Conceptualizing the Learning Design of lesson plans with LAMS and CADMOS

Conceptualización del diseño didáctico de los planes de clase con LAMS y CADMOS

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ABSTRACT

The rapid development of digital technology in today's times can enrich distance learning in a variety of ways. The use of digital technology in education focuses on teaching new concepts and ideas, courses, and particularly its use by the learners through web-based applications. One of the most important factors that should be taken into consideration is the learning design. In learning, students participate in group and role-based activities using an environment with appropriate resources and services. This paper tries to contribute to a better understanding of learning design with emphasis on Visual Instructional Design Languages and Learning Design Tools (COMPENDIUM, MOT+, COLLAGE, LAMS). In addition, special emphasis is given on the learning design of lesson plans with LAMS (Learning Activity Management System) and CADMOS.

Keywords: Educational Technology; Learning Design; LAMS (Learning Activity Management System); CADMOS; Learning Environments.

RESUMEN

El rápido desarrollo de la tecnología digital en los tiempos actuales puede enriquecer la enseñanza a distancia de diversas maneras. El uso de la tecnología digital en la educación se centra en la enseñanza de nuevos conceptos e ideas, cursos y, sobre todo, en su uso por parte de los alumnos a través de aplicaciones basadas en la web. Uno de los factores más importantes que hay que tener en cuenta es el diseño del aprendizaje. En el aprendizaje, los alumnos participan en actividades de grupo y basadas en roles utilizando un entorno con recursos y servicios adecuados. Este artículo trata de contribuir a una mejor comprensión del diseño del aprendizaje haciendo hincapié en los lenguajes de diseño instruccional visual y las herramientas de diseño del aprendizaje (COMPENDIUM, MOT+, COLLAGE, LAMS). Además, se hace especial hincapié en el diseño didáctico de planes de clase con LAMS (Learning Activity Management System) y CADMOS.

INTRODUCTION

Digital technology is part of our everyday life, research and teaching. The digital technology used to facilitate learning in every educational process is educational technology. The most significant part however in everyday learning practice is the well-structured learning design. In learning, students participate in group and role-based activities using an environment with appropriate resources and services.

Learning Designs are "*pedagogically informed learning activities which make effective use of appropriate tools and resources*".[1,2,3,4,5,6,7,8] IMS Learning Design can be described as a specification used in learning scenarios. It helps these scenarios to be presented to learners online. Also, it enables the share of these scenarios between systems.[1] The Rob Koper and Colin Tattersall, creators of EML/IMS Learning Design, state the following about learning design:[2]

"*… the core of Learning Design can be summarized as the view that, when learning, people in specific groups and roles engage in activities using an environment with appropriate resources and services.*"

In general, learning design:

- involves people from different fields, such as software developers, educators, content developers, domain experts, instructional designers, web application experts, who must collaborate and therefore must use a common and understandable language in creating the courses.
- contains pedagogical, interactional and technical issues that need to be considered, and requirements need to be defined and documented.
- instructing novices and reusability of lesson plans is a demanding process.

Background

Learning Design can make the structures of desired teaching and learning - pedagogy - more visible and explicit, thus promoting understanding and reasoning. Also, learning design can serve as a description or template, which can be adapted or reused by another teacher to suit their own context. Furthermore, it adds value to building common understanding and communication between those involved in the planning and teaching process and contributes to the promotion of creativity. [3,4,9,10,11,12,13,14,15]

According to James Dalziel, creator of LAMS (Learning Activity Management System) [3]: "*The field of Learning Design seeks to describe the "process" of education – the sequences of activities facilitated by an educator that are often at the heart of small group teaching.*"

Many of the works on Learning Design give special emphasis on technology-enhanced learning. Technology is used to automatically "run" the sequence of learner activities with the use of computer software and hardware. However, an activity in a learning design could also be run without the use of technology.[3,4,5,6,7,16,17,18,19,20,21,22,23] Therefore, a learning design could be a mixture of face-to-face and online learning activities ("*blended learning*"), or act as a lesson plan in the form of standardized written description of the learning process.

