Offer downloadable videos and multiple resolution formats

2.9.4 Challenges Faced by Learners

Table 2.6 presents key issues associated with video-based learning and proposed solutions.

Table 2.6 – Challenges Related to Video-Based Learning and Corresponding Solutions

Problems	Solutions
Video access (internet connection)	Provide videos in high and low resolution formats and allow downloads
Complex knowledge transfer	Use additional multi-angle videos, discussion forums, and Q&A sessions
Massification and distance learning	Organize interactive online sessions and scalable modules

2.9.5 Types of Courses Offered

Table 2.7 presents a classification of artisanal training courses by type, description, and examples.

Table 2.7 – Typology of Artisanal Training Courses with Descriptions and Examples

Course Type	Description	Examples

Process-based courses	Detailed instruction on the steps of making an artisanal product from start to finish	Furniture making (cabinetmakers), pottery (ceramicists)
Technique-specific courses	Short, focused videos on a particular technique	Stone carving (masons), traditional weaving (weavers), gem setting (jewelers)

2.9.6 Current Teaching Supports Analysis

Table 2.8 summarizes the limitations of current training methods and the corresponding pedagogical solutions.

TABLE 2.8 – Assessment of Existing Training Supports, Associated Challenges, and Proposed Solutions

Existing Supports	**Problems**	**Solutions**
In-person training	Limited by geographical proximity	Introduce online training to widen access
Written materials (manuals, technical sheets)	Lack of interactivity and hard to visualize techniques	Complement written materials with explanatory videos
Lack of educational videos	Limited knowledge transfer at a distance	Produce educational videos to democratize access and provide practical demonstrations

2.9.7 Technological Tools Analysis

Table 2.9 presents key technological tools used in educational video production, alongside common problems and targeted solutions.

TABLE 2.9 – Overview of Technological Tools, Challenges, and Suggested Solutions for Educational Video Production

Technological Tools	**Problems**	**Solutions**
Video production tools : cameras, editing software	Lack of quality equipment and trainer expertise in video creation	Provide adequate equipment and training in video production tools
Distribution platforms : YouTube, Vimeo, educational platforms	Lack of familiarity with distribution platforms	Simplify platform use, offer guides and training
Video formats : short practical demos	Lack of short, attention-sustaining formats	Create 1–5 minute videos as supplements to longer ones

2.9.8 Training Constraints

Table 2.10 presents the main technical and pedagogical constraints along with their corresponding challenges and proposed solutions.

TABLE 2.10 – Summary of Technical and Pedagogical Constraints, Associated Problems, and Proposed Solutions

Constraints	**Problems**	**Solutions**
Technical : internet, equipment	Unstable connection, difficult to use video tools in some areas	Offer downloadable formats and offline access, provide loaner tools
Pedagogical : adapting artisanal methods	Hard to digitize traditional artisan methods	Support trainers in structuring content and using multimedia tools
Massification and remote pedagogy	Hard to manage many learners and maintain individual follow-up	Create virtual classes, discussion forums, and asynchronous content

2.10 Our Analysis

In this section, we identify and analyze the main anomalies observed in pedagogical engineering, knowledge transfer, the use of video and animation, and distance learning. Each anomaly is associated with potential causes and consequences that impact the effectiveness of educational processes.

2.10.1 Pedagogical Engineering Anomalies

We start by analyzing the anomalies related to pedagogical engineering, which concern how educational paths are designed and assessed.

- **Difficulty in Formalizing Learning Pathways :**
  - *Potential Causes :* Lack of teacher training in instructional design.
  - *Consequences :* Poorly structured content leading to reduced learning quality.
  - *Likely Causes (MCQ) :*
    1. Lack of pedagogical training
    2. Technical issues
    3. Lack of student motivation
- **Absence of Continuous Assessment :**
  - *Potential Causes :* Evaluation tools not integrated into learning platforms.
  - *Consequences :* Students lack regular feedback, affecting their performance.
  - *Likely Causes (MCQ) :*
    1. Lack of digital tools
    2. Lack of teacher training
    3. Teacher overload

2.10.2 Knowledge Transfer Anomalies

We then examine the challenges in transferring knowledge, both tacit and explicit, which can hinder collaboration and retention of institutional memory.

- **Lack of Tacit Knowledge Transfer :**
  - *Potential Causes :* No formal methods to capture or document tacit knowledge.
  - *Consequences :* Loss of valuable undocumented knowledge.
  - *Likely Causes (MCQ) :*

   1. Lack of documentation platforms
   2. Communication issues
   3. Lack of formalization

- **Poor Sharing of Explicit Knowledge :**
  - *Potential Causes :* Ineffective or unused collaborative tools.
  - *Consequences :* Limited access to shared resources, reducing teamwork efficiency.
  - *Likely Causes (MCQ) :*
    1. Lack of collaborative tools
    2. Lack of time to share
    3. Poorly organized content

2.10.3 Video and Animation Usage Anomalies

We continue our analysis by focusing on the use of video and animation in teaching, which plays a crucial role in online engagement and comprehension.

- **Low Interactivity of Videos :**
  - *Potential Causes :* Videos not designed with interactive elements.
  - *Consequences :* Reduced student engagement in online classes.
  - *Likely Causes (MCQ) :*
    1. Poor video design
    2. Inappropriate video tools
    3. Low-quality visual materials
- **Technical Quality of Videos :**
  - *Potential Causes :* Outdated hardware and software.
  - *Consequences :* Low-quality videos hinder effective distance learning.
  - *Likely Causes (MCQ) :*
    1. Inadequate equipment
    2. Lack of training
    3. Videos too long

2.10.4 Distance Learning Anomalies

Finally, we address the anomalies affecting distance learning, particularly those linked to digital accessibility and content adaptation.

- **Limited Access to Digital Resources :**
  - *Potential Causes :* Unequal or inadequate infrastructure.
  - *Consequences :* Educational inequalities due to unequal access.
  - *Likely Causes (MCQ) :*
    1. Lack of infrastructure
    2. Local technical problems
    3. Lack of funding
- **Lack of Content Adaptation for Online Learning :**
  - *Potential Causes :* Content not designed for distance learning.
  - *Consequences :* Difficulty in keeping students engaged online.
  - *Likely Causes (MCQ) :*
    1. Poor instructional design
    2. Overly technical content
    3. Lack of interactive tools

2.10.5 Multiple Choice Questions (MCQ)

Based on the dimensions analyzed, we conducted Multiple Choice Questions (MCQs) with trainers and engineers from the Chambre de l'artisanat et des métiers de Tiaret [2].

MCQ 1 : Trainer Profile

1. What is the main problem related to the age group distribution of trainers ?
   (a) Too many young trainers.
   (b) Lack of generational diversity.
   (c) Trainers are too geographically distant.
   (d) Low mastery level of artisanal techniques.
2. What solution is proposed to encourage trainer participation in rural areas ?
   (a) Increase the salary of rural trainers.
   (b) Use distance learning.
   (c) Organize more in-person training sessions in rural areas.
   (d) Provide written training manuals.

MCQ 2 : Difficulties Faced by Trainers

3. What is the main obstacle to transmitting the tacit knowledge of trainers ?
   (a) Video technology is not available.
   (b) The knowledge is too technical to explain.
   (c) Knowledge is mainly transmitted orally and practically.
   (d) Learners do not understand the videos.
4. How can trainers be helped to better structure their educational videos ?
   (a) By providing them with technical sheets.
   (b) By offering training on the use of digital tools.
   (c) By asking them to film their work themselves.
   (d) By giving them more time to film.

MCQ 3 : Learner Profile

5. What is the main difficulty in providing content adapted to different learner levels (beginner, intermediate, advanced) ?
   (a) It is difficult to have enough trainers for each level.
   (b) The courses are too theoretical.
   (c) It is difficult to adapt content to all learning levels.
   (d) The courses are too long for beginners to follow.
6. What solution is proposed to make content accessible to learners in rural areas ?
   (a) Organize in-person training sessions in rural areas.
   (b) Create downloadable videos in different formats.
   (c) Provide written manuals to learners in rural areas.
   (d) Increase course duration to cover more details.

2. `https://tiaret.mta.gov.dz/fr/chambre-de-lartisanat-et-des-metiers/`

MCQ 4 : Types of Courses Offered

7. Which type of course is best suited for teaching a specific technique (e.g., jewelry setting) ?
   (a) Theoretical in-person course.
   (b) Short video demonstration course.
   (c) Reading technical sheets.
   (d) Practical group workshop.
8. What is the main advantage of a course based on a manufacturing process ?
   (a) It suits a large number of learners.
   (b) It allows teaching every step of a handcrafted product from start to finish.
   (c) It requires less equipment.
   (d) It is faster than other types of courses.

MCQ 5 : Technological Means Used

9. What is the main problem trainers face when producing educational videos ?
   (a) Trainers lack time to create videos.
   (b) Trainers are not familiar with digital tools.
   (c) Learners do not watch the videos.
   (d) There is not enough video equipment in training centers.
10. What solution is proposed to improve the quality of educational videos ?
   (a) Provide explanatory manuals.
   (b) Train trainers on the use of cameras and editing software.
   (c) Reduce video length.
   (d) Give trainers more time to film.

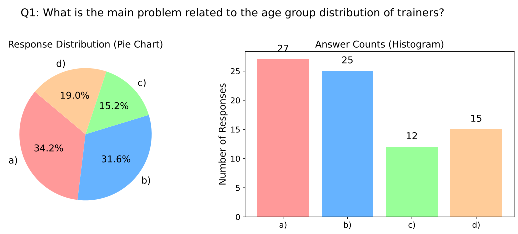
MCQ 6 : Training Constraints

11. What solution is proposed to manage the massification of learners in distance learning ?
   (a) Organize more in-person sessions.
   (b) Create virtual classes with discussion forums.
   (c) Reduce the number of learners per class.
   (d) Offer training only to advanced learners.
12. What is the main problem faced by learners in rural areas regarding access to educational videos ?
   (a) Videos are too long.
   (b) There are not enough trainers.
   (c) Access to a stable internet connection is difficult.
   (d) Learners are not interested in the videos.

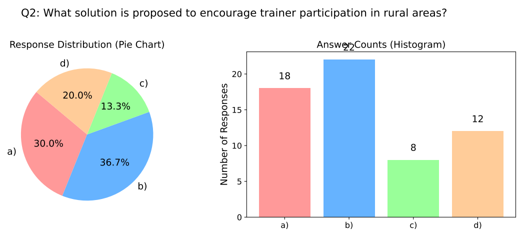
2.10.6 Results and Discussion

The following pages include the full content of the report titled *MCQ_Statistics_Report.pdf*. The results show varied opinions, with some clear majorities highlighting key challenges and solutions. Mixed answers reveal areas needing more focus. This helps target improvements in training and better support learners.

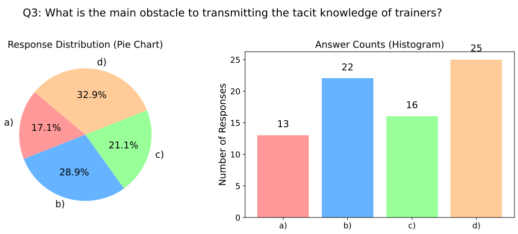
This segment reveals foundational issues in knowledge transfer, rural inclusion, and the structuring of educational content. Addressing them requires institutional strategies for mentoring, digital literacy training, and inclusive policy planning.



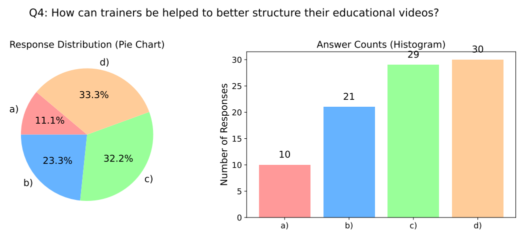
(a) Q1 : Age group distribution of trainers



(b) Q2 : Trainer participation in rural areas



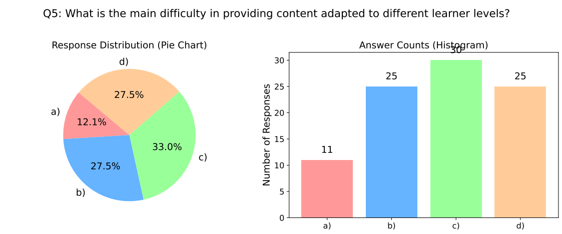
(c) Q3 : Transmitting tacit knowledge



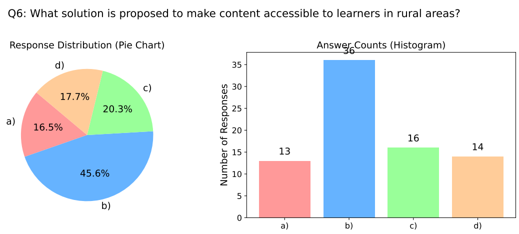
(d) Q4 : Structuring educational videos

FIGURE 2.5 – Survey Results for Questions 1 to 4

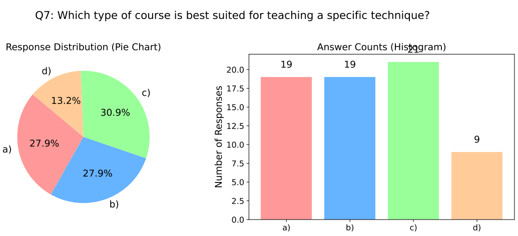
This set illustrates the need for differentiated learning approaches, especially in resource-constrained settings. Tailoring courses to both learner needs and contextual constraints (technical and geographic) is essential for inclusive and effective education.



