

## Original Article

# Educational multimedia technology for hybrid courses in SENAI Paraná

*Desenvolvimento de mídias para cursos híbridos de nível técnico no SENAI Paraná*

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## Abstract

This article presents a brief experience report discussing the media and applications of SENAI PR teaching methodology, adapted to contents for technical secondary courses, in hybrid courses or 100% distance learning. It is detailed the media possibilities to the classes developing processes, which implementation showed that it is important to identify the target audience, as well as to adjust the content for a valuable and accessible training.

**Keywords:** Technical training. Metaverse. Comics. Hybrid education.

## Resumo

Este artigo apresenta um breve relato de experiência sobre as mídias e aplicações da metodologia de ensino do SENAI PR, adaptadas aos conteúdos para os cursos técnicos de nível médio, em cursos híbridos ou

DOI: <http://dx.doi.org/10.17143/rbaad.v23iEspecial.714>

100% a distância. Nesse sentido, detalham-se as possibilidades de mídias para serem utilizadas nos processos de desenvolvimento das aulas, cuja implementação revelou a importância de identificar o público-alvo, no caso, alunos do Ensino Médio, bem como de adaptar os conteúdos, para que a formação seja valorosa e acessível.

**Palavras-chave:** Formação técnica. Metaverso. HQs. Educação híbrida.

## 1. Introduction

Although historically the industrial sector has been served by in-person courses, the current market demands a faster and more objective form of education, implying that companies must continuously improve their processes and further qualify their employees in order to gain a strategic advantage over their competitors.

Technological changes, both in the support and utilization of educational platforms, as well as within the industrial sector, are fostering new models of specialized courses aimed at meeting the demands for professional development and expanding the sector's technological context updates. In this sense, it is necessary to understand the moment and develop courses aligned with the students' profiles, creating media for quick courses, especially in hybrid or fully online formats, with a methodology that engages and adds value to those seeking initial training or even an update.

## 2. SENAI Vocational Education Methodology

SENAI Paraná is an institution committed to meeting the demands of industries by providing education through innovative educational processes, adopting best practices based on competencies. To achieve this, it employs the SENAI Methodology of Professional Education, which aims to plan and develop effective pedagogical practices in line with current and future demands of the world of work and education.

According to SENAI (2019), the competency-based methodology is grounded in various authors from the educational field, such as Vygotsky, Piaget, Ausubel, Perrenoud, Feuerstein, and Moran, who support the planning and development of pedagogical practice, assisting in teaching and learning processes. In this perspective, Sánchez (2020) asserts that competency-based learning connects different areas of knowledge and, instead of focusing solely on theory, seeks to combine knowledge, resources, attitudes, values, stimuli, and skills. He states:

The job market requires individuals who are not only well-qualified in theory and content, but also responsible, capable of making decisions, leading, and managing their relationships. Competency-based education in professional education is precisely capable of developing these abilities (Sánchez, 2020).

In this context, educators should consider technological tools as means that facilitate teaching and learning processes, which supports Masetto's (2013) view. According to him, the strategic use of technologies, aligned with educational challenges, aids in mediation promotion and the development of meaningful learning.

The SENAI Methodology of Professional Education employs various learning situations in its courses, which "[...] constitute a set of actions that, pedagogically planned, foster meaningful learning through the use of challenging learning strategies and different teaching strategies" (SENAI, 2019, p. 113), across different teaching modalities - face-to-face, hybrid, and distance.

### 3. The user experience

Understanding the end user is a crucial part of the process to develop learning situations that bring value and to design the necessary media for the main objective, which is effective learning. Through UX research - focused on user experience - we seek to understand their pains, expectations, and experiences in order to maximize our productions,

thereby meeting their real needs. According to Grant (2019, p. 13), this requires "[...] empathy to understand the needs, goals, and frustrations of your users. It requires objectivity to look at your product from a new perspective, detect flaws, and correct them. The rest can be learned."