According to James Dalziel[3]: "*A particular Learning Design is like an educational recipe for a teacher – it describes ingredients (content) and instructions (process).*"

In the field of learning design, a design team could include: (i) a Faculty Member/Content Expert, (ii) Instructional designer, (iii) Course coordinator, (iv) Graphic artist, (v) Multimedia producer, (v) Web developer, and (vi) the Learner.

Research Methodology and Discussion of Findings

We try in this paper to answer to the following research questions:

RQ 1: Is there a classification framework for Educational Modeling Languages in Instructional Design and which are some commonly used learning design tools ?

RQ 2: What is the use of LAMS (Learning Activity Management System) and CADMOS in everyday learning practice?

RQ 1: Is there a classification framework for Educational Modeling Languages in Instructional Design and which are some commonly used learning design tools ?

To identify a classification framework for Educational Modeling Languages in Instructional Design we describe about the visual instruction languages E2ML, PCel, coUML, POEML a classification framework described by Luca Botturi et al.[10] A comparison of the above-mentioned visual instruction languages according to specific criteria is the following:[10,11,12]

1. User skills – novice, medium, expertise: The user skills are dependent to user level.
2. Formalization (SCORM / IMS CP): A formal design language defines a closed set of ideas and concepts to describe designs.
3. Stratification: A language consisted of layers, provides tools for describing entities such as persons and roles, learning material or learning tasks.
4. Elaboration: Each particular design language is able to provide specific details of an artifact.
5. Perspective: Multiple-perspective languages use various tools to represent many views of the same entities.
6. Notation: If a language exposes a notation-system, this can be in visual form (e.g. UML-Unified Modeling Language), or non-visual form (e.g. IMS).

Next, in figure 1 there is a representation of learning teaching tools based on the above-mentioned classification framework (see figure 1).

Learning Design Tools

	User skills	Guidance	Templates-Design Patterns	Exports IMS-LD A,B,C	Editing of IMS LDs
COMPENDIUM	Medium	-	+	-	-
MOT+	Expertise	-	-	IMS-LD LEVEL A	-
COLLAGE	Medium	+ (no wizard style)	+	IMS-LD LEVEL A	-
LAMS	Medium	-	-	-	-

Figure 1. Learning Design Tools

RQ 2: What is the use of LAMS (Learning Activity Management System) and CADMOS in everyday learning practice?

LAMS

LAMS - Learning Activity Management System offers activity-based courses in the form of a sequence with alternative streams.[13,14]

Student characteristics as a source of adaptation means personalization according to student role, knowledge levels and student preferences. Personalization can be integrated and implemented in LAMS according to the characteristics of the student. Specifically, we can have a different sequence of activities depending on the learning style, preferences, and performance of each student.[13] An alternative could be the presentation of different learning material through the use of alternative resources. For instance, at certain points in the course depending on learning style: (i) for theorists more resources are presented, and (ii) for practicals more activities are presented.[13]

The LAMS system should be adaptable to student choices. It should adapt to student choices through the use of support tools and optional activities. The way of implementation consists in the free choice of the level of knowledge and learning preferences. A key finding is that once the learning style and cognitive background are chosen, the sequence of study of the educational material is fixed and the student cannot modify it.