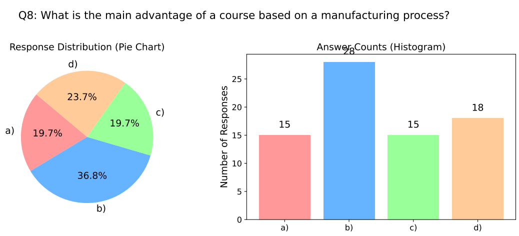
(a) Q5 : Content adapted to different learner levels



(b) Q6 : Content accessibility in rural areas



(c) Q7 : Course types for specific techniques



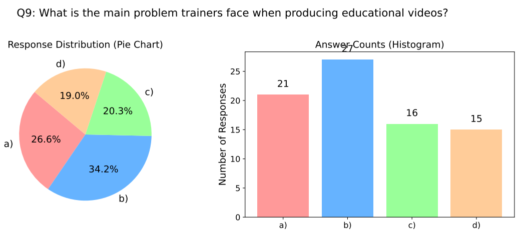
(d) Q8 : Advantages of manufacturing-based courses

FIGURE 2.6 – Survey Results for Questions 5 to 8

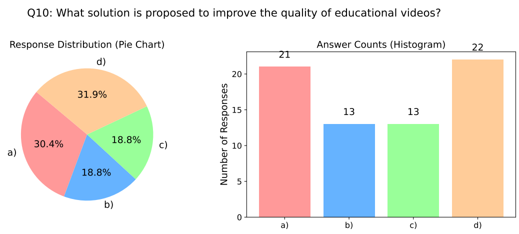
This cluster stresses the dual challenge of content production and distribution. Sustainable solutions require equipping trainers with production skills and ensuring technological infrastructure reaches marginalized learners.

2.10.7 Our Mission

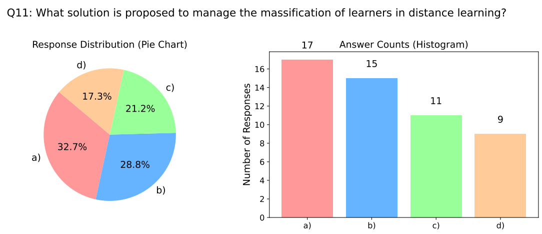
Our mission is to empower artisans and craftsmen through a structured design language tailored for educational videos in craftsmanship. This initiative aims to enhance learning expe-



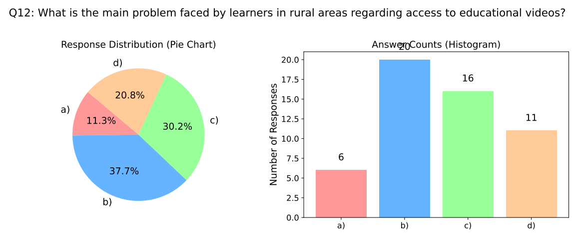
(a) Q9 : Problems in producing educational videos



(b) Q10 : Improving video quality



(c) Q11 : Managing learner massification



(d) Q12 : Access issues in rural areas

FIGURE 2.7 – Survey Results for Questions 9 to 12

riences by making artisanal knowledge more accessible, engaging, and reusable.

In the case study of the *Chambre de l'artisanat et des métiers de Tiaret*, we address the needs of over 6000 learners spread across the *wilaya de Tiaret*, encompassing diverse rural and urban communities. Many of these learners face limited access to traditional, in-person training due to geographic, economic, or infrastructural constraints.

To bridge this gap, our mission focuses on the development of a scalable, online solution for delivering craftsmanship courses. By formalizing a design language for educational videos, we seek to :

- Capture and preserve both tacit and explicit artisanal knowledge ;
- Support the creation of pedagogically sound and visually coherent video content ;
- Facilitate knowledge sharing across generations and regions ;
- Enable trainers to produce reusable and adaptable content through templates and structured storyboarding ;
- Encourage inclusive digital learning strategies aligned with local needs and cultural practices.

Ultimately, this approach contributes to sustainable skills development and supports the broader mission of preserving and promoting Algeria's artisanal heritage through modern learning technologies.

This project spans a six-month period, from January to June 2025, and includes sequential phases ranging from design to testing. The Gantt chart in Figure 2.8 illustrates the timeline and structure of key activities planned throughout this period.

2.11 Conclusion

This chapter has explored the foundations of learning experience and the application of Learning Design Theory to create meaningful and engaging educational pathways, particularly in artisan contexts. By integrating structured instructional principles and motivational models like ARCS, educators can tailor learning to align with learners' needs, foster active participation, and support long-term knowledge retention. Through concrete examples and decision tools, we

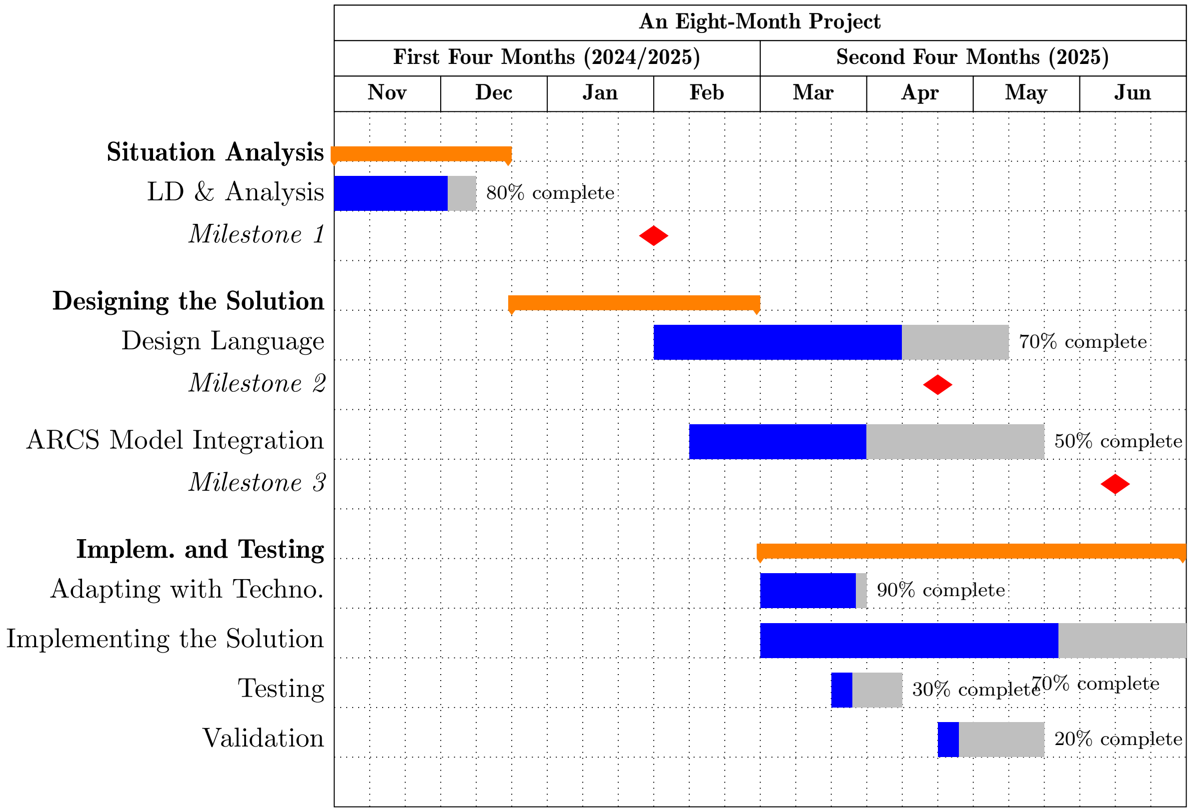


FIGURE 2.8 – Project Gantt chart from November 2024 to June 2025 showing planned activities

demonstrated how well-designed learning experiences can effectively combine tacit and explicit knowledge, ensuring both relevance and impact.

Chapitre 3

A Design Language for Educational Videos in Craftsmanship

■ *Good design is obvious. Great design is transparent.* ■
— *Joe Sparano*

3.1 Introduction

This chapter explores the fundamental challenges involved in capturing and transferring tacit knowledge in craftsmanship. It discusses the nature of artisan expertise, the difficulties in making implicit skills explicit, and the importance of preserving this knowledge for future learners. By understanding these challenges, we motivate the development of effective methods and tools to support knowledge sharing and learning in traditional crafts.

3.2 Background & Motivating Example

In this section, we introduce our motivating example to illustrate the challenges and design considerations in modeling and transferring tacit knowledge in craftsmanship.

3.2.1 Challenges in Modeling and Transferring Tacit Knowledge in Craftsmanship

To enhance learning experiences for artisans through educational videos, it is essential to address the challenge of capturing and transferring tacit knowledge—practical, experience-based know-how that is often difficult to explain but crucial in craftsmanship. Our design language, $\mathcal{LD}_v$, aims to make this knowledge explicit and transferable through animated representations of craft practices. However, this process presents several key challenges :

C1. Modeling Tacit Knowledge with Sufficient Detail. How can we represent the subtle techniques, decisions, and gestures of artisans in a way that makes them understandable to beginners ? Since artisanal expertise is often non-verbal and acquired through years of practice, creating clear, visual models that expose these elements is critical for effective knowledge transmission.

C2. Compositional Transfer of Knowledge. How can we decompose complex skills into smaller, manageable parts that can be progressively combined into complete learning experiences ? A compositional approach allows learners to grasp basic actions before moving to more advanced techniques, supporting structured and incremental learning.

C3. Promoting Reuse and Flexibility. How can we design animations and models that are general enough to be reused across different crafts while still capturing each craft's uniqueness ?

Mapping basic techniques to their contextual applications promotes reuse and supports the flexible adaptation of learning content across domains.

C4. Motivating and Engaging Learners. How can we capture learners' interest and sustain their motivation ? Storytelling, relevant real-life scenarios, and meaningful feedback help learners connect emotionally and intellectually with the content. Encouraging small wins and showcasing practical value can increase engagement and satisfaction.

These challenges emphasize the need for a structured, animated, and modular design approach that makes the invisible aspects of artisan knowledge visible and teachable. Addressing them not only supports effective learning but also contributes to preserving traditional knowledge for future generations.

3.2.2 Understanding Tacit Knowledge Barriers

In more detail, three major barriers hinder the transfer of artisan knowledge :

— **Tacit Knowledge Complexity :** Artisan skills often rely on intuition developed through hands-on experience, making them hard to articulate or document with traditional methods. These subtleties are essential but frequently overlooked in conventional learning materials.

— **Replication Difficulties :** Educational videos may show procedures but cannot easily capture the nuanced decision-making artisans perform. Without revealing the rationale behind actions, learners may imitate without understanding, limiting deeper learning.

— **Articulation Barriers :** Experienced artisans may find it difficult to explain what they do, as their actions have become second nature. This verbal gap hinders the formal transfer of knowledge, especially to novices unfamiliar with the context.

By integrating these insights into our design framework, $\mathcal{LD}_v$ provides a promising path to make artisanal knowledge more accessible, reusable, and pedagogically sound for learners in diverse crafts.

3.2.3 Craftsmanships' Learning Experiences

The experience of artisans and craftsmen in arts and crafts is often grounded in tacit knowledge—unspoken understanding and personal expertise accumulated over years of practice. This type of knowledge includes :

— Deep familiarity with tools and materials,

— Skilled hand movements and precision,

— Intuition for quality and aesthetics,

— Problem-solving strategies that are internalized rather than documented.

Artisans often say : *"I can do it, but I can't explain how to do it."* This highlights the challenge of knowledge transfer, especially to beginners who :

— Cannot easily observe or replicate subtle techniques,

— Struggle with hidden mechanisms not visible in demonstrations or videos,

— Miss out on experiential insights that experts apply intuitively.

This difficulty is also observed in agricultural scenarios. Consider a farmer who :

— Encounters unexpected issues in farm management,
— Resolves them through multiple trials and adjustments,
— But does not document the solutions for future use.

As a result, new recruits often :

— Face the same problems repeatedly,
— Cannot benefit from past solutions,
— Waste time rediscovering known practices.

Example : Female Artisan (Embroiderer)
A female artisan masters complex embroidery through years of practice. However, she finds it hard to explain her methods, making it difficult to pass on her skills to younger generations.

We ask : *Why is this reuse of experience so difficult ?*
In the business and farming world, knowledge is categorized as :

— **Explicit knowledge** — documented, structured, and transferable,
— **Tacit knowledge** — internal, experience-based, and hard to verbalize.

When experts retire or move on without sharing their insights :

— Their unique knowledge is lost,
— Organizations face setbacks in efficiency and quality,
— Knowledge capital is diminished.

Our goal is to :

— Capture both tacit and explicit knowledge,
— Store and structure it in an institutional memory,
— Make it accessible and reusable for future generations.

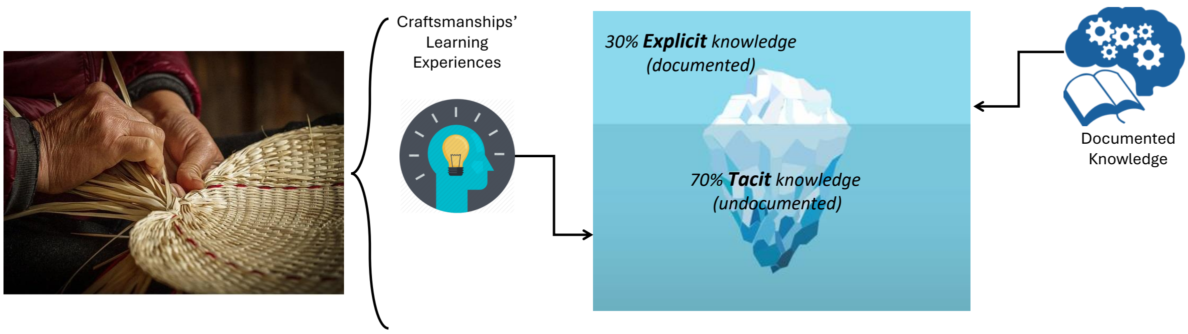


FIGURE 3.1 – Illustration of *Tacit Knowledge* and *Explicit Knowledge* explained by the metaphor of the iceberg.

The Figure 3.1 illustrates the flow and types of knowledge involved in managing equine heritage in an agricultural setting, focusing on how this knowledge can be preserved and promoted within an enterprise context. The farmer or breeder is depicted as the primary source of both explicit and tacit knowledge. This individual faces various problems and anomalies in the daily operations of the farm. The problems encountered by the breeder, along with the solutions found, are documented. This is represented by a database-like structure at the bottom left of the figure, showing different problems (Problem 1, Problem 2, Problem N) and their corresponding solutions (Solution 1, Solution 2, Solution N).