For the research process, we employ UX design tools to define the needs of both students and the business, based on scenario analysis, guided by the design thinking methodology. This methodology emphasizes user experience, executing six phases to gather the necessary information for structuring an educational product with value and delivering it to the correct user profile, namely (Grant, 2019):

- a. Empathy: Understanding the needs and pains of users.
- b. Definition: Identifying the problem and challenges that need to be solved.
- c. Ideation: Generating ideas through design techniques.
- d. Prototyping: Ideas begin to take shape, and small prototypes are implemented for validation and necessary adjustments.
- e. Testing: Prototypes are tested with end users.
- f. Implementation: Bringing the proposed solutions to market.

For the development of media, we applied the six stages, beginning with qualitative research with students and the community to define pain points and opportunities. Based on the results, we established personas and constructed an empathy map, determining the student profile considering their reality and aspirations within the scope of Distance Education (DE).

The user journey in the Virtual Learning Environment (VLE) was also analyzed, enabling alignment with student satisfaction surveys to define the new learning journey and the most suitable media for enhancing the user experience.

With all the compiled data, we sought new ways to meet the needs for rapid, quality education across different modalities, making it possible to utilize various media types to achieve greater accuracy in addressing each need and audience.

## 4. Media production

A distinguishing feature in content production at SENAI PR is the presence of a technical team that develops materials and also engages in tutoring. Thus, continuous improvement becomes a premise, as the entire production and development core operates within the same physical environment.

This close collaboration with content creators significantly enhances the production of new media, giving them an active voice in the creation process and providing the team with a better understanding of the subject matter. Additionally, we leverage the creativity of teachers, who bring extensive experience both in the classroom and with the SENAI Methodology.

In disciplines covering more complex topics in technical courses, tailored content adaptation is carried out based on the user's/target audience's profile. Additionally, the definition of media to be used (and how it will be done) takes place within the working group, considering a wide range of possibilities, including:

- a. TikTok-style videos
- b. Standard videos
- c. 2D and 3D animations
- d. Metaverse (virtual reality meetings - VR - and presentations)
- e. VR
- f. SCORM
- g. Comic Books (HQ)
- h. Infographics
- i. Technical flows and diagrams
- j. Podcasts
- k. Audio recordings
- l. Illustrations.

Utilizing the diverse range of resources available on the internet and platforms for technologies means motivating and providing flexibility with educational material. Transforming the features of applications into

educational materials is an innovation and an opportunity to cater to the individualities of students (BARROS, 2014, p. 42).

Through the diversity of media, we aim to accommodate the profile of the end user, aligning their expectations with the competencies and skills that will be developed throughout the courses, whether short or long-term. Collaborative work among content production teams, tutors, teachers, educational designers, and graphic designers enriches and diversifies the ways media are used, prioritizing student immersion. We understand immersion as:

...the key to any understanding of media development - even if the concept seems somewhat opaque and contradictory. [...] It is always characterized by the decreasing critical distance from what is being displayed and the increasing emotional engagement with what is happening (GRAU, 2007, p. 30).

Regarding aesthetics, we craft a unique identity for the material, coupled with content writing based on competencies and skills aimed at the comprehensive development of the student. Another crucial factor for the success of hybrid technical level courses relates to cohesion, as syllabi, course plans, and student guides are developed by the same team.

Overall, through alignment between user profile and potential media, material content is developed and presented in a way that, with the use of the VLE, the student acquires all necessary knowledge, complemented by in-person sessions where practical activities occur, along with interaction with peers and professors, problem-based learning (PBL), as well as research and engagement with various companies and start-ups.

#### 4.1. Available media

Below, we present some proposals for the use of media in the development of pedagogical content for distance learning courses.