However, LAMS is one of the few general-purpose e-learning environments with appropriate tools for implementing alternative pathways and adaptive courses (see figure 2 y 3).
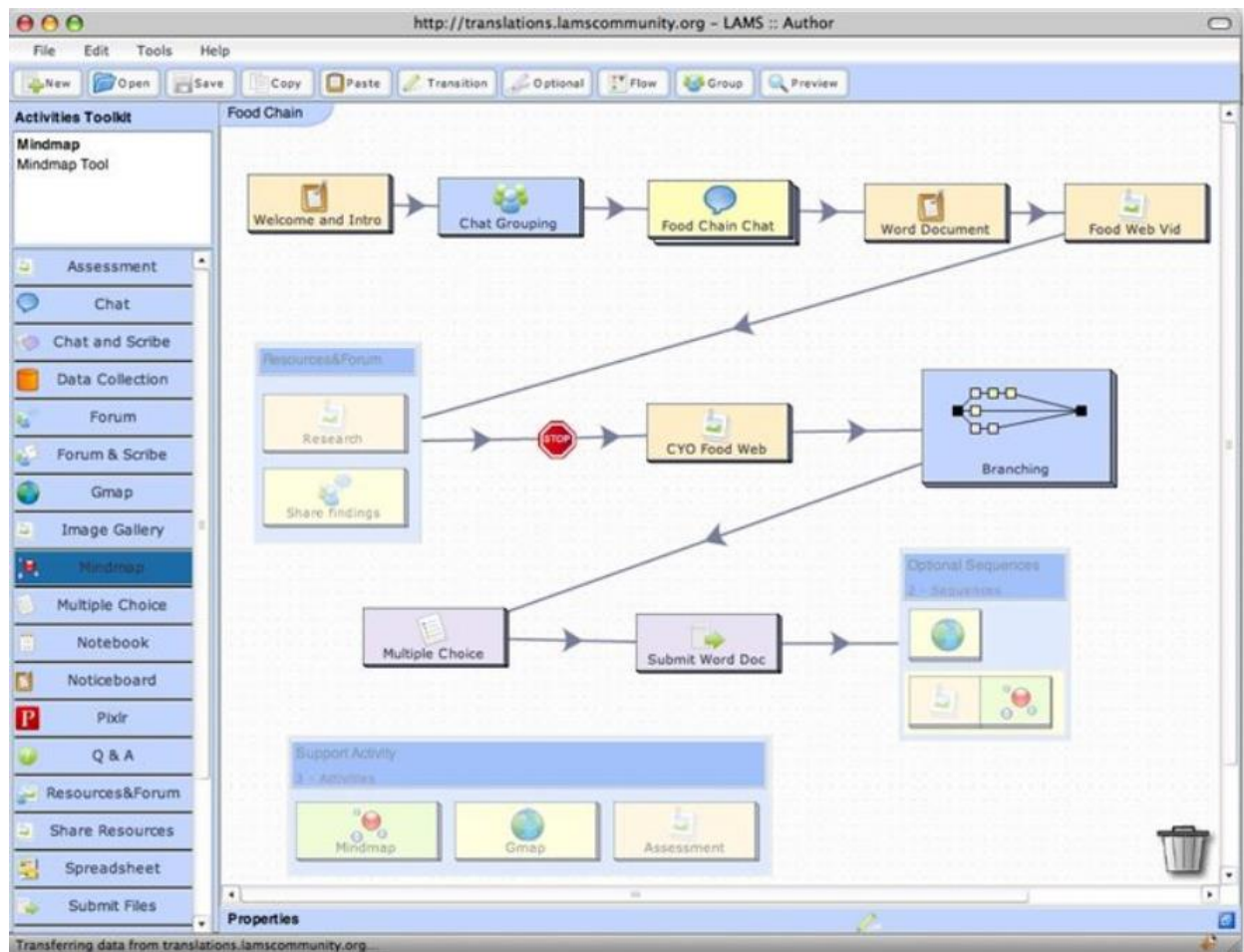

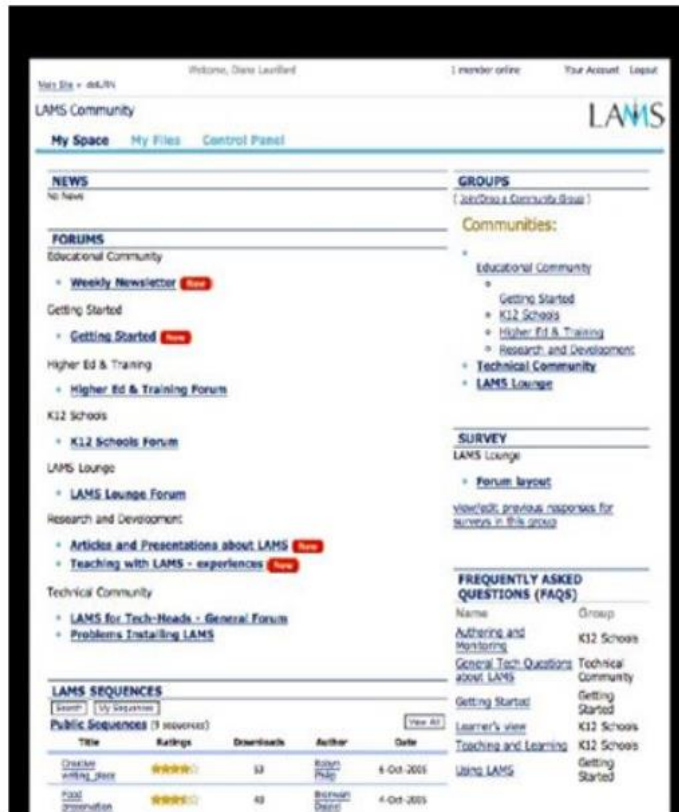**Figure 2.** LAMS – (Learning Activity Management System)