The iceberg graphic represents the two types of knowledge (Figure 3.1) :

- **30% Explicit Knowledge (documented) :** This is the visible part of the iceberg above the water, including documented knowledge that can be easily shared and accessed, such as the solutions to problems that the breeder has documented.
- **70% Tacit Knowledge (undocumented) :** This is the larger, submerged part of the iceberg, representing the undocumented knowledge residing in the breeder's mind, including experiences, insights, and intuitions that are not easily expressed or recorded.

Arrows indicate the flow of knowledge from the breeder to a centralized repository.

The objective is to capture both explicit and tacit knowledge to ensure it is preserved and can be utilized by the organization. This centralized repository allows for the codification and sharing of knowledge, making it accessible to new recruits and other stakeholders, preventing the loss of valuable insights due to the retirement or transfer of experienced breeders.

Figure 3.1 highlights the significance of adopting a design language for educational videos in craftsmanship to enhance the learning experiences of artisans. By structuring and sharing practical knowledge through well designed audiovisual content, this approach supports continuity of traditional know-how, improves understanding of complex techniques, and stimulates innovation.

The use of a design language enables the systematic capture, organization, and transmission of artisanal skills and gestures, thereby fostering better learning practices and contributing to the sustainable development of craftsmanship education, particularly in culturally rich contexts like Algeria.

Focusing on the difficulty of modeling and transferring tacit knowledge, and emphasizes the need for detailed, compositional, and reusable approaches to facilitate effective learning for beginners.

R1. How to explicitly model tacit knowledge with enough detail to support effective transfer, making hidden techniques visible for beginners ?

R2. How to decompose artisan knowledge into basic, combinable components to enable structured, progressive learning ?

R3. How to generalize skills beyond specific crafts to encourage reuse and flexibility by linking foundational skills to advanced techniques ?

R4. How to engage and motivate learners through meaningful narratives, visible benefits, progressive challenges, and recognition ?

3.2.4 Animation Enginering

The engineering of animation enables the description of complex behavioral scenarios by combining graphic elements and animation expressions. The key points are :

- **Definition of mechanical animation** : It is based on graphic elements and animation expressions combining :
  - animation operators (translation, rotation, etc.),
  - animation control (triggers),
  - a scheduler,
  - visual variables (color, size, line type, etc.).
- **Animation as a composition of primitives** : A complex animation is built from elementary (primitive) animations, organized :
  - sequentially,
  - in parallel,

Basket Weaving is one of the oldest of crafts that preceded fabric weaving created many patterns
https://pixabay.com/photos/hands-weave-fan-craft-handmade-5409293/

Figure 3.2 – System Animation Mechanics

  - or in nested forms (repetition of behaviors).
- **Synchronization events** : Each animation has a synchronization event track (*sync/async*). It can react to various events :
  - *SignalEvent*,
  - *ChangeEvent*,
  - *TimeEvent*,
  - *CallEvent*.
- **Challenges of manual development** : Manually programming animation behavior is :
  - time-consuming,
  - tedious,
  - error-prone.
- **Solution : animation patterns** : It is better to define :
  - basic animation patterns,
  - combine them to create complex scenarios,
  - organize them into reusable libraries.
- **Final objective** : From animation patterns and their transformation rules, one can :
  - describe complex animation graphs,
  - automatically generate the required transformations.

3.2.5 Identifying Basic Animation Patterns

To identify the relevant basic animation patterns, we analyzed specific animated views inspired by adventure games featuring roles such as *embroiderer, weaver, potter, ceramicist, blacksmith, saddler, tanner, carpenter, jeweler, and glassmaker.*

Based on this analysis, we made the following observations :

- Each business process applies a different animation policy, using multiple types of motion and animation.
- Each process view can be considered a digital 2D workspace, denoted as $\mathcal{DS}$, where time is discretized over an interval $[t_0, t_F]$ representing the animation duration.

— Elements (such as tools, products, or actors) are distributed on a grid, with geometric positions $x_E \in [1, n]$, $y_E \in [1, m]$, where x_E and y_E are the x and y coordinates of an element. The cell $\mathcal{DS}_{(i,j)}(k)$ represents the presence of an element at row i and column j at time k.

From these observations of interactive views, we identified different unit transformations used in animating business processes for artisans in an education context.

These unit transformations are organized into a catalog of animation rules (see Figure 3.3).

TABLE 3.1 – Catalogue of Generic Operations with Corresponding Actions

Operation	**Possible Actions / Animations**
Prepare	Sorting, Arranging, Gathering, Setting up tools
Measure	Using ruler, Calibrating, Marking dimensions
Cut	Slicing, Snipping, Sawing, Chopping
Assemble	Joining, Fitting, Connecting, Fastening
Inspect	Checking, Scanning, Testing, Comparing
Repair	Fixing, Replacing parts, Welding, Adjusting

For instance, Figure 3.3 illustrates a UT rule that describes how an artisan sharpens a tool (rule : "'`Artisan sharpens tool`"') along with its corresponding animation. The animation mechanism adds, replaces, or removes elements such as the tool, sharpening stone, and hand movements, individually or simultaneously, to reflect the dynamic changes involved in the process. The animation corresponding to the rule "'`Artisan sharpens tool`"' is represented through visual effects generated as a sequence of still images, chained together to show the transformation, addition, or removal of components throughout the duration of the scene (see Figure 3.3).

FIGURE 3.3 – A transformation rule : "Artisans actions"

From the running example we can observe that relying on automatic animation mechanisms to express transformation stages across animation layout to a human user in a clear and comprehensible fashion is interested. The whole transformation can be looked as animation form, in witch each unit transformation (i.e. stage of transformation) can be mapped to unit animation. Trying to animate information of model transformation as good graphical representation technique for this kind of information is motivate our investigation into the automation and becomes attractive. We believe that constructing a transformation with reusable animation building blocks should be considerably less work than writing it from scratch.

3.3 Challenges Educational Videos in Craftsmanship

We now revisit the Challenges formulated at the Section 3.2.1, to identify key ingredients and to provide general guidelines for building knowledge transfer systems that would allow flexibility and reuse.

3.3.1 Tacit Knowledge Modeling (TKM)

The first challenge, Tacit Knowledge Modeling (TKM), is related to capturing the tacit knowledge of artisans and craftsmen through a structured approach :

$$\text{Expert Knowledge} \underset{\text{observation}}{\overset{\text{documentation}}{\rightleftharpoons}} \text{Structured Knowledge}$$

In traditional crafts, *observation* is not sufficient because beginners cannot easily grasp the intricate skills involved. On the other hand, *documentation* is crucial for representing and preserving this knowledge, serving as the foundation for effective knowledge transfer.

Having explicit mappings between expert knowledge and structured knowledge assumes that the tacit knowledge is explicitly documented : following a systematic approach, this documentation should cover the definition of various techniques (tools, materials, processes), but also the ability to define the documentation relationship, i.e. patterns associating expert knowledge elements with structured knowledge elements. We identified at least four challenges :

TKM.1. Providing *simple* visualization for techniques Providing configurable representations for common techniques such as tool usage, material handling, and process steps presents the benefit of rapidly presenting information from a model. This ability should rely on detailed observation to identify, and eventually modify, the elements of the technique used for "populating" such visualizations.

TKM.2. Providing *complex* documentation patterns The partial models in **??** specify the *initial* steps of a technique in different ways : by explicitly listing the steps, by characterizing each step with key properties, or by using hierarchical structures. Many systems would only support the latter, because they essentially only allow associating various steps to categories. This approach is too simplistic and forces model designers to tweak their models towards a rigid structure, introducing yet another specialization (as it is already the case for editing and analysis, among others). Complex documentation patterns should allow freely associating visual counterparts to various combinations and values of model elements.

TKM.3. Integrating "contextual understanding" *natively* We call *contextual understanding* the equivalent of *containment* in modeling, i.e. the ability to uniquely put elements *inside* a context so that elements inside disappear along with the context's removal. This feature presents two advantages. First, it would allow to natively handle common situations like including detailed notes within a step (e.g., displaying a step's description within a visual frame) and then treat them in a universal manner. Second, if the feature is customizable, it would enforce a natural semantics with an expected behavior.

TKM.4. Providing "snapping" capabilities Snapping helps a precise arrangement of elements by "gluing" them to a specific target, e.g. a framework's boundary, a grid, or points on objects.

Experience is a form of *fresh knowledge*, derived from practice and real-life situations.
It is expressed through a set of **skills**, namely :

— **Abilities** (what a person can do),

— **Skills** (how they do it),

— and **Concrete actions** that demonstrate their know-how in context.

As illustrated in Figure 3.4, a competency is formed by the integration of knowledge elements, skills, and attitudes.

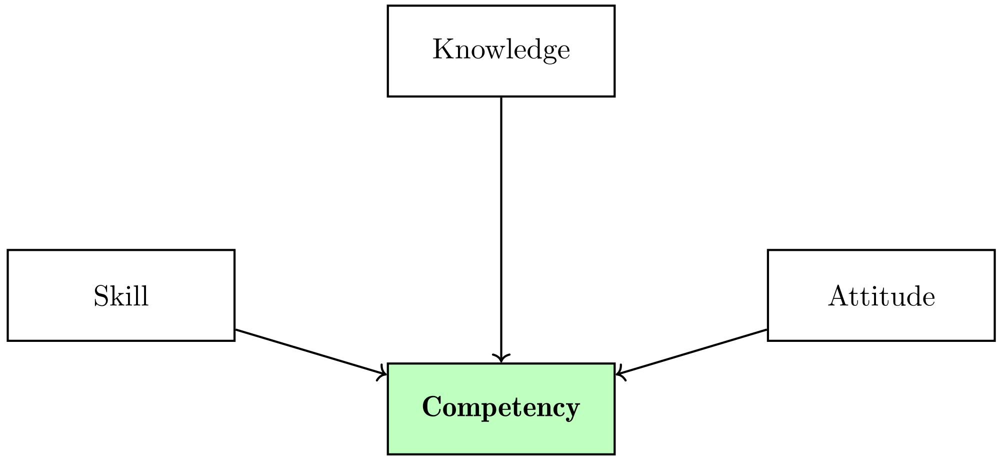


Figure 3.4 – Competency as the combination of Knowledge, Skill, and Attitude. These three foundational components together define the ability to perform effectively in a professional context.

3.3.2 Knowledge Transfer (KT)

To tackle Challenge C2, it is important to design the KT framework with the idea of reuse at its core. One possible approach is to separate two things : the basic blocks defining knowledge transfer *components* that may be combined into comprehensive Knowledge Transfer Units (KTUs), from the way they are organized and scheduled to build complex learning experiences. The approach we propose is similar to the de-/reconstruction of modular systems : the idea is to capture the most basic components, and offer powerful mechanisms to combine them, resulting in the ability to effectively specify any kind of learning module. We quickly discuss basic components before describing two approaches for scheduling.

KTU Components

Components may be roughly classified into four categories, depending on the features they act on :

Introduction components introduce an element into the learning module in various ways, e.g. by simply presenting it at the right time, or by "zooming" it in, i.e. starting from a broad overview until reaching detailed steps, while preserving the element's context.

Removal components remove an element from a learning module, e.g. by making it disappear, or by "zooming" it out.

Update components modify one, or several features of an element, e.g. the color, size, etc. of a text, an image or a process step.

Transition components move an element along a predefined path, e.g. a linear or sequential progression, or a branching decision point.

We expect that most of the KTUs would make use of a small set of basic components. These components could be organized into libraries and potentially exchanged among KT specialists, but their reuse across different platforms may be hindered by how components are highly dependent on the way the elements of the model are defined.

KTU Scheduling

Although theoretically equivalent, two approaches are possible for realizing this requirement.

Embedding the scheduling *inside* KTUs Each KTU is extended with pre- and post-conditions. A precondition indicates how a KTU starts relatively to the previous one (at the same time, after, or delayed by a given time) ; while a postcondition would define whether the KTU is repeated (and how many times).

Define *combinators outside* of KTUs Another approach, is to provide explicit *combination* operators (aka. *combinators*) that would take as operands KTUs. The same combinators, i.e. sequencers with a possible delay, repetitors, and parallelization, may be defined.

The second approach may seem more familiar to KT designers with a programming background, because the combinators approach proposes constructions similar to what is available in GPLs. However, the

3.4 $\mathcal{LD}_v$ Framework and its Theoretical Foundations

We propose a framework called $\mathcal{LD}_v$ (a Domain Specific Language for Graph Animation) for designing animations of behavioral n Craftsmanship to handle many Learning Experiences for Artisans.

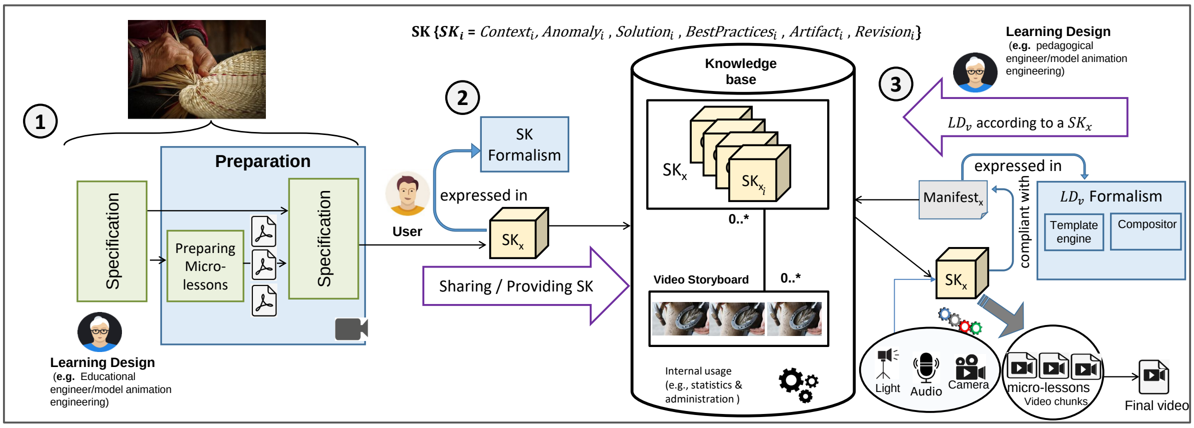


FIGURE 3.5 – Overview of our approach.

