Representing Curriculum Design Practices in ESSENTIA CURRICULUM: A Case Study at the University of Nariño, Colombia

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Abstract

In examining curriculum design theory over the past century, we analysed how design methods are defined. Despite established theoretical methods, a global survey of 226 professors revealed a reliance on subjective crieria for designing curricula. Professors expressed a need for better documentation, leading to limited information on their design processes for others to learn from. Furthermore, varied terminology and graphical forms make curriculum designs complex to communicate and understand. To address this, we proposed *ESSENTIA CURRICULUM*, a representation of curriculum design practices. This system is based on a common language developed by integrating a century of curriculum theory with the experiences of 226 professors worldwide. *ESSENTIA CURRICULUM* is a simple, flexible language applicable in various contexts. It has been successfully implemented in representing design practices in the Systems Engineering Programme, yielding satisfactory results. This approach provides a foundation for future artificial intelligence developments in curriculum design.

Keywords: Curriculum, Design, Practice, Language

Introduction

A literature review was conducted to compile a century's data, explicitly focusing on curriculum design theory. Literature exploration sheds light on the evolution and transformation of various curriculum design methods. Most notably, the definitions and concepts associated with these methods have witnessed significant shifts aligned with historical moments in each context, reflecting the changing dynamics of educational landscapes and the ever-evolving needs of learners.

However, despite the academic world being equipped with some theory-based curriculum design methods, practical implementation often tells a different story. A survey involving 226 professors worldwide highlighted a striking deviation from these theoretical frameworks, revealing that many educators rely heavily on subjective criteria when crafting curriculum designs. While reflecting individual expertise and experiences, such personal biases and inclinations may not always align with widely accepted methods. This disparity highlights the need to bridge the theoretical knowledge gap and its real-world implementation.

The insights gleaned from the professors' survey describe a concerning picture of the current state of curriculum design documentation. A recurring sentiment expressed by these educators is the palpable absence of documentation detailing curriculum design processes, which not only hampers the preservation of pivotal steps and decisions but also deprives future educators of potential reference material. Further compounding the issue is the proliferation of diverse terminologies and myriad representations in curriculum designs. While reflecting the richness of individual approaches, this diversity inadvertently introduces significant heterogeneity, resulting in a marked impediment to clear communication and understanding within academic circles, posing challenges in adopting and adapting these curriculum designs.

In response to the challenges presented by the diverse and often fragmented approaches to curriculum design, we introduce *ESSENTIA CURRICULUM*. This language emerged from linguistic analysis, grounded in a linguistic corpus created from a century's worth of curriculum design theory. By integrating the collective experiences and insights of 226 professors worldwide, *ESSENTIA CURRICULUM* captures the essence of shared practices and commonalities in curriculum design. Beyond its foundational strengths, what sets it apart is its user-friendly nature, making it understandable and versatile. Its adaptability is focused on fitting into diverse educational landscapes, serving as a common language that bridges gaps and facilitates coherent communication in curriculum design endeavours.

To substantiate the functionality of *ESSENTIA CURRICULUM*, we conducted a practical validation within a real-world academic setting. The chosen scenario for this exercise was the Systems Engineering Programme at the University of Nariño in southern Colombia. Throughout the course, the language was actively employed as a curriculum design and representation tool, receiving a primarily positive response, with participants expressing their appreciation for the clarity and adaptability of *ESSENTIA CURRICULUM*. Beyond the immediate benefits observed, this validation paves the way for further exploration and potential advancements, positioning *ESSENTIA CURRICULUM* as a promising asset in educational design if it can be supported by generative artificial intelligence in future iterations.

This article is divided into six sections. The second section presents a literature review of a century's worth of curriculum design theory and describes some preliminary findings in experiences related to curriculum design. The third section describes the methodology used in the research. The fourth section depicts the proposed solution by constructing a linguistic corpus based on the theory and the responses from a worldwide survey. These serve as the foundation for the *ESSENTIA CURRICULUM* language. The fifth section describes the validation of *ESSENTIA CURRICULUM* in an academic scenario, providing an overview of the results. The sixth section presents a discussion on validating the proposal. Finally, the last section presents the research conclusion and mentions the scope for future studies.