Figure 3. LAMS – Community example

CADMOS

CADMOS is a graphical design tool and uses and distinguishes 2 stages in the course creation process: [15]

1. The stage of defining the learning activities and matching them with the learning resources (**Conceptual Design**).
2. The planning stage of navigation between learning activities (**Navigational Design**).

CADMOS directs a practitioner to design a learning script in layers: first by opting for the learners' and teachers' activities and the associated learning services and resources required therefore constructing a learning task conceptual model, and afterwards by harmonizing the tasks per human actor and adding constraints and rules using the metaphor of swim lanes which are all illustrated in the learning task flow model. The output of the learning design process using CADMOS can lead to three options: (i) a learning design codified in its own format in order to be reused and modified later, (ii) a learning design package that conforms to the IMS-Learning Design level specification, and (iii) a Moodle package which could be uploaded onto a Moodle server and used for "restoring" it as a Moodle course. [15,24]

Next, we present how we created a learning design using CADMOS and deployed it into Moodle platform (see figure 4,5,6,7,8,9). Figures 4 – 9 illustrate screenshots of CADMOS learning activity conceptual model, learning activity flow model and the Moodle preview of a learning script.
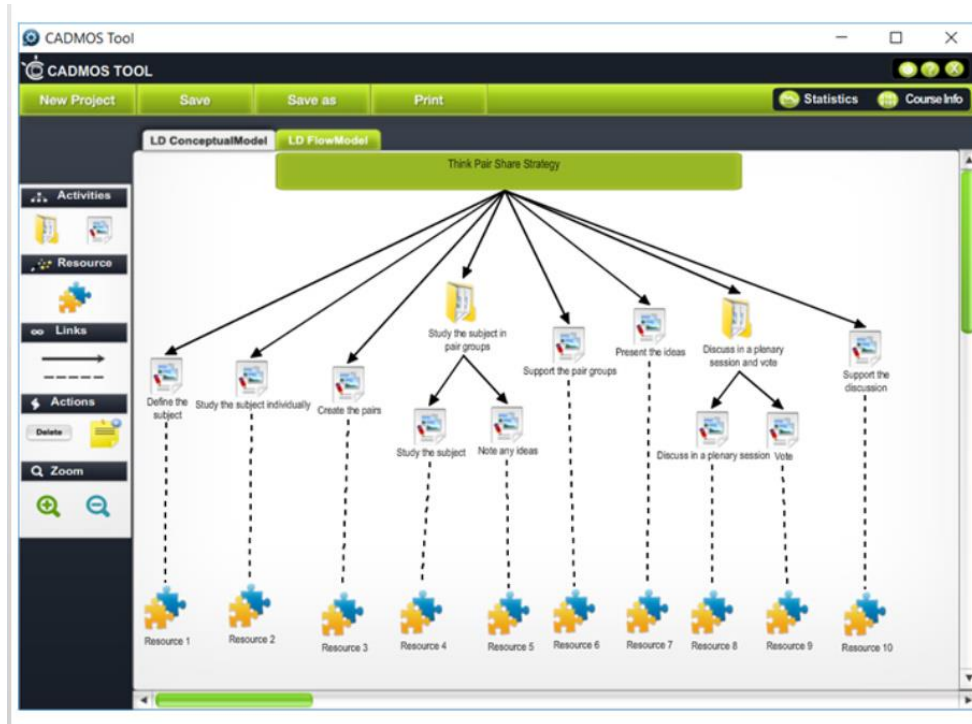
Figure 4. CADMOS Tool screenshot1
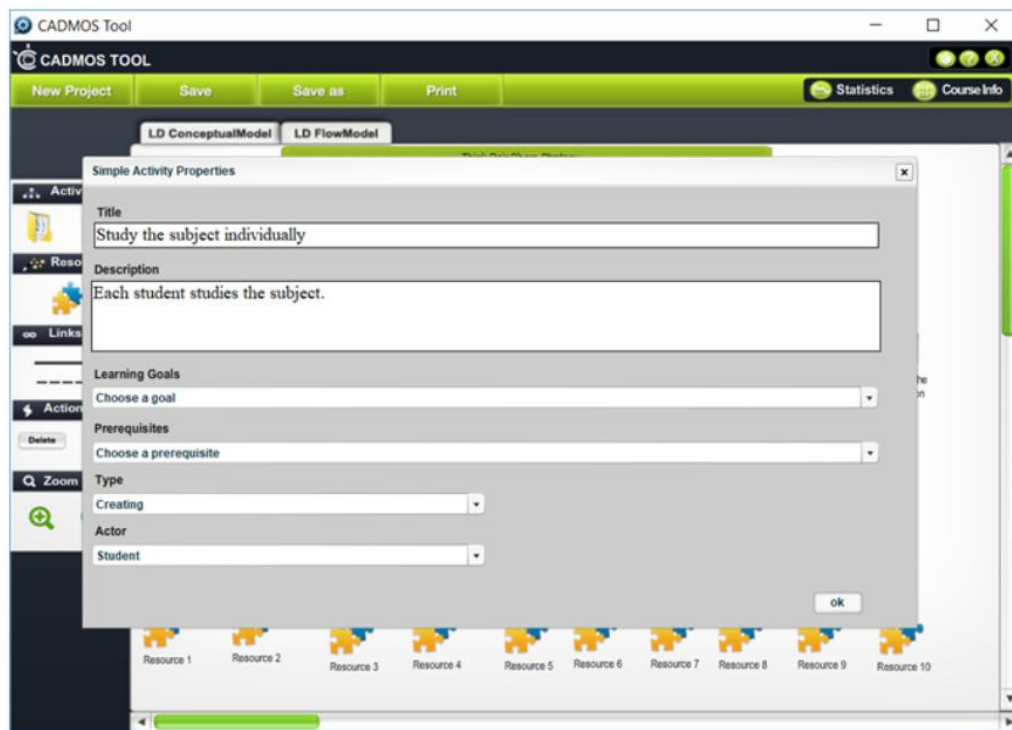