It provide reuse granularity of units animations (UAs) that enabling the creation of complex animation according to a transformation rules. Figure 3.5 illustrates the overview of our framework.

- Our DSL enables the capture of all Unit Animations (UAs) required to express the behavioral logic of transformations, which can be either *inplace* or *outplace* (i.e., model-to-model).
- The animation provided by $\mathcal{LD}_vL$ corresponds to an entire business process (BP), which may also be either inplace or outplace.
- Business processes can be modeled in any suitable modeling language and consist of a set of Unit Operations (UOs).
- The design language $\mathcal{LD}_vL$ supports tailored animations for specific user needs and allows :
  - Modification and composition of animation aspects,
  - Use of information objects (e.g., *rectangle*, *line*, *arc*),
  - Customization of visual properties (e.g., *background color*, *line thickness*, *line style*).
- Once the animation model is defined as a set of Animation Units (AUs), it can be :
  - Refined through a refinement process,
  - Mapped to a corresponding set of Unit Operations (UOs).
- A reusable transformation *trans*, defined over the $\mathcal{LD}_v$ meta-model, can be applied across different Business process (BP) by establishing a mapping :

$$\text{Animation Units (MM)} \leftrightsquigarrow \text{Unit Operations (MM')}$$

enabling flexibility and reuse in various application contexts.

3.4.1 Protocol for detailing artisans' business processes

To clarify this tacit knowledge, we apply a field observation protocol that captures all the interactions, as well as the observations and movements of the craftsmen to ensure proper reproduction. This part must record and justify all the basic steps through a survey of each operation performed by the craftsmen to obtain an explicit description of all elementary actions.
Figure 3.6 illustrate the Protocol for detailing artisans' business processes.

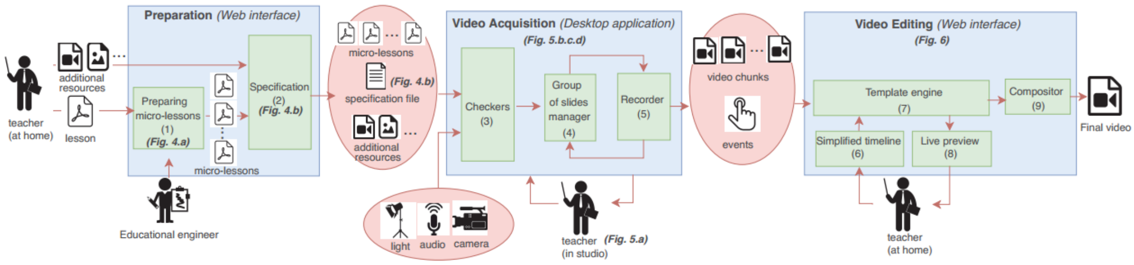


FIGURE 3.6 – Protocol for detailing artisans' business processes.

3.4.2 Theoretical Foundation of Equine-Turath

In this section, to address the first challenge C1, we formalize the concept of our metamodel $\mathsf{MM}_{\mathcal{SK}}$ to explicitly define shared knowledge ($\mathcal{SK}$) of practitioners' learning experiences.

Shared Knowledge of learning experiences

Shared knowledge of practitioners learning experiences is defined as :

$$\mathcal{SK} = \{SK_i = \text{Context}_i, \text{Anomaly}_i, \text{Solution}_i, \text{BestPractices}_i, \text{Artifact}_i, \text{Revision}_i\}$$

where :

— **Context**$_i$: A set of parameters $cxt_i = \{P_{i1}, P_{i2}, \ldots, P_{in}\}$, each belonging to specific dimensions D_k.

— **Anomaly**$_i$: An irregular or unexpected event within the equine heritage management system that is characterized by $< C_i, Csq_i, Categ_i, Freq_i >$:

$C_i = \{C_{i1}, C_{i2} : \ldots\}$ **:** *Causes* attributed to Anomaly$_i$.

$Csq_i = \{Csq_{i1}, Csq_{i2}, \ldots\}$ **:** resulting from Anomaly$_i$. Each *consequence* Csq_{i1} is characterized by <id, type, severity, description>

$Categ_i$ **:** The category of the problem (Organizational (Org), Informational (Inf), Technical (Tech)).

$Freq_i$ **:** The frequency of the anomaly occurrence, e.g. *daily*, *weekly*, *monthly*.

— **Solution**$_i$: Solutions and their related artifacts addressing Anomaly$_i$ and consists of a set of attempts $\{att_{i1}, att_{i2}, ...att_{im}, \ldots\}$that clearly explaining the logic leading to a decision can be as important as the decision itself. Each instance Solution$_i$ $\subseteq$ {Org, Tech, Inf}.

— **BestPractices**$_i$: Recommended best practices for preventing or managing Anomaly$_i$. Each Best Practice BP$_i$ is characterized by <*name*, *domain*, *goals*, *summary*, *application conditions*, *solution*, *benefits*, *disadvantages*, *examples*, *guidelines*>.

— **Artifact**$_i$: Artifact related to solutions addressing Anomaly$_i$, where artifacts can be *images*, *texts*, *videos*, etc. In our context, we focus on the design of videos created through Learning Design ($\mathcal{LD}$) in an academic manner, thanks to the intervention of a pedagogical engineer, to facilitate the transfer of practitioners' learning experiences : $\mathcal{LD}_{\mathsf{v}}$ <Objectives,

Storyboard, Interactivity>, with *Objectives :* Clearly define what the video aims to teach viewers, *Storyboard* : $S = S_1 \bowtie S_2 \ldots \bowtie S_k$, is "*the visual representation of a SK*" , i.e. it visually renders the steps defined by the problem-solving skills specification, by visually projecting the changes operated on the $\mathcal{SK}$ model through its visual animation, and *Interactivity* : browsing, editing, and trusting the existing problem-solving skills.

The challenge of pedagogical engineer, Video design ($\mathcal{LD}_\mathsf{v}$), is related to our metamodel $\mathsf{MM}_{\mathcal{SK}}$ through two transformations :

$$\mathsf{MM}_{\mathcal{SK}} \underset{\text{parsing}}{\overset{\text{rendering}}{\rightleftharpoons}} \mathcal{LD}_v$$

In video-directed editing, *parsing* is not necessary because models are created by relying on the syntax, thus preventing ill-models. On the other hand, *rendering* is crucial for representing a model when appropriate, but it also represents the anchor for animation

— **Manifest** : is the user need that is represented by a subset of context × anomalies.

Based on contextual analysis, we proposed the implementation of a knowledge manager aimed at validating knowledge before sharing. Each $\mathcal{SK}$ can be revised by domain expert by five key elements :

$$\textbf{\textit{Revision}}_i < \mathrm{UC}_i, \mathrm{PA}_i \mathrm{OBS}_i, \mathrm{TD}_i >$$

— ***Users' Consideration*** **($\mathbf{UC}_i$) :** Users contemplate their object of interest within the $\mathcal{SK}$ shared.

— ***Parameter Adjustment*** **($\mathbf{PA}_i$) :** They adjust various parameters of the $\mathcal{SK}$.

— ***Observation and Feedback*** **($\mathbf{OBS}_i$) :** Users observe the responses of the $\mathcal{SK}$ object to parameter changes.

— ***Trust Decision*** **($\mathbf{TD}_i$) :** Domain experts trust the $\mathcal{SK}$ using a degrees of confidence (e.g. "I'm sure," "I'm fairly confident, "I'm doubtful").

This structured formalization and examples provide a clear framework for understanding and managing shared knowledge in equine heritage preservation.

[Instantiation of our formalization] We present a sample excerpt of instance of shared knowledge in equine heritage preservation. The specifications for this instance are outlined as follows (Figure 3.2) :

— **Context :** Woman Tailor Traditional Crafts.
— **Anomaly :** Incorrect Stitching Technique Identification.
— **Anomaly Type :** Stitching Technique Analysis.
— **Causes :** Lack of experience, improper needle use, wrong thread tension.
— **Consequences :** Weak seams, fabric damage, reduced garment durability.
— **Solution Type :** Technical solution.
— **Artifact :** Stitching Technique Guide.
— **Name :** Correct Stitching Technique.
— **Domain :** Traditional Tailoring, Textile Crafts.
— **Goals :** Create durable seams, preserve fabric integrity, ensure aesthetic quality.
— **Summary :** Ensures strong and neat stitches, preventing damage and extending garment life.
— **Application Conditions :** Appropriate needle and thread, fabric suited for stitching, skilled tailor.
— **Solution :** Use correct needle size, maintain proper thread tension, sew consistent stitches.
— **Benefits :** Durable seams, improved garment quality, professional appearance.
— **Disadvantages :** Requires practice and attention, mistakes can damage fabric.
— **Examples :** Tailor uses hand-sewing needles and traditional thread to secure seams without puckering.
— **Guidelines :** Select suitable needle and thread, maintain even stitch length, avoid excessive tension.

FIGURE 3.7 – Unified template to specify $\mathcal{SK}_{instance}$ adapted to a woman tailor's traditional crafts (cf. Figure 3.2).

3.4.3 Design Language of Learning Design

Figure 3.9 specifies the metamodel of the $\mathsf{MM}_{\mathcal{SK}}$ to explicitly define shared knowledge ($\mathcal{SK}$) of practitioners' learning experiences in equine heritage. A digital practice is defined as a set of events. Each event involves several components of $\mathcal{SK}$ such as : `Anomaly`, `Solution`, `Artifact`, `BestPratics`, `Context`, and `Revision` expressed by our metamodel $\mathsf{MM}_{\mathcal{SK}}$ (Figure 3.9). Solving anomaly problems is very common in many application domains and is often tackled by decomposing them into smaller problems and sequencing subproblems. The breeder's actions are not independent subproblems of anomalies, as finding the solution involves composing and introducing these actions to solve complex problems. To specify these traces related to the anomalies, we must construct a resolution trace to handle the data log entries during the resolution activities (Figure 3.9).

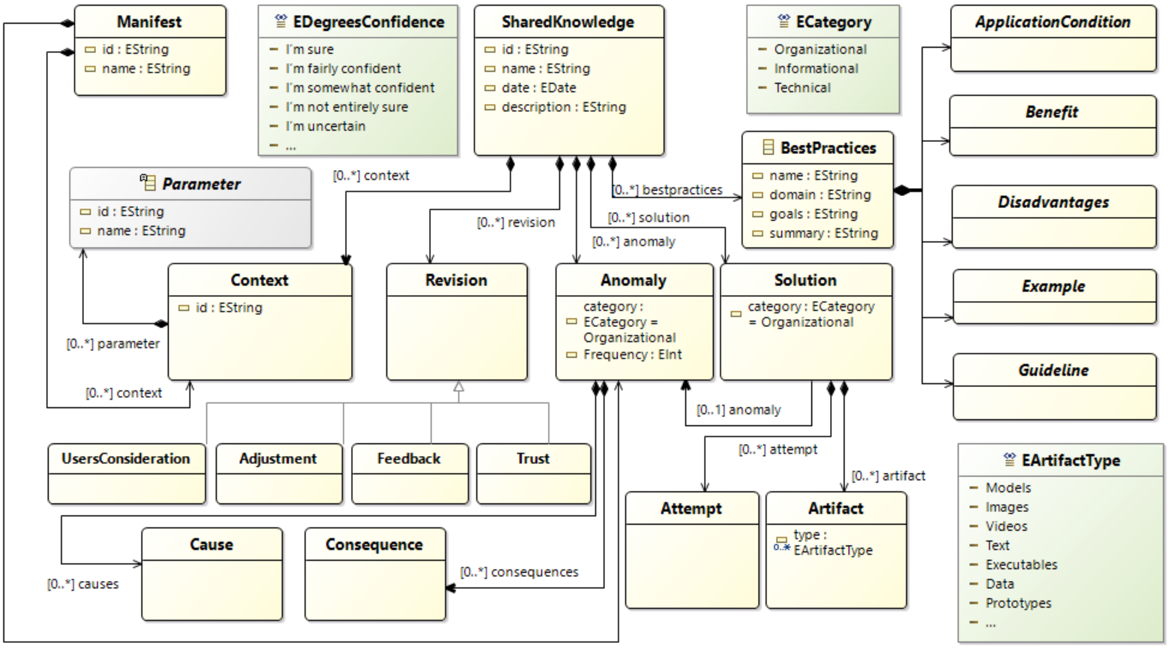


FIGURE 3.8 – Excerpt of Conceptual Organization of Shated Learning Experience.

Shared knowledge is reviewed by domain experts. The review (instance of `Revision` class) ensure the accuracy of shared knowledge. This review is conducted using guidelines to compare expert revisions. Correctness knowledge will then be available for reuse to aid in applying the necessary skills for the current work. Each piece of shared knowledge can be revised by domain experts according to five key elements.

Problem-solving skills solving are very popular in many application domains, and often tackled by decomposing them into a small problem and a sequencing subproblems. Practitioners actions sequencing are not independent subproblems of problem-solving formulation, since finding the basic building blocks that are introduced and composed to realise complex problem. To perceive these digital traces related to the practice learning in equine heritage, we must construct a video learning trace to handle the sequence of problem-solving during the learning activities (Figure 3.9). The change is identified when a practitioners test the attemps that is expressed in the class `ActivityLog` (Figure 3.9). To handle the digital traces of problem-solving skill, we have propose a trace constructor based on a set of operations. These latter provide the solution path that reflect the practitioners' writing problem-solving and their behavior aspects.