Literature Review

In the early 20th century, curriculum design saw significant shifts influenced by progressive educational movements. Kilpatrick's project method 1918 introduced experiential learning, emphasising the role of students' interests and activities in education. Contributions from Bobbitt in 1924 and Charters in 1929 focused on systematic curriculum construction, aligning educational objectives with societal needs. Rugg, in 1930, further examined the curriculum's role in reflecting and shaping social dynamics, while Caswell and Campbell 1935 emphasised the potential for social transformation by introducing a curriculum design focused on actual needs.

Post-World War II, curriculum theory witnessed diverse developments. Tyler's Basic Principles of Curriculum and Instruction (1949) provided a foundational structure for curriculum development, emphasising clear objectives and systematic evaluation. Hilda Taba (1962) is globally recognised for her contribution to establishing a clear relationship between theory and practice in curriculum design. Smith *et al.* (1957) linked the nature of the curriculum to prevailing thoughts within specific contexts. Kerr (1968) focused on strategies to overcome challenges in designing curricula for contexts. Nicholls and Nicholls (1972) proposed a practical guide for curriculum design with defined steps and concrete actions. Bruner's The Process of Education (1977) advocated for discovery learning and the spiral curriculum, while Stenhouse (1975) introduced a research-oriented approach emphasising teacher autonomy and iterative refinement. Grayson (1978) suggested a curriculum design method involving problem definition, curriculum structure, and evaluation.

The latter part of the 20th and early 21st centuries witnessed the integration of technical and global perspectives in curriculum design. Isman *et al.* (2005) proposed a new instructional design model reflecting technology's growing influence on education. Walters's PhD thesis (1978) and Perkins's Smart Schools (1998) contributed to the discourse on curriculum design in specific disciplines and the role of intelligence in learning, respectively. Van Den Akker *et al.* (2006) integrated research perspectives into the curriculum design.

In the 21st century, the focus shifted to internationalisation and rapid design models. Clarke *et al.* (2016) and Young and Perovic (2016) discussed transnational curriculum frameworks and fast course design, reflecting the need for adaptable and globally relevant curricula. IBE-UNESCO's work in 2017 emphasised the global need for inclusive and sustainable educational practices.

Curriculum design theories have continued to evolve in recent years, emphasising understanding and design. Wiggins and McTighe's Understanding by Design (1999) introduced a backward design model, prioritising learning outcomes. Ornstein and Hunkins

(2018) offered a comprehensive overview of foundational principles and contemporary issues in curriculum, highlighting the dynamic and evolving nature of the field.

Problem Statement and Research Methodology

Surveys are a pivotal research method employed in various academic and professional fields, offering a systematic approach to collecting data from a specific population. They can be conducted via questionnaires or interviews and are highly valued for their versatility, efficiency, and ability to gather large volumes of data. According to Babbie (2016), surveys are particularly effective in descriptive, explanatory, and exploratory research. Additionally, as highlighted by Creswell and Creswell (2017), they can be tailored to qualitative and quantitative research paradigms, making them adaptable to diverse research questions. However, as Dillman *et al.* (2014) cautioned, the validity and reliability of survey data hinge on well-crafted questions and representative sampling, underscoring the importance of meticulous survey design, as Fowler (2013) emphasised, to ensure accurate and generalisable findings.

In an ambitious effort to gather insights from leading academic minds in curriculum design, we utilised the 2019 Academic Ranking of World Universities (ARWU) by Shanghai Jiao Tong University as a starting point, meticulously sifting through this prestigious list, focusing on the top one thousand universities globally (ARWU, 2019). Our extensive research identified a pool of professors renowned for their expertise in curriculum design. We issued a 'Call for Action,' inviting them to contribute their valuable perspectives through a survey. This was met with a response, underscoring the selectivity and commitment required for such a task. Two hundred twenty-six professors worldwide agreed to participate. Figure 1 details the demographic data of these participants, providing a snapshot of the professors that shaped our survey's findings.