Figure 5. CADMOS Tool screenshot2

Figure 6. CADMOS Tool screenshot3
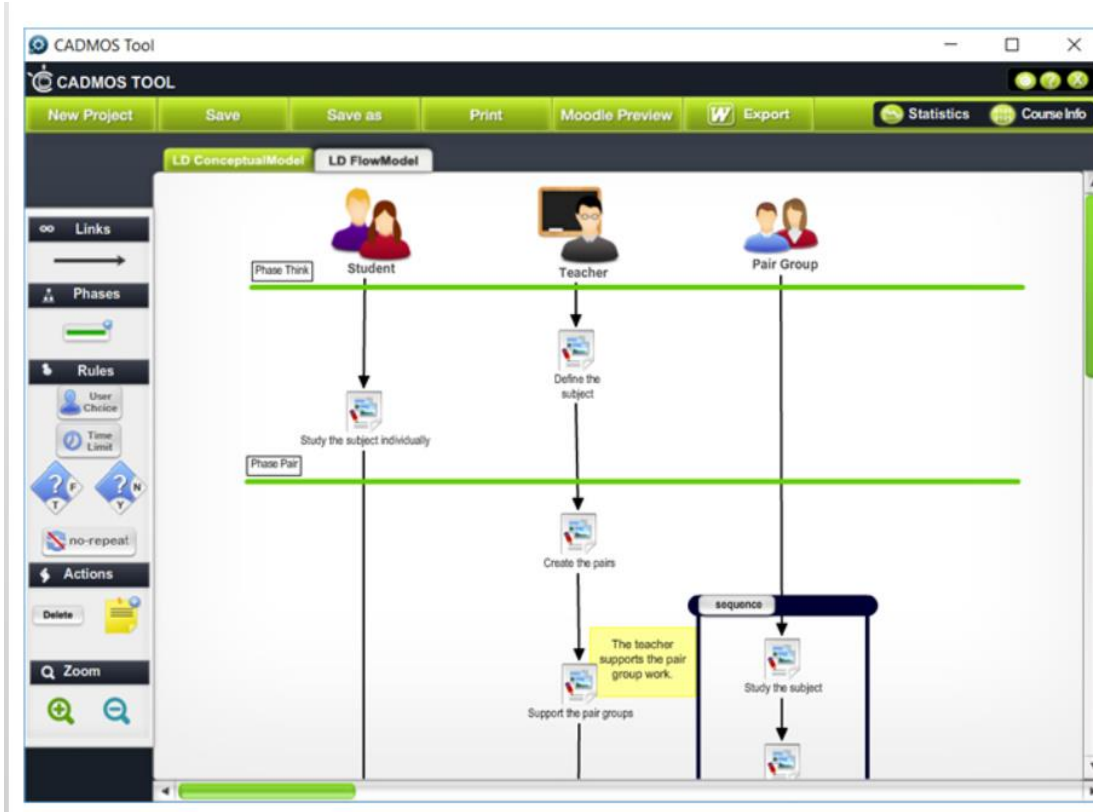

Figure 7. CADMOS Tool screenshot4
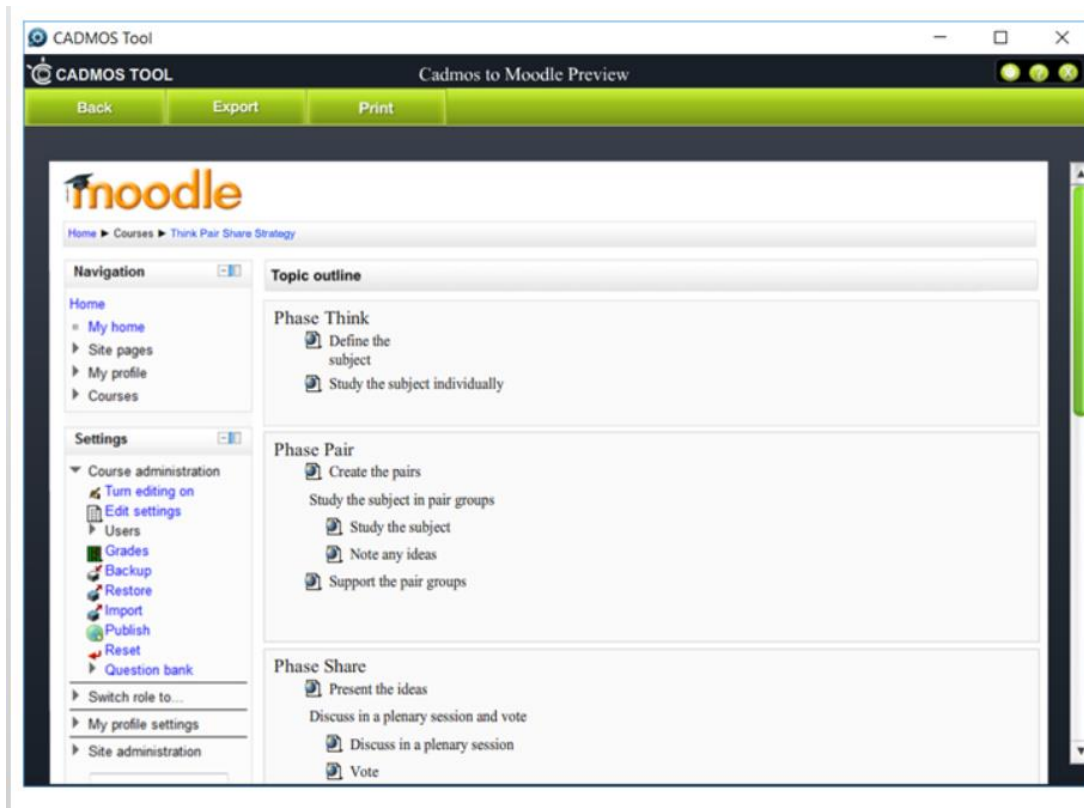
Figure 8. Learning Design Flow Model