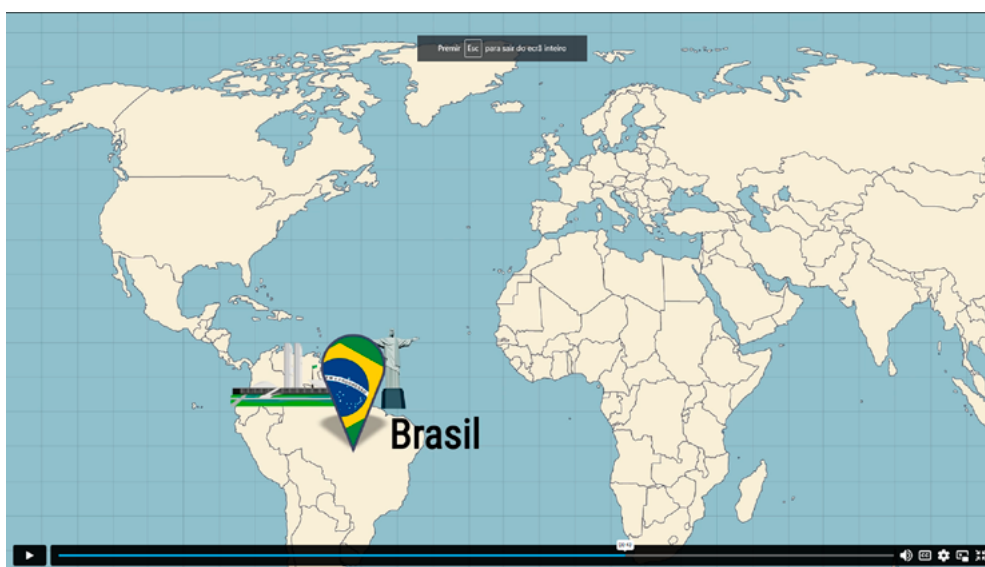
### 4.1.1. Animations

Animations, whether in 2D or 3D, are employed with the aim of transforming static content into dynamic learning objects that are more easily comprehensible for students. In their creation, we consider, throughout the process, in addition to the necessary time and tools, the appropriateness of language and the educational value it will bring to learning.

The script is developed by an educational designer, grounded in the content written by the instructor and in research, and is validated by the subject-matter expert. As for the graphic development, a briefing is conducted, serving as a guide for aligning profile and expectations, as well as language and colors.

2D animations, crafted in a two-dimensional space (that is, with height and width), are utilized to demonstrate content that does not require a high level of interaction with the proposed theme (Figure 1).

**Figure 1 - Example of 2D Animation**



Source: The authors, 2023.

In 3D animation, in addition to width and height, we have depth, which allows us to reproduce situations that would be very complex in reality. For instance, visualizing the internal elements of a functioning



engine, using augmented reality to view an object with all its details, creating worlds in VR, photorealistic images of historical events, and so forth.

For its creation, we employ modeling software to construct objects and spaces, and finally render them for the desired media. Another tool utilized is the 3D scanner, which creates a faithful visualization of a study object, enabling an in-depth understanding of every detail of its production. The 3D scanner can also be employed for reverse engineering, constructing objects exactly as they are.

#### 4.1.2. Metaverse

The metaverse is a virtual world where we can replicate a classroom or other environments, enabling interaction between faculty and students. With this technology, for example, we can hold lectures, "take" students on a visit to another planet, or transport them to Ancient Rome. Additionally, the metaverse allows interaction and participation of those who are in the same place within this virtual universe.

Research on the possibilities and applications in the field of education is ongoing; although the combination of virtual and in-person classes is gaining traction, this type of teaching is much more than that. With this approach, it is possible to provide more comprehensive, dynamic, and personalized instruction, capturing students' attention and engaging them in inquiry, as they cease to be mere consumers of knowledge and become its producers.

We utilize the free platform Spatial.io for hosting, complemented by the Unity graphics engine, also free, which facilitates assembly and optimization of resources, and the free software Blender, for modeling artistic elements.

Several initiatives have already been undertaken in schools to engage with the teaching proposal, such as lectures and special classes (Figures 2 and 3).



**Figure 2 - Content Gallery in the Metaverse**



Source: The authors, 2023.

**Figure 3 - Modeled Classroom for Inaugural Class**



Source: The authors, 2023.

Like many institutions, SENAI PR, through its education team, has been seeking ways to utilize the metaverse with the aim of fostering hybridization, enabling learning to occur in different forms and spaces, promoting the exchange of ideas, communication, and engagement.