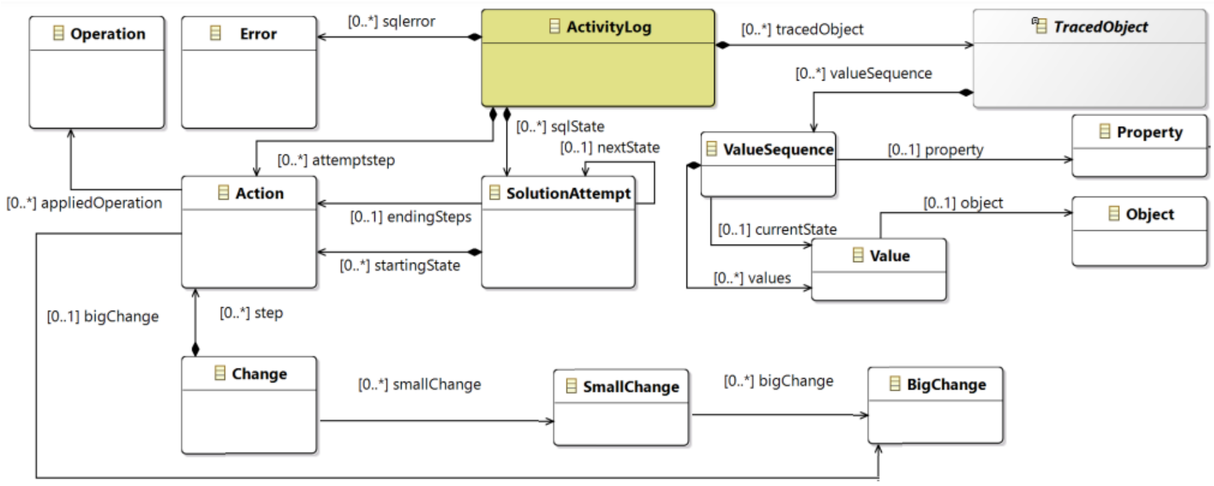


FIGURE 3.9 – Excerpt of video trace model (focus on `ActivityLog` class).

3.4.4 Trace constructor for designing educational videos

To tackle Challenge C2, we explicitly model the transfer of artisan knowledge compositionally, we break down complex skills into basic components that can be progressively combined into a comprehensive learning experience for beginners. At this point, we have addressed video storyboard (cf. Figure ③).

We remind you that we want to understand the practitioners behavior during anomaly farm work in order to transfer practitioners' Learning Experiences to preserve and promote equine heritage.

As illustrated in our motivating example, a big step during problem-solving skills is simply a sequence of small steps, we only need to capture problem-solving states with its error type before and after small steps. A compositional approach for defining complex animations is adopted by relying on basic specifications of $\mathcal{SK}$, which are combined to form complex animations. However, we also need to capture when steps occur, hence `addSmallChange` must be called at small steps, while `bigChangeStarted` and `bigChangeEnded` must be called before and after a big step, respectively. Figure 3.10 visualizes the main operations required for practitioners' trace construction.

- **initialize :** initialize the first problem-solving introduced by a practitioner as first attempt in the activity log.
- **addPractitionersAction :** add a practitioner action operation in the event trace if image state created/deleted or changed by a practitioner.
- **addSmallChange :** add a small change in the problem-solving trace.
- **bigChangeStarted :** means that a big change has started on the initial problem-solving signature.
- **bigChangeEnded :** means that a big step has ended in the last attempt.

Conceptually, each action performed by the practitioner and unit animations should be in an N :N relationship. The actions are defined explicitly by our metamodel $\mathsf{MM}_{\mathcal{SK}}$, and the animations are composed compositionally using $\mathcal{LD}_\mathsf{v}$, i.e., by creating an animation using basic components that are progressively combined into a fully-fledged animation that reflect the learning experiences. The set of attempts to clearly explain the logic leading to a decision must be explicitly related to their animation counterparts through rendering/parsing. In summary, all the solution attempts performed by practitioners are necessary to construct the trace that represents actions carried out by a practitioner's during learning experiences issues from their daily activities.

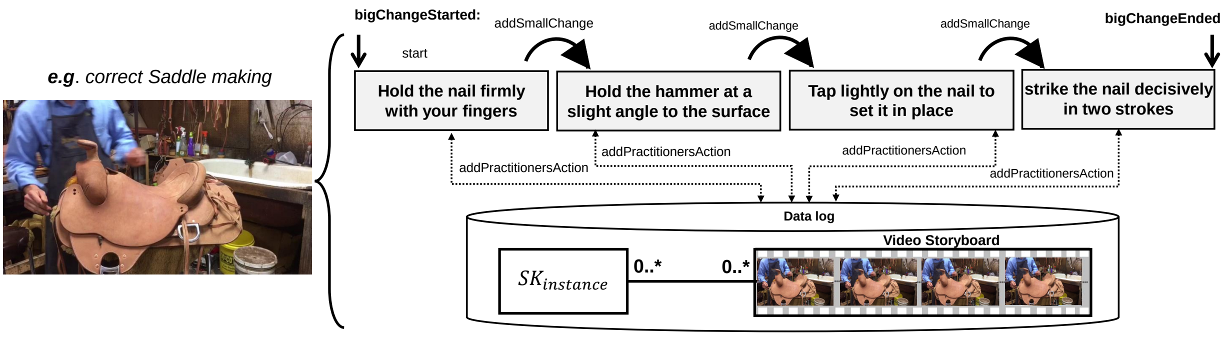


FIGURE 3.10 – Illustration of the operations of the trace constructor for designing educational videos.

ARCS components	Strategies	Application in Educational Videos
Attention	Strategies for arousing and sustaining students' curiosity and interest.	Narration, visuals, animations and videos used in Educational Videos.
Relevance	Strategies that link to learners' needs, interests, and motives.	Relevance to the topic, syllabus and activities to the students' daily life.
Confidence	Strategies that help students develop a positive expectation for successful achievement.	Full control over the mE- book, the interest and the capability to navigate throughout the lessons.
Satisfaction	Strategies that provide extrinsic and intrinsic reinforcement for effort.	Enrichment activities (Quiz). Immediate feedback for every question. Certificate of Completion is awarded upon completion of the unit.

TABLE 3.2 – Application of ARCS components in Educational Videos design

3.4.5 Designing videos ARCS Model

Describes the design of multimedia video based on the Keller's ARCS Model of Motivational Design. This model has been widely used in instructional materials and is an example of a well-documented design model that gives importance to the motivational aspects of the learners. There are four components in the ARCS model that are necessary when designing a motivating instructional material : attention, relevance, confidence and satisfaction.

How to stimulate and motivate beginners according to the ARCS model of Keller ? This involves focusing on the difficulty of modeling and transferring tacit knowledge, and emphasizes the need for detailed, compositional, and reusable approaches to facilitate effective learning. The ARCS model covers :

Attention Capturing the interest of learners by using engaging and relevant examples of tacit knowledge in arts and crafts.

Relevance Connecting the learning material to the learners' goals and interests by showing how these skills can be applied in real-world scenarios.

Confidence Building the learners' belief in their ability to acquire these skills through incremental and compositional learning modules.

Satisfaction Ensuring learners find the learning process rewarding by providing opportunities for practical application and feedback.

3.4.6 $\mathcal{LD}_v$ modelling language

In this section, we define the core elements and the design architecture. $\mathcal{LD}_v$ enable to design a complex animation with collection of animation primitives construct that is define at fine Level of granularity. These primitives offer common basics to build as block-structured through rules call in sequencing, iteratively, parallel, or a recursive call. We can define the abstract syntax of $\mathcal{LD}_v$ by the metamodel given in Figure 3.11.

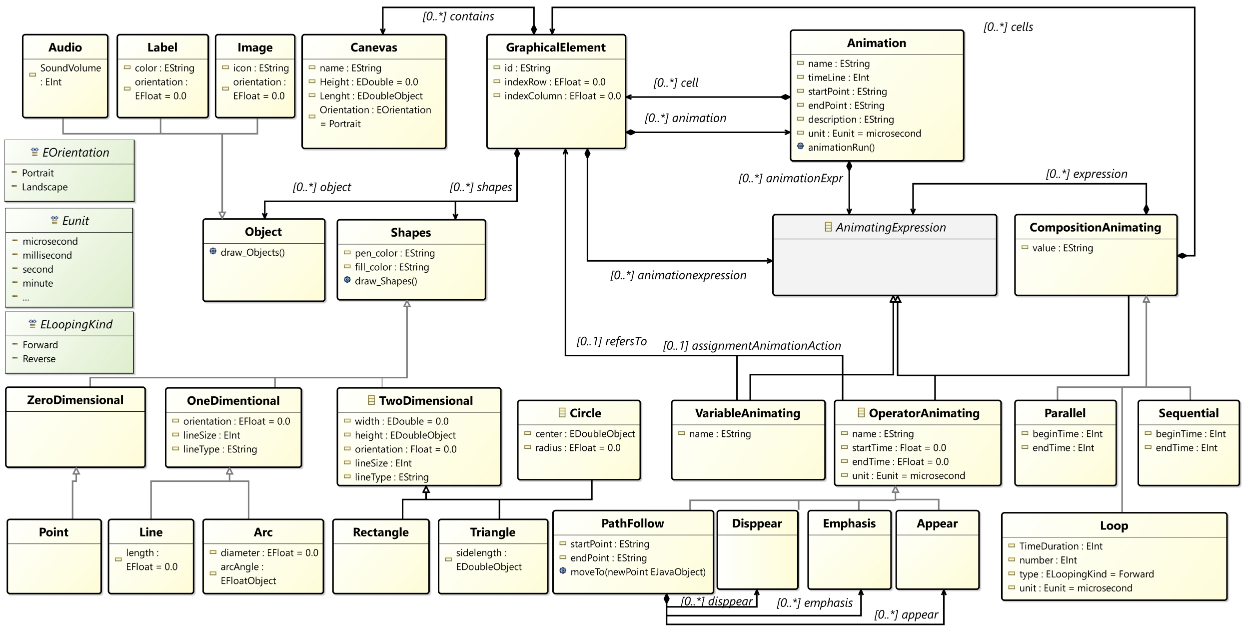


FIGURE 3.11 – Abstract Syntax of $\mathcal{LD}_v$ given as a Metamodel

Graphical Element

An graphical element E_i (e.g. form, shape, image text, son, volume, object) represents the symbol employed to animate the logical behavioral of DSL. Also, each graphical element has its own properties, which representing further information, the attributes of each object are placed as a tuple of coordinates $k = (x, y)$ within the canvas of a 2D, on which the elements are animate. For instance we can use a symbols like rectangle map the element *transition* of PN and the information of this rectangle, e.g. *backgroundColor attribute*, are called visual variables. An element can be seen as link between the variable of semantic transformation and the symbolic model with its visual variables.

Animation Expression

From this discussion of Section 3.2.4, we identify the following basic animation patterns UA_1,UA_2,...,UA_n that explain how to express and construct a desired basic and composed animations.

$r\_pat(r,d,E[,u])$ A path follow animation allows to move objects E from m_i to m_j in a given direction d under number of steps *steps*, and with a speed s that can be varied, for instance; reduced speed of the ghosts when it move through the tunnels. A path animation is a derived pattern that is obtained using two basic patterns $s\_app(E[,u])$ and $s\_dis(E[,u]$ in discrete time. Its consists of a sequence of functions describes to determine path or trajectory between the states with an execution order, e.g. describe the transition between 'visible' (i.e. $s\_app(E[,u])$ and 'hidden' (i.e. $s\_dis(E[,u])$ at various times. In addition, we can also use the operator path follow to help create many basic spatial transformation primitives such as scaling, moving, and rotating.

The path pattern $r\_pat(r,d,E[,u])$ must ensure the sequence of animations under the sequence of $\mathcal{S}$ state changes $\delta(\mathcal{S}_0,\ \mathcal{S}_1)$, $\delta(\mathcal{S}_1,\ \mathcal{S}_2)$,...,$\delta(\mathcal{S}_{N-1},\ \mathcal{S}_N)$. Here, $\delta(.)$ is a dynamically change of different state and their properties (e.g. colors and behavior). For instance, the pac-man trajectories is represented by a time-varying vector.

Composing Animation Patterns

Our domain-specific language (DSL) supports the custom design of complex instructional animations by explicitly composing basic animation primitives. This allows us to describe how animation elements behave and how they are sequenced or combined with specific timing.

These primitives can be composed explicitly either sequentially ($\oplus$) or concurrently ($\otimes$) to construct a complex animation scenario that reflects the real-world craftsmanship processes.

The initial model M_1 and the target model M_2 represent two distinct states of an artisan's task (e.g., preparing raw material and producing the final crafted product). The animation illustrating the transition from M_1 to M_2 requires identifying, at each step, a sequence of animation primitives UA_1, UA_2, ..., UA_n. These primitives are connected by composition operators $\odot \in \{\oplus, \otimes\}$.

Thus, we describe the animation from M_1 to M_2 as $UA_1 \odot UA_2 \odot \cdots \odot UA_n$, representing various actions such as *”the artisan grinds the tool before carving”* or *”a component is assembled before decoration.”* The animation semantics must align with a visual learning design language $\mathcal{LD}_v$, which defines how creation, deletion, and modification of components (e.g., tools, materials, gestures) occur visually.

These animation rules can be applied in different ways to achieve the same instructional effect without altering the underlying educational meaning. For instance, consider a simplified Petri Net with two places $P = \{p_1, p_2\}$, one transition $T = \{t_1\}$, and two arcs $A = \{(p_1, t_1); (t_1, p_2)\}$. This can visually simulate a rule such as ”‘*draw a token*”’—a metaphor for an artisan moving from one phase of the process to the next (see Figure 3.12).

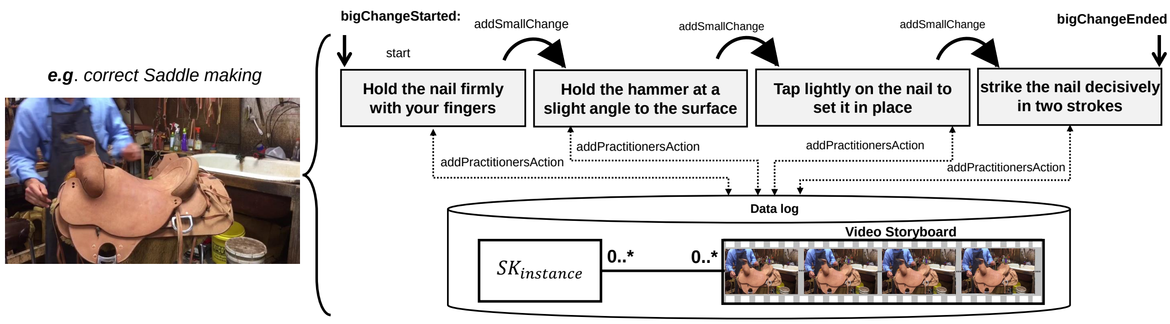


FIGURE 3.12 – An example of unit transformation fire() expressed with two animations.