Figure 9. CADMOS to Moodle Preview

What is needed to better design lesson plans with LAMS and CADMOS

Designing lesson plans with LAMS (Learning Activity Management System) and CADMOS involves creating engaging and interactive learning experiences for students. LAMS is a platform that allows educators to sequence learning activities and manage the flow of content, while CADMOS is a conceptual framework for designing learning designs within LAMS. Here's a guide to help you learn how to design lesson plans using these tools:

1. Understand LAMS and CADMOS: (i) Familiarize yourself with the features and capabilities of LAMS, (ii) Understand the CADMOS framework and its components, including roles, entities, activities, and tools.
2. Identify Learning Objectives: Clearly define the learning objectives you want to achieve with the lesson plan. These objectives will guide the selection of activities and tools within LAMS.
3. Determine the Pedagogical Approach: Choose a pedagogical approach that aligns with the learning objectives. Consider whether a collaborative, constructivist, or other approach is most suitable.
4. Plan Learning Activities: (i) Break down the lesson into smaller activities. These can include discussions, quizzes, and group projects among others, (ii) Choose appropriate tools within LAMS for each activity. LAMS offers a variety of tools like forums, quizzes, chat, and more.
5. Sequence Activities: (i) Arrange activities in a logical sequence to facilitate learning progression, (ii) Consider the flow of content and how each activity builds upon the previous one.
6. Consider Interaction and Collaboration: (i) Leverage LAMS tools to promote interaction and collaboration among students, (ii) Utilize discussion forums, group activities, and collaborative tools to enhance engagement.
7. Incorporate Assessment: (i) Integrate formative and summative assessments into the lesson plan, (ii) Use LAMS tools for quizzes, assignments, and other assessment activities.
8. Provide Resources: (i) Include relevant resources such as readings, videos, or external links, (ii) Use LAMS to embed multimedia content and provide access to external resources.
9. Consider Differentiation: (i) Cater to diverse learning styles and abilities, (ii) Use LAMS to provide alternative paths or activities for students with different needs.
10. Test and Review: (i) Test the lesson plan within LAMS to ensure functionality and flow, (ii) Gather feedback from colleagues or students and make necessary adjustments.
11. Implementation: (i) Implement the lesson plan in the actual teaching environment using LAMS, (ii) Monitor student progress and engagement during the lesson.
12. Reflect and Iterate: (i) After the lesson, reflect on what worked well and what could be improved, (ii) Iterate on the lesson plan based on feedback and experience.
13. Explore the various tools and features within LAMS to maximize its potential.
14. Stay updated on LAMS and CADMOS developments and community resources.
15. Collaborate with other educators using LAMS to share insights and best practices.
16. Collaborative Learning: Leverage LAMS to encourage collaboration among students. Use tools like discussion forums, group activities, and collaborative documents.
17. Assessment and Feedback: Integrate formative and summative assessments into the lesson plan. Use LAMS tools for quizzes, assignments, and peer reviews.
18. Adaptability: Design lessons that are adaptable to various learning paces and styles. LAMS allows for flexibility in how students progress through activities.
19. Resource Integration: Embed relevant resources within LAMS, including readings, articles, and external links. This helps provide additional context and depth to the learning experience.
20. Monitoring and Analytics: Use LAMS monitoring features to track student progress. Analyze data