Country	Count		Country	Count
Australia	8		Netherlands	6
Austria	2		New Zealand	4
Belgium	2		Nigeria	1
Brazil	8		Norway	1
Canada	20		Portugal	4
Chile	3		Republic of Ireland	2
China	6		Republic of Korea	1
Cyprus	1		Russia	2
Czech Republic	1		Saudi Arabia	2
Denmark	1		Serbia	2
Estonia	1		Singapore	3
Finland	3		South Africa	1
France	6		Spain	16
Germany	17		Sweden	8
Greece	5		Switzerland	4
Hungary	2		Taiwan	2
India	5		Thailand	1
Iran	4		Tunis	2
Israel	1		Turkey	3
Italy	3		United Arab	1
Japan	2		United Kingdom	18
Malaysia	2		U.S.A.	39

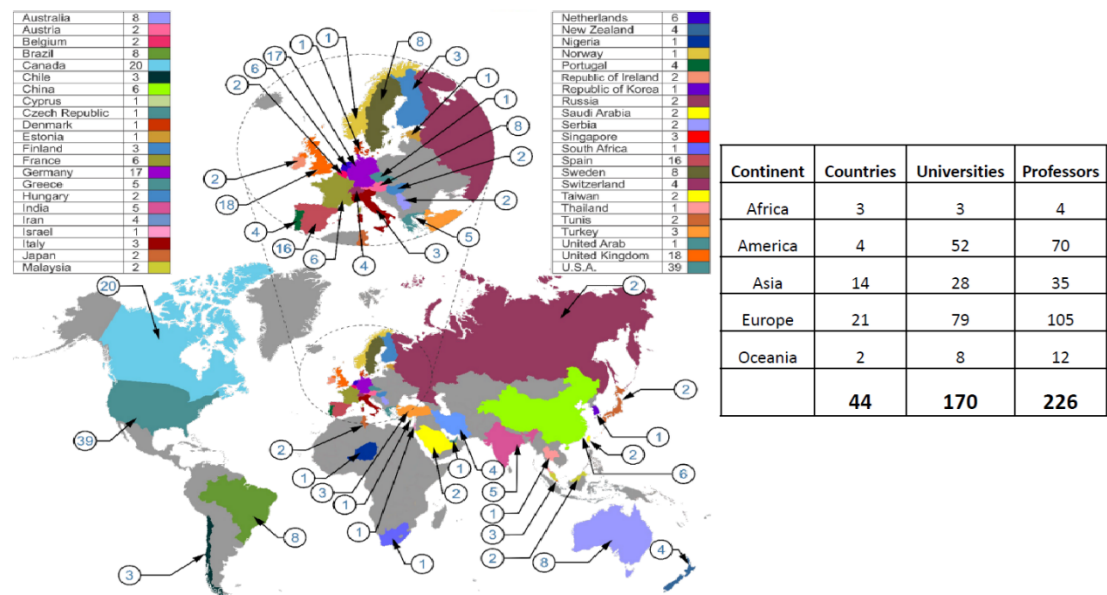| Continent	Countries	Universities	Professors
Africa	3	3	4
America	4	52	70
Asia	14	28	35
Europe	21	79	105
Oceania	2	8	12
	44	170	226

Figure 1: Professors worldwide participation.

Creating a linguistic corpus from the responses of 226 professors, in conjunction with a comprehensive literature review spanning a century in curriculum design, constitutes a crucial step in this research. Such a linguistic corpus, derived from theoretical foundations and survey data, provides a rich dataset for analysing trends, patterns, and evolving

perspectives in curriculum design from theoretical and practical viewpoints. McEnery and Hardie (2012) highlighted that a linguistic corpus offers an invaluable resource for empirical research, allowing for detailed linguistic analysis across diverse contexts. The global scope of the responses ensures a wide-ranging perspective, aligning with the principles outlined by Baker (2006) for corpus representativeness. Additionally, by integrating insights from seminal works in curriculum design, such as those by Pinar (2013) and Tyler (1949), this corpus not only reflects current academic thought but also traces the historical evolution of the field. This dual approach of synthesising contemporary survey data with historical literature offers a unique lens through which to examine the trajectory of curriculum design, as advocated by Cohen *et al.* (2018) in their work on research methods in education.