In Figure 3.12, we apply two primitive animations sequentially :

$$r\_emp(r, d, E[, u]) \oplus r\_dis(r, d, E[, u])$$

over the interval $r = [t_0, t_f]$, with a loop showing/hiding tokens at each time step $n \in [t_0, t_f]$, based on their distance to the target.

Each animation assignment is defined as :

$$\mathcal{DS}(E, UA, I)$$

where :

— E : graphical element with parameters P,

— UA : set of unit animations,

— $I \subseteq E \times UA$: links elements to animation primitives.

Two combination operators for unit animations $UA_1, \ldots, UA_p \in UA$, $p > 1$, are defined :

$$\text{Sequential : } \oplus \quad \text{and Concurrent : } \otimes$$

— $\oplus$ is commutative ; $\otimes$ is not,

— $\otimes$ has higher precedence.

For shorthand :

$$UA_1 UA_p \equiv (UA_1, \ldots, UA_p), \quad \in \{\oplus, \otimes\}$$

3.4.7 Concept and Vocabulary of the Design Language : Educational Video Metamodel

The metamodel of an educational video defines the conceptual structure of the fundamental components of a pedagogical video. It is based on a set of classes representing the various elements and aspects that enable the design, organization, and analysis of educational videos.

Each class includes specific attributes that describe its properties, thereby facilitating formalization, reuse, and analysis of videos in an educational context.

As shown in Table 3.3, the core classes structure educational videos by defining their roles and key attributes. This provides a clear framework for organizing and managing video content effectively.

Class	**Description**	**Key Attributes**
Video	Represents the educational video itself	Title, Duration, Content, Format
Chapter	Represents divisions within a single video	ChapterID, Title, Number, ContentSummary
Playlist	Contains a sequence of related videos or modules	PlaylistID, Title, Description, VideoList
Storyboard	Outlines the sequence and flow of the video content	StoryboardID, Scenes, Transitions, Timing
Level	Represents different stages or levels of content within the video	LevelID, Difficulty, ContentDescription
ContentType	Specifies the type of content in the video	ContentTypeID, TypeName, Description
Transcript	Provides a written transcript of the video's content for accessibility	TranscriptID, Content, Language

Table 3.3 – Core Video Structure Classes

As detailed in Table 3.4, the classes define learning goals, specific objectives, and assessments associated with educational videos. This structure supports clear definition and evaluation of learning outcomes.

Table 3.5 summarizes the classes related to learner interactions and feedback during video use. These classes enable tracking of user behavior, responses, and content evaluation to enhance learning experiences.

This metamodel offers a clear and extensible framework to design, analyze, and exploit educational videos, integrating pedagogical, interactive, and motivational dimensions, while allowing for tracking and evaluation of learner progress.

Class	Description	Key Attributes
Objective	Defines the learning goals and outcomes of the video	ObjectiveID, Description, ExpectedOutcome
LearningObjective	Defines specific learning targets for each video or chapter	LearningObjectiveID, Description, AssessmentCriteria
Assessment	Represents assessments or quizzes related to the video content	AssessmentID, Type, Questions, ScoringCriteria

Table 3.4 – Learning Goals and Assessment Classes

Class	Description	Key Attributes
Learner	Represents the students or users interacting with the video	LearnerID, Name, Profile
Interaction	Detailed records of how learners interact with the video	InteractionID, Type, Timestamp, Details
Reaction	Captures learner responses and interactions with the video	ReactionID, Type, Timestamp, Context
Feedback	Provides feedback based on learner interactions and performance	FeedbackID, Type, Content, DeliveryMethod
CompletionStatus	Tracks the completion status of learners for each video or chapter	CompletionStatusID, LearnerID, VideoID, Status, CompletionDate
Evaluation	Collects and tracks evaluations of the video content from learners	EvaluationID, Rating, Comments, Date
Annotation	Highlights or notes added to specific parts of the video	AnnotationID, Timestamp, Content, LearnerID

Table 3.5 – Learner Interaction and Feedback Classes

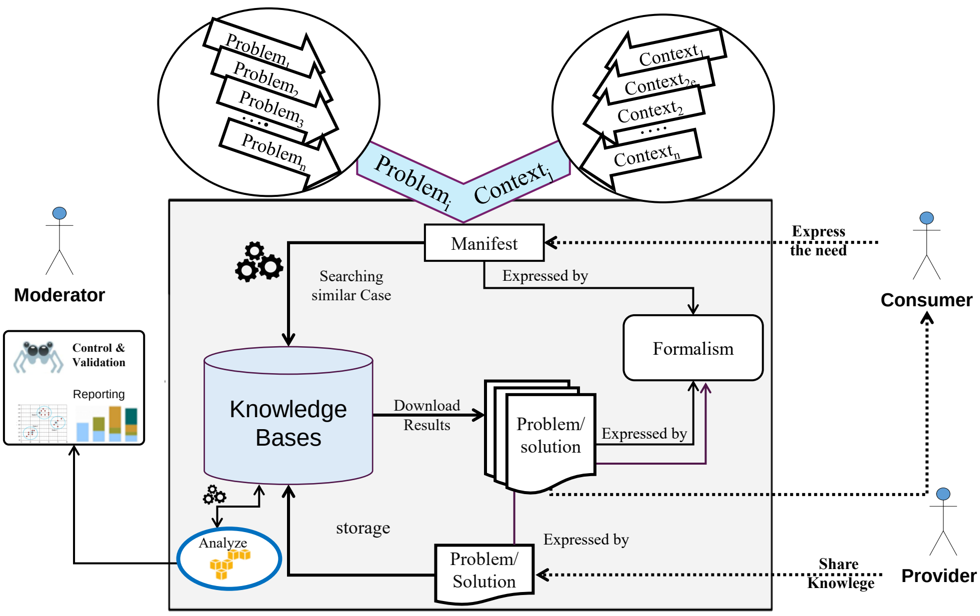


Figure 3.13 – Learning Design repository

3.4.8 Learning Design repository

To tackle Challenge C3, our system interacts with three kinds of users through its model repository : consumers, producers, and moderators (Figure 3.13). The system handle three

Class	Description	Key Attributes
MotivationAspect	Addresses motivational elements integrated into the video	MotivationAspectID, EngagementStrategies, PracticalRelevance, ConfidenceBuilding, PersonalSatisfaction

Table 3.6 – Motivation and Engagement Classes

main process : (i) **Searching Process :** Based on the manifest expressed as problem and context, users can find solutions expressed with their related artifacts. (ii) **Providing Process** The knowledge and information related to equine breeding, such as traditional breeding practices, local horse breeds, significant historical events, and care and breeding techniques, can be shared by a provider. This process involves collecting relevant information from various sources and systematically documenting it. (iii) **Analyzing and Validation Process :** The moderator ensures the management of organizational memory to maintain the longevity of capitalized knowledge. This involves implementing policies and procedures for managing, updating, and preserving knowledge in the long term.

3.5 Conclusion

This chapter highlighted the challenges of capturing and transferring tacit knowledge in craftsmanship through educational videos. We emphasized the need for a structured design language to make artisan skills explicit, reusable, and engaging for learners. Our approach aims to bridge the gap between expert intuition and beginner understanding, ultimately preserving valuable craft knowledge for future generations.

Chapitre 4

Our Implementation

■ *Passion is energy. Feel the power that comes from focusing on what excites you.* ■
— *Oprah Winfrey*

1.1 Introduction

The objective of this chapter is to visualize and assess the results of the suggestions made during the study of the existing system and the wishes expressed during the needs assessment. It also makes the design tangible by proceeding as follows :

— Presentation of the various tools (technological and software) used for the development of our system.

— Presentation of the main functionalities implemented.

1.2 Implementation of $\mathcal{LD}_v$

We have developed a design tool allowing creating and animating a graph conform to our design language. The structure of the developed design tool is based on Java EMF (Eclipse Modeling Framework) API and has been integrated as a plugin in Eclipse [1] which is an IDE (Integrated Development Environment).

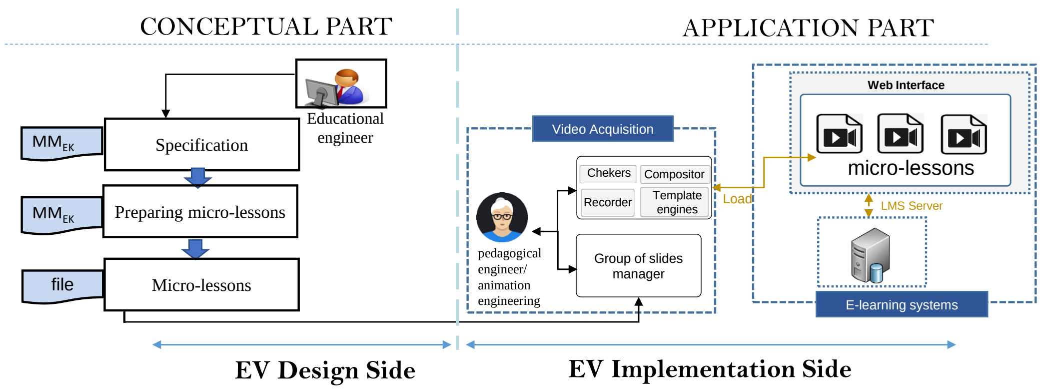


FIGURE 1.1 – Technical Implementation of our approach.

Figure 1.1 sketches this structure where the abstract syntax of $\mathcal{LD}_v$ have been implemented using Ecore meta-modeling language and the implementation of concrete syntax is based on

1. Eclipse Modeling Project. `www.eclipse.org/modeling/emf`

Sirius framework [2, 1]. Thanks to Sirius and Ecore plugins, users of $\mathcal{LD}_v$ language can instantiate their Animations in a user-friendly manner by using the Eclipse tree editor and a suitable properties tab.

1.3 Presentation of the development technologies used

In this section we present the tools used for the development of our application (Hyperfile, IDE WLangage, Enterprise Architect, etc.).

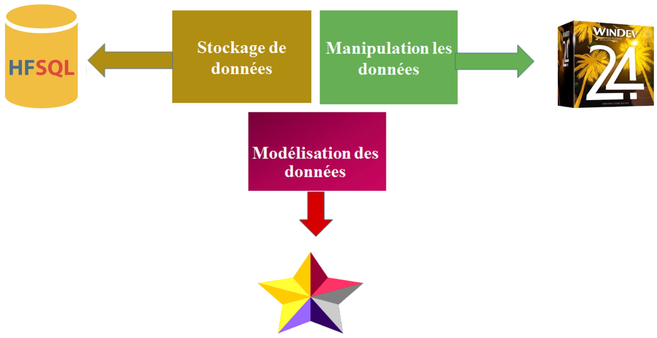


FIGURE 1.2 – The development technology used

1.3.1 Presentation of the WL language

WLanguage is a 5th generation programming language (5GL) that is both simple and very powerful. Included in the WinDev, WebDev, and WinDev Mobile development tools, it is proprietary and can only be used with PC SOFT tools. WLanguage is based on the concept of problem solving using constraints given to the program, rather than using an algorithm written by a programmer (3rd generation) or a formal specification of representation in SQL tables and queries (4th generation). Most constraint-based or logic-based programming languages, as well as some declarative languages, are fifth-generation languages. WLanguage can also rely on the Java framework for some of its functionality, which allows for relative and limited independence of the executable file from the target operating system. The same is true in WebDev, where WLanguage can rely on the PHP framework, without however allowing the use of all of the latter's capabilities.

Windev is a Software Engineering Workshop (SWG) published by PC SOFT that allows you to easily develop all types of Windows applications in the fields of management, industry, medicine, etc. The applications developed may include access to databases. WinDev offers a powerful database engine : Hyper File. W-Language is a 5th generation language (5GL) that is both simple and very powerful. The WinDev integrated development environment consists of different editors :

- A project editor allowing you to view and interact with the project graph.
- An analysis editor allowing access to any type of database (Hyper File, xBase, AS/400, Oracle, SQL Server, Access, ODBC, OLE DB, etc.)
- A UML editor allowing object modeling of data and processing.
- A GUI editor with a corrector.
- An advanced code editor (with wizards, code verification, etc.) including a powerful debugger.
- A query editor for selecting records in files.

— A report editor.

— A help editor for generating help files in CHM format.

— Installation editor.

— ...

1.3.2 Hyperfile

For managing the database of our application, we chose Hyperfile. It is a relational SQL database server developed with a focus on high read performance. It operates on many different operating systems including Linux, Mac OS X, and Windows. Hyperfile was developed by the company of the same name (Hyperfile Corporation `http://www.Hyperfile.com`), a global leader in database systems. The company, originally named Relational Software Incorporated (RSI), was founded in 1977 by Lawrence Ellison, Bob Miner, and Ed Oates. RSI marketed a Relational Database Management System (RDBMS) named Hyperfile.

1.3.3 Ecore Eclipse

StarUML is an open-source software, released by its former publisher under the GNU GPL license, dedicated to Windows platforms. It is developed in Delphi and supports data export. We used this software (version 4.0.0) to create diagrams for UML modeling.

1.4 Presentation of Our Tool

The development of our application progressed through several stages, from designing the Entity-Relationship model to building its interfaces. This section presents the key interfaces and illustrates a global usage scenario to demonstrate the framework's usefulness and effectiveness.

1.4.1 Tool Support

Our knowledge management tool, `CRAFT-LD`, designed as a Design Language for Educational Videos in Craftsmanship : Enhancing Learning Experiences for Artisans, is an innovative software solution that enables users to capitalize on all knowledge related to artisans, including information about learning experiences, learning modes, and the process of skill reproduction and evolution.

Additionally, all incidents and events can be logged and capitalized upon through this tool, including details such as their name, date, attempted actions, and solutions implemented for successful reproduction. This functionality preserves accumulated experience within the organization, facilitating the sharing of best practices and knowledge transmission among team members. `CRAFT-LD` consists of six modules : **(1)** *CRAFT-LD Home Page :* Overview of craftsmanship origins, characteristics, techniques, and practices. **(2)** *Business Process Specification :* Guides on craft processes, replicating practical experience. **(3)** *Animation Design Scenarios :* Exploration of significant stages and events in craft history and techniques. **(4)** *Generating LD :* Sorting and validating knowledge for reuse, promoting learning from mistakes. **(5)** *LD Repository :* Interactive tools for analyzing and interpreting craftsmanship knowledge. **(6)** *LD Helper :* Provides additional support and resources for users.