to understand participation levels and identify areas for improvement. Monitoring student progress in LAMS involves leveraging its features to gather data, assess engagement [25], and identify areas where students may need additional support. Here are steps to effectively monitor student progress using LAMS: (i) Familiarize with the monitoring features available in LAMS. This may include tracking student logins, participation in discussions, completion of activities, and quiz performance. (ii) Analyze individual student activity logs to understand their interactions with the learning materials and participation in collaborative activities. (iii) Monitor the completion rates of different activities. Identify any patterns or trends that may indicate challenges in understanding or engagement. (iv) Utilize LAMS tools for quizzes and assessments to gauge student understanding. Analyze the results to identify topics where students may need additional support. (v) Explore any analytics or reporting features within LAMS. These tools can provide insights into overall class progress and individual student performance. (vi) Assess the level of student participation in discussions, group activities, and other collaborative tasks.[26,27] Low participation may indicate areas for improvement or the need for additional motivation. (vii) Use LAMS to provide timely feedback on assessments, forum discussions, and other activities. Constructive feedback can guide students toward improvement. (viii) Identify students who may be struggling or disengaged. Intervene promptly by offering additional resources, personalized support, or encouraging communication. (ix) Incorporate opportunities for students to reflect on their own progress. Self-assessment activities can help them identify areas where they feel confident and areas that require further attention. (x) Based on the data gathered, be prepared to adjust instructional strategies. Tailor support to address specific learning needs or challenges that students may be facing. (xi) Use LAMS communication tools to foster a dialogue with students. Regularly check in on their progress, address concerns, and encourage them to seek assistance when needed. (xii) Continuously refine a monitoring approach based on ongoing feedback and the evolving needs of the students. Consider using feedback from monitoring to enhance future lesson plans. By actively monitoring student progress in LAMS, it is possible to gain valuable insights into the effectiveness of the instructional design and provide targeted support to help students succeed in their learning journey.

21. Interactive Discussions: Foster meaningful online discussions using LAMS forums. Encourage students to share ideas, ask questions, and engage with each other.
22. Reflection and Iteration: Incorporate reflection points in the lesson plan. Encourage students to reflect on what they have learned. Similarly, reflect on the effectiveness of the lesson plan and iterate for future improvements.

The key is to leverage the capabilities of LAMS to create a dynamic and engaging learning environment. Regularly gather feedback from students and be open to adjusting learning approaches based on their experiences and needs. While CADMOS may not be directly applicable to designing lesson plans in LAMS, a thoughtful and pedagogically sound approach using LAMS tools will contribute to a positive learning experience for students. By thoughtfully applying these principles within the LAMS platform, we can create a positive and effective learning experience for the students, promoting engagement and achievement of learning objectives.

CONCLUSION

The rapid development of digital technology in today's times can enrich distance learning in a variety of ways. The use of digital technology in education focuses on teaching new concepts and ideas, courses and in particular its use by the learners through web-based applications. Learners can, through these applications, be transformed from passive receivers into constructors of their own knowledge through

their participation to collaborative learning teams. Courses are available to all people who have a computer and an internet connection, without the need for a specially organized training area. Teaching is effective when it comes to different ways of presenting the educational material, such as: multimedia (image, video, audio), performances, speech, interactive collaboration. Learning take place in online learning environments and access to knowledge is provided in numerous ways such as modern teaching, communication with the instructor and with the other learners. Segmentation of both presentation and content is being offered, offering possibilities for reuse and creating a common basis with many themes.

Future Scope

This paper tried to contribute to a better understanding of learning design with emphasis on Visual Instructional Design Languages and Learning Design Tools (COMPENDIUM, MOT+, COLLAGE, LAMS). In addition, special emphasis was given on the learning design of lesson plans with the LAMS and CADMOS. Future research will focus more on investigating this continuously evolving research area of learning design.

The primary goal is to enhance the understanding of learning design, emphasizing the role of Visual Instructional Design Languages and various Learning Design Tools. The paper mentions several Learning Design Tools, including COMPENDIUM, MOT+, COLLAGE, LAMS, and CADMOS. Each tool likely plays a role in facilitating the design and implementation of instructional materials. Special attention is given to the learning design aspects of lesson plans using LAMS and CADMOS. This indicates a focus on exploring how these specific tools contribute to the creation of effective lesson plans.

The paper recognizes that the field of learning design is continuously evolving. This implies that there is ongoing research and development in this area, and the paper contributes to this evolving body of knowledge. The paper suggests that future research will delve deeper into the continuously evolving field of learning design. This could include exploring emerging technologies, pedagogical approaches, or improvements to existing design tools.

In summary, the paper aims to contribute to the understanding of learning design, specifically emphasizing Visual Instructional Design Languages and Learning Design Tools like COMPENDIUM, MOT+, COLLAGE, LAMS, and CADMOS. The focus on LAMS and CADMOS suggests a detailed exploration of these tools for designing lesson plans. The acknowledgment of the continuous evolution of the field hints at the dynamic nature of research in learning design.

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