As part of the intricate process of analysing the qualitative data from our comprehensive literature review on curriculum design theory spanning a century, coupled with the insightful responses from 226 professors worldwide, we employed NVivo Software. NVivo, renowned for its robust qualitative data analysis capabilities, was instrumental in constructing our linguistic corpus, facilitating the systematic categorisation and thematic analysis of the vast textual data. It enabled us to identify key themes, patterns, and nuances in curriculum design perspectives, both from historical literature and the contemporary viewpoints of experienced professors. Using NVivo ensured a methodologically sound and nuanced analysis, allowing us to draw meaningful and contextually rich insights into global curriculum design practices' evolution and current state.

Using 3D representations to visualise the concepts within our linguistic corpus marked a significant methodological advancement in our study. These 3D visualisations revealed the semantic relationships between keywords, offering insights into the intricate interconnections and hierarchical structures within the field of curriculum design. By transforming abstract textual data into tangible, spatial models, these representations facilitated a more intuitive understanding of complex conceptual relationships, as depicted in Figure 2.

Figure 2: Conceptual relationships on the linguistic corpus.

Complementing this approach, we conducted a cluster analysis using NVivo Software. This analysis was crucial in identifying standard codes and themes from the vast corpus, effectively categorising the data into coherent, analysable segments. The constructive collaboration between the 3D conceptual mapping and NVivo's cluster analysis provided a dual lens: one that offered a macroscopic view of overarching themes and another that delved into the microscopic intricacies of semantic linkages. This enriched our understanding of the data and enhanced the clarity and depth of our findings, revealing the nuanced dynamics of curriculum design theory and practice.

Conducting a cluster analysis to examine a linguistic corpus is a pivotal step in computational linguistics, offering profound insights into the semantic structures and commonalities within a body of text. Cluster analysis allows researchers to identify natural groupings of related words and concepts within the corpus based on their usage and context, revealing underlying patterns that may not be apparent through simple observation. This method is essential to discern thematic concentrations and variations in language use across different texts or within a single comprehensive document. According to Manning and Schütze (1999), cluster analysis is a powerful tool for understanding the relationships and hierarchies among words, enabling the construction of more sophisticated language understanding models. Similarly, as Jockers (2014) notes, the technique is invaluable for tracing thematic trends over time in digital humanities. In educational research, cluster analysis can pinpoint prevailing pedagogical themes within curricular documents or academic discourse, as Rehurek and Sojka (2010) highlighted by demonstrating the utility of software such as Gensim. Thus, this analytical approach is integral to advancing our comprehension of linguistic phenomena and enhancing the robustness of curriculum design and other language-sensitive analyses.

Our study's exploration of curriculum design practices included syntax analysis and collocations within computational linguistics, using our comprehensive linguistic corpus as the foundation. Syntax analysis allowed us to meticulously examine the grammatical structures within the corpus, illustrating how language constructs in curriculum design are typically framed and developed. This syntactic scrutiny revealed underlying patterns in articulating curriculum design concepts, offering insights into common practices and prevailing pedagogical philosophies, as discussed in Manning and Schütze's Foundations of Statistical Natural Language Processing (1999). Investigating collocations – frequently co-occurring words or phrases – provided a deeper understanding of the contextual usage of key terminologies in curriculum design.

Collocation analysis is a cornerstone of corpus linguistics, providing significant insights into how words combine in natural language use. By analysing the habitual juxtapositions of words, it unveils the inherent syntactic and semantic patterns that define language structure and meaning. This analytical tool is crucial to understanding language idiosyncrasies, often overlooked by traditional linguistic analysis. McEnery and Hardie (2012) emphasise that collocations are not merely frequent word combinations but are fundamental to constructing meaning in discourse. Sinclair's (1991) pioneering study of collocations revealed their role in shaping the texture and cohesiveness of language. In language teaching, Hill (2000) highlights the importance of collocation analysis in developing learners' proficiency and fluency, allowing them to use natural language that is contextually appropriate. Collocation analysis is also instrumental in computational linguistics for tasks such as machine translation and natural language processing, as it helps capture the subtleties of meaning and the complexity of language use (Manning & Schütze, 1999). The results of such analysis can

significantly inform curriculum design, particularly in language education, by integrating authentic language patterns into learning materials.

By identifying these collocations, as outlined in Sinclair's 'Collocation: A Progress Report' (2004), we discerned the prevalent terms, conceptual associations, and thematic linkages. This combined approach of syntax analysis and collocation examination, facilitated by advanced computational tools, enabled us