1.4.2 CRAFT-LD Home Page

We have developed a support tool for instructional designers called CRAFT-LD, aimed at creating detailed specifications for educational videos dedicated to the crafts sector of the Tiaret Chamber of Crafts. This tool enables the design phase to take place before implementation, within the context of producing educational videos, in order to make training for artisans digital and accessible remotely. Figure 1.3 shows the CRAFT Home Page.

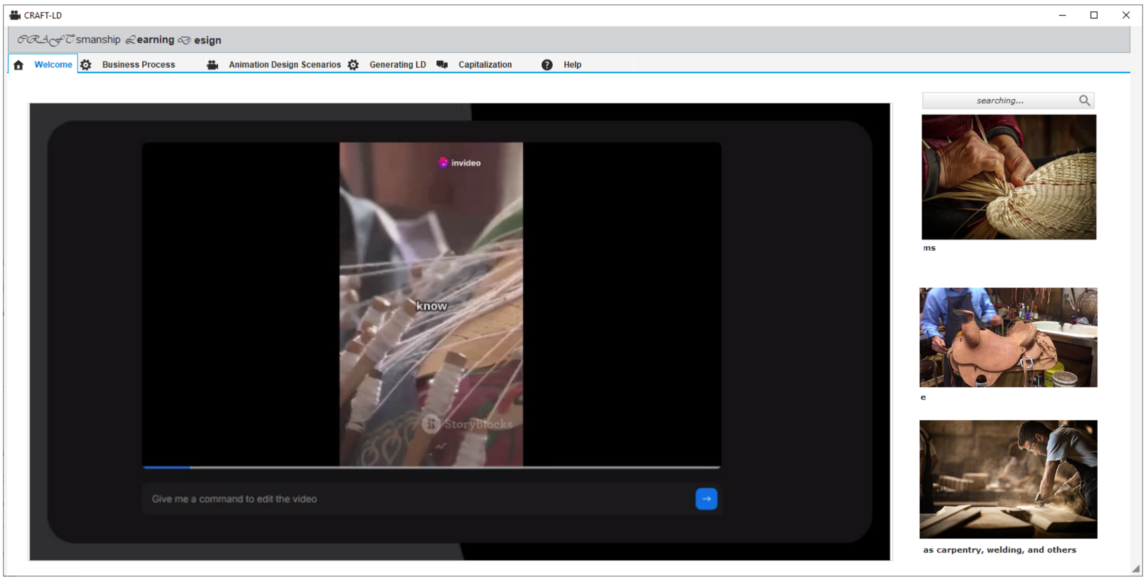


FIGURE 1.3 – CRAFT Home Page.

1.4.3 Business Process Specification

Through the interface shown in Figure 1.4, the designer, after detailed monitoring using the video acquisition protocol, allows the breakdown of the overall business process information as well as the list of operations in this process, including the specification of order relations between successors and predecessors, and the customization of each elementary operation with frequency, duration, etc.

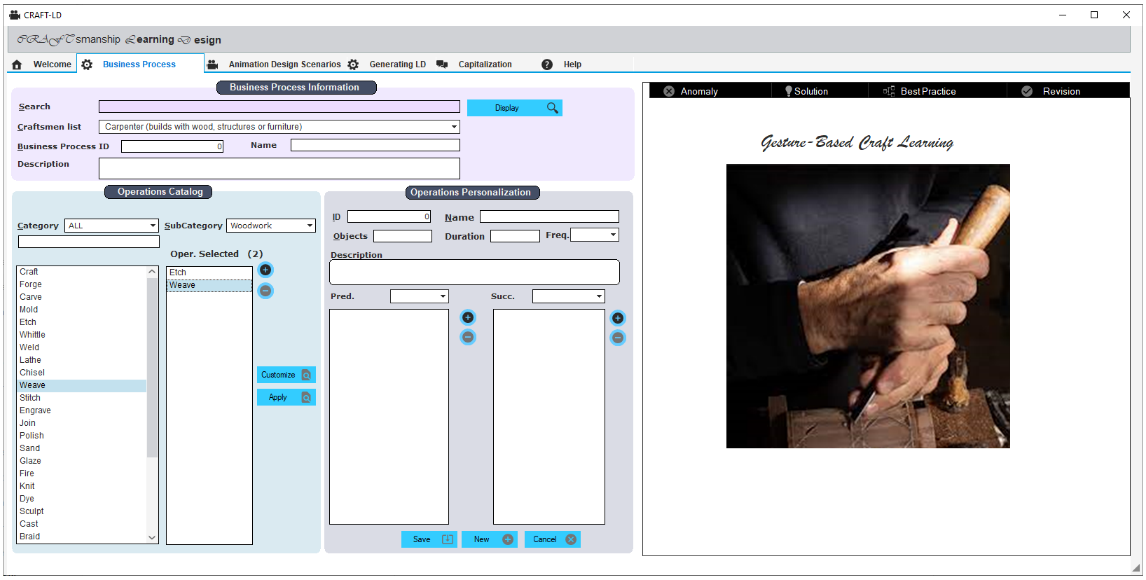


FIGURE 1.4 – Business Process Specification.

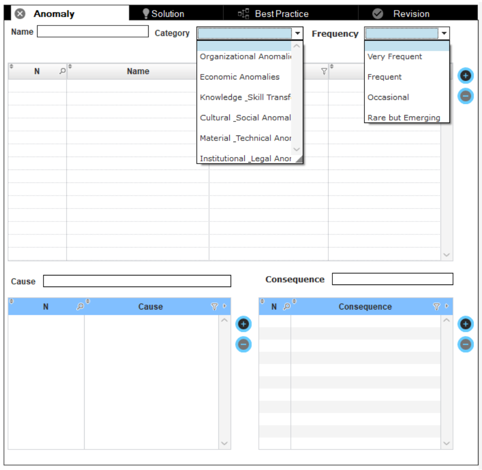
Through the following interfaces (Figure 1.8), the design can :

— **Identify anomalies related to business process operations :** Detect and describe problems or malfunctions occurring at different stages of the work process.

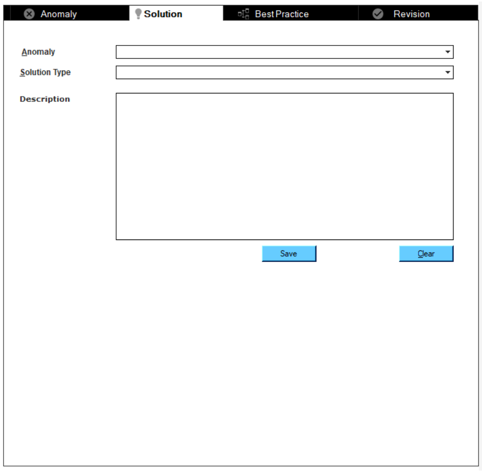
— **Document solutions to these anomalies :** Propose and record corrective actions implemented to resolve identified issues.

— **Capture best practices :** Collect effective methods and procedures recommended to optimize business process operations.

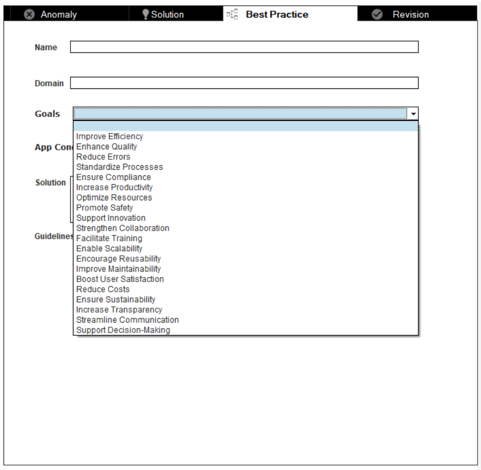
— **Revise business process specifications :** Continuously update and improve the descriptions and rules of the process based on feedback, analysis of anomalies, and solutions.



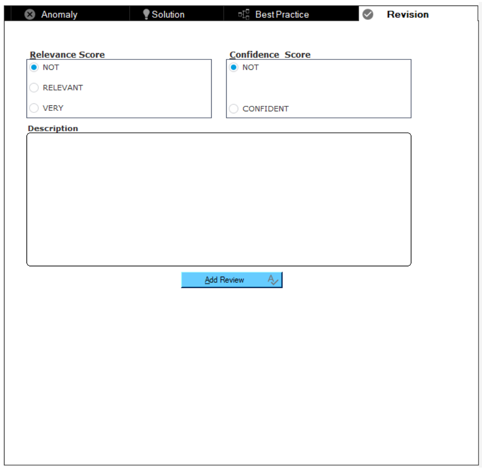
(a) Anomalies related to business process operations



(b) Solutions to anomalies



(c) Best Practices



(d) Revision BP Specification

FIGURE 1.5 – `CRAFT-LD` main GUI of BP and its component module panels.

1.4.4 Animation Design Scenarios

The following interface of Figure 1.6, **Animation Design Scenarios**, supports instructional designers in creating animated learning steps for task-based training. It begins with a *search bar* to select a profession, filtering relevant tasks. These tasks appear in a table where designers can assign *animation effects*, such as "Smooth Transition (Fade)," and mark motivational elements like Attention or Relevance from the **ARCS Model**.

The interface includes checkboxes for adding *interaction, questions*, or *theoretical content*. Designers can input custom questions and map them to ARCS strategies like "Celebrate small wins." The right panel allows configuration of *background type*, *content*, learning *goal*, and cognitive level (e.g., "Recall knowledge").

A *Concentration Flow* checklist lets users ensure effective instructional design through options like micro-goals and feedback. Once complete, the configuration is saved using the **Save** button, making this tool a structured system for developing engaging, theory-based learning content.

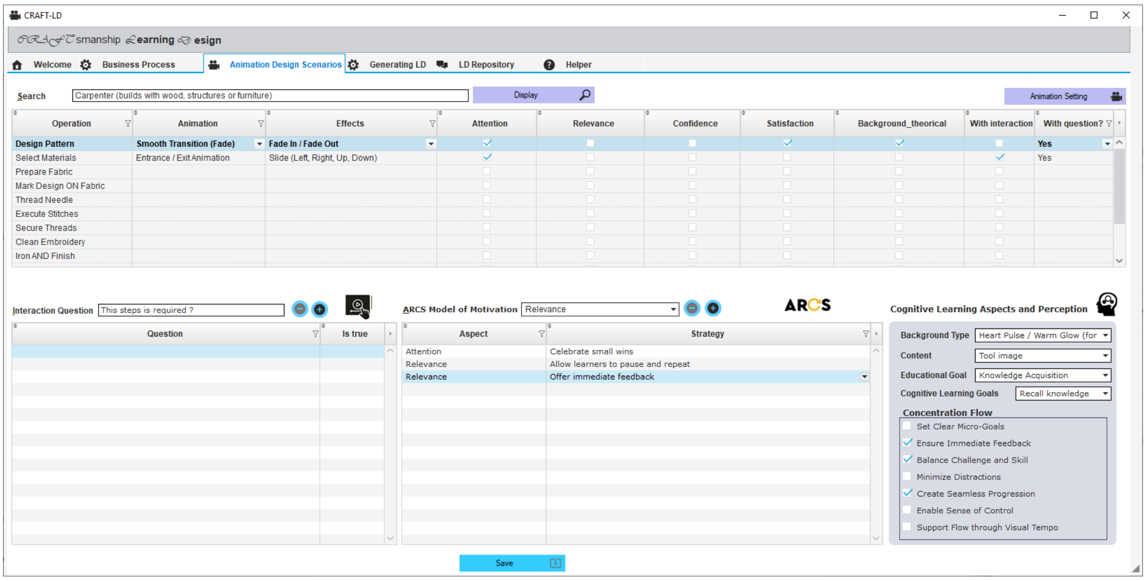


FIGURE 1.6 – Business Process Specification.

1.4.5 Generating LD

All the specifications can be generated in textual form to be used for documentation and shared with animation designers to produce detailed educational videos (See Figure 1.7). Another approach is to generate a detailed prompt to query generative AI tools and platforms (text-to-video) in order to accelerate the creation of instructional videos for learners. The detailed prompt enables generative AI to produce videos that integrate the guidance of domain experts and pedagogical engineers.

Figure 1.8 illustrates examples of videos generated using our specification as a prompt in generative AI. Subfigure 1.8a shows a general video about Algerian artisans, highlighting the diverse craftsmanship in the region. Subfigure 1.8b presents a general video focusing on a specific artisan, showcasing detailed aspects of their craft. These examples demonstrate the practical application of our design language in creating educational videos that capture and promote artisan knowledge.

1.4.6 LD Repository

Learning Design instances can be capitalized on and stored in a repository to facilitate the search and sharing of Learning Designs among designers. These Learning Designs are considered CRUD objects (Create, Read, Update, Delete). The reuse of Learning Designs by designers helps improve the quality of educational video design (see Figure 1.9).