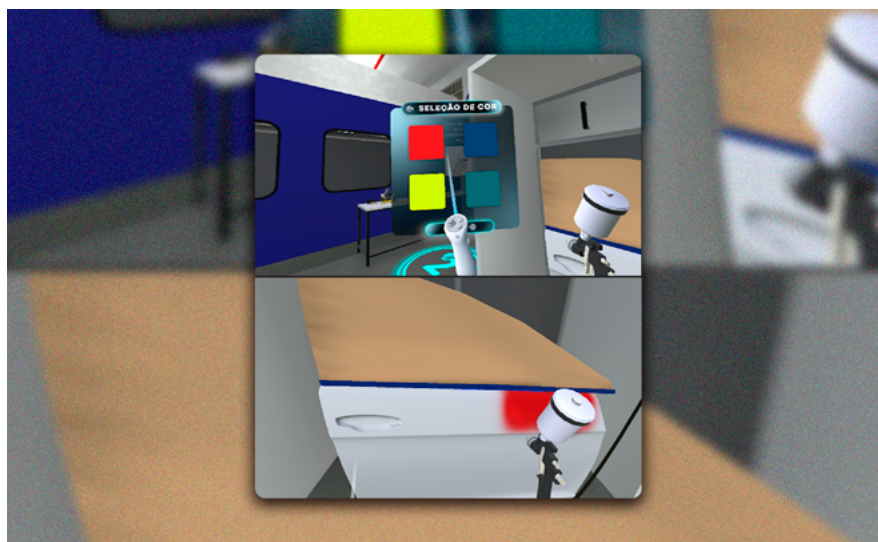
#### 4.1.3. Virtual reality

We understand VR as the use of technologies aimed at developing virtual environments capable of transporting the user to places that may or may not exist in the real world.

At SENAI PR, studies are being conducted on the use of Meta Quest 2 glasses in technical courses, in order to prepare students for practical classes, enabling familiarity with the environment in which they are immersed, as well as reducing inputs and preparation time for a practical class.

For the development of tools, such as the automotive paint gun (Figure 4), mechanics and proper use are aligned with the technical instructor responsible for the Automotive Painting course, in order to bring fidelity to this "virtual world". Additionally, we rely on 3D artists responsible for developing these materials as close to reality as possible.

**Figure 4 - Automotive Paint Gun Produced in VR**



Source: The authors, 2023.

#### 4.1.4. Comics

As one of the proposals to rethink the structure of dense content in technical areas across various levels of education, we have developed comics (or graphic novels), where adaptation aims for greater interaction of students with the content, as well as a more playful focus for understanding complex subjects.

The specific construction of comics facilitates differentiated interaction, combining words and illustrations in a dynamic that aims to communicate from simpler to



beyond the code to ensure that the user's perception is adequate and that sensory barriers do not interfere with how the user consumes the content of the page. Design should consider the user experience and their perceptions of form, colors, and the positioning of elements on a page (Ferraz, 2020, p. 69).

The tools used during classes - and even the way content is made available - adhere to the Web Content Accessibility Guidelines (WCAG), aligning with various formats so that, in addition to being accessible, materials promote inclusion through elements such as avatars, case studies, problems, etc.

In broad terms, we strive to meet the following parameters to achieve accessibility.

1. Colors: Attention to color contrast for readability.
2. Language: Inclusive, comfortable, and understandable for all, avoiding jargon, and providing translations when necessary.
3. Formatting: Text alignment to the left, considering the needs of dyslexic students.
4. Content: Responsive to all devices and accessibility tools.
5. Videos: Inclusion of audio and captions.

In the case of SCORM, for example, we use Rise 360, a tool from Articulate that is responsive and follows the WCAG in a simple and organic way, as all necessary accessibility information is embedded in the platform. Despite some limitations, which are not the focus of this study, Rise 360 meets the demands well and enables quick construction of digital books without losing interactivity.

## 5. Conclusion

In this article, we briefly present an experience report involving the possibilities of media for hybrid and online classes, adapted to the content of technical courses at the high school level at SENAI PR. In this regard, we aim to demonstrate the importance of understanding the

target audience, in this case, students of the New High School, and of a consolidated educational model for the development of objective and understandable content. Another highlighted factor was the differential production of intellectual content by the teachers who accompany the students during in-person moments, ensuring continuous improvement and adaptation of language and references.

We emphasize the need to further enhance and develop resources for VR glasses and augmented reality, for example, to bring students closer to the reality of the industry. Furthermore, we recommend studying solutions such as 360° mapping of laboratories and the use of simulators integrated into technical education.

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