1.4.7 LD Helper

We have added to our tool a taxonomy structured as a tree that displays Learning Design concepts, with the ability to document these elements and view their details. This catalog

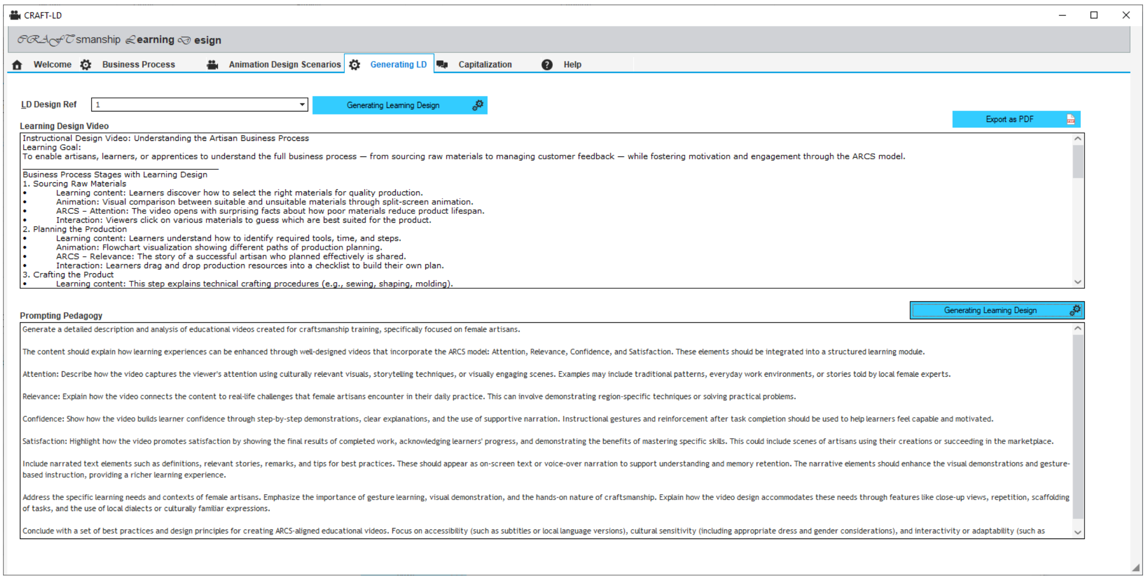
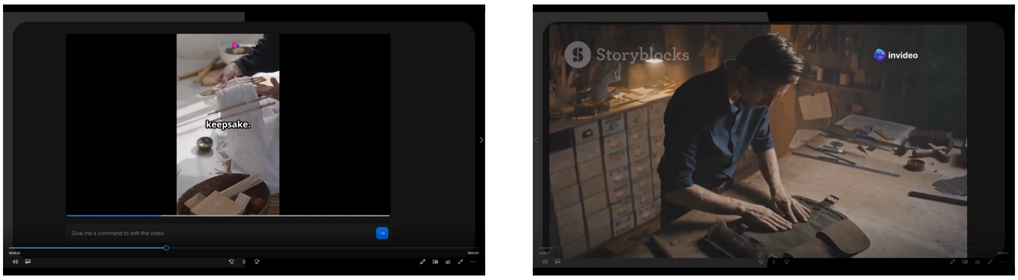


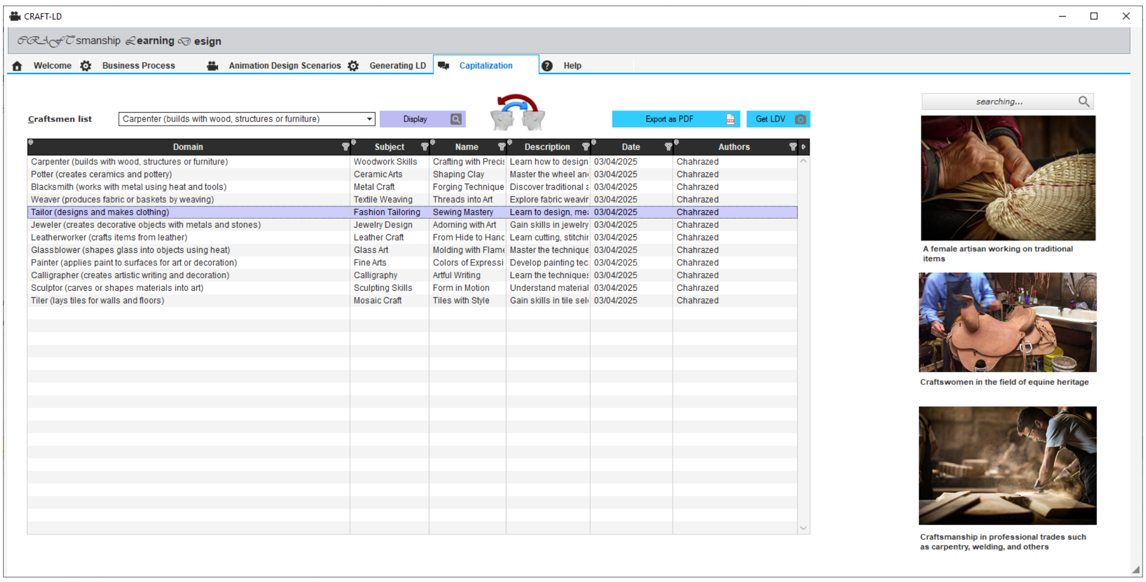
FIGURE 1.7 – Generating LD.



(a) Example of a general video about Algerian artisans

(b) Example of a general video about an artisan

FIGURE 1.8 – Example of generating videos using our specification as a prompt in generative AI.



Domain	Subject	Name	Description	Date	Authors
Carpenter (builds with wood, structures or furniture)	Woodwork Skills	Crafting with Precis	Learn how to design	03/04/2025	Chahrazed
Potter (creates ceramics and pottery)	Ceramic Arts	Shaping Clay	Master the wheel an	03/04/2025	Chahrazed
Blacksmith (works with metal using heat and tools)	Metal Craft	Forging Technique	Discover traditional a	03/04/2025	Chahrazed
Weaver (produces fabric or baskets by weaving)	Textile Weaving	Threads into Art	Explore fabric weavir	03/04/2025	Chahrazed
Tailor (designs and makes clothing)	Fashion Tailoring	Sewing Mastery	Learn to design, me	03/04/2025	Chahrazed
Jeweler (creates decorative objects with metals and stones)	Jewelry Design	Adorning with Art	Gain skills in jewelry	03/04/2025	Chahrazed
Leatherworker (crafts items from leather)	Leather Craft	From Hide to Hanc	Learn cutting, stitchir	03/04/2025	Chahrazed
Glassblower (shapes glass into objects using heat)	Glass Art	Molding with Flame	Master the technique	03/04/2025	Chahrazed
Painter (applies paint to surfaces for art or decoration)	Fine Arts	Colors of Expressi	Develop painting tec	03/04/2025	Chahrazed
Calligrapher (creates artistic writing and decoration)	Calligraphy	Artful Writing	Learn the technique	03/04/2025	Chahrazed
Sculptor (carves or shapes materials into art)	Sculpting Skills	Form in Motion	Understand material	03/04/2025	Chahrazed
Tiler (lays tiles for walls and floors)	Mosaic Craft	Tiles with Style	Gain skills in tile sel	03/04/2025	Chahrazed

FIGURE 1.9 – LD Repository

allows users to explore, inspect, select, and display necessary information such as the concept, educational goals, components, applications, and examples (Figure

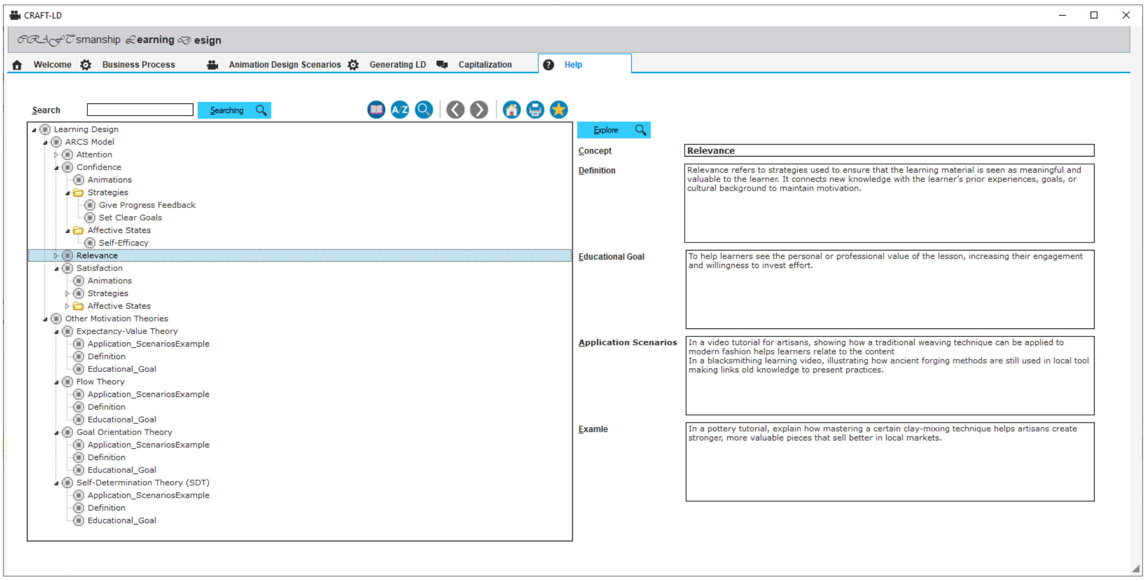


FIGURE 1.10 – LD Helper

1.4.8 Mockup of our Business Process UX Design Tool

In this section, we present the architecture of the mockup for the prototyping tool that enables UX designers and business analysts to quickly build block diagrams of business processes on a 2-dimensional canvas.

Figure 1.11 illustrates the mockup prototype implementation of our UX design framework. It consists of three main modules : (i) the basic elements block palette, (ii) the canvas for arranging graphical components, and (iii) the process visualization builder that generates an intuitive abstract syntax for visualizing business process flows.

The design process involves a series of steps that a business process model undergoes during development. Specifically, our workflow for constructing these models consists of three stages (see Figure 1.11) :

① First, the designer begins with a blank canvas workspace and selects process elements (e.g., tasks, decisions, events, and data objects) from the editor palette. These elements are organized following the business process structure, allowing easy identification and browsing. The hierarchical organization lets users navigate through components and their sub-elements, searching for specific design blocks in the component library.

② Second, the tool supports editing properties of selected elements directly on the canvas. Designers can drag and drop blocks representing process steps, and customize parameters (e.g., task duration, assigned roles, conditions) through popup dialogs that guide the user. Contextual information and required user actions are shown in a status bar below the editor panel. Advanced settings allow fine-tuning of process parameters.

③ Third, designers can define the logical flow and interactions between process blocks by connecting them with directional arrows, representing transitions and dependencies. The interface supports flexible drag-and-drop actions to move, connect, group, and nest elements within the two-dimensional workspace, providing an intuitive environment to model complex business processes.

This mockup tool aims to facilitate rapid prototyping and iterative refinement of UX designs for business processes, improving clarity and collaboration among stakeholders.

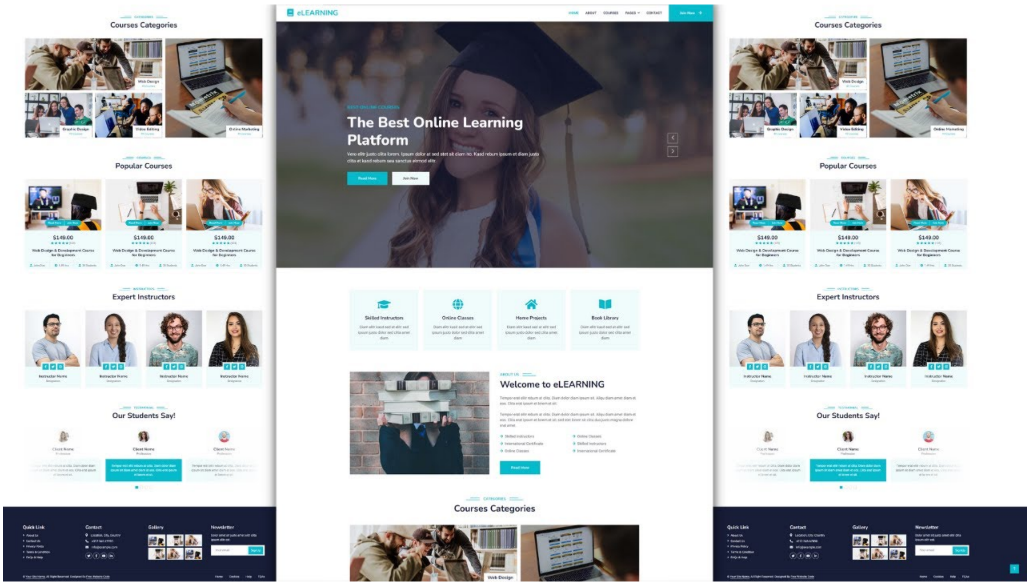


FIGURE 1.11 – Mock-up of the E-learning systems.

③ Finally, after constructing the educational video storyboard by linking the different visual and instructional blocks, the designer proceeds to visualize the content elements in their final format. Our prototype reads the video language (VL) specification along with generator template files that define the animation and sequencing scripts. These scripts can be rendered directly in modern web browsers (such as Safari, Chrome, Firefox), enabling immediate preview and interaction with the educational content. This capability also supports testing and validation, ensuring that the designed animations and instructional flows are correctly interpreted and displayed, enhancing the learning experience for artisans.

1.5 Conclusion

We proposed a design language for educational videos to better capture and share artisans' tacit knowledge. Key challenges include creating clear visual syntax, enabling reusable animation components, and aligning animations with learning processes. Inspired by model animation, our approach aims to make learning experiences more flexible, understandable, and transferable. This work lays the groundwork for systematically designing educational animations that support craftsmanship training.

Conclusion Générale

"I have come to the conclusion that if the powerful of the earth are capable of causing misery, they are incapable of bearing its sight."
— Bertolt Brecht

4.1 Conclusion

In this thesis, we introduced a design language called $\mathcal{LD}_v$ that helps create educational videos to support learning in craftsmanship. This language was specially made to help artisans and learners better understand and follow step-by-step processes through animated videos.
Our goal was to make it easier for instructional designers to build clear, reusable, and meaningful learning content. $\mathcal{LD}_v$ makes this possible by using small, reusable animation blocks that show each step in a craft process. This helps learners see how things are done, not just read or hear about them.
We also created a tool using a language workbench to help designers use $\mathcal{LD}_v$. Through a real case study, we showed that our approach can make the learning process more visual, structured, and easier to adapt for different skills and crafts.
This work is a step forward in supporting artisans with better learning experiences. It combines video, animation, and learning design in a way that respects traditional knowledge while using modern technology to teach it.

4.2 Future Work

To improve this work, we plan to :

— Add features like voice instructions and interaction in the videos.

— Use AI to suggest animations based on the content of a lesson.

— Test the design language in different types of craftsmanship with real artisans to improve its usefulness.

We hope this work helps educators and designers create better learning tools for artisans, making it easier to learn and pass on traditional skills using video technology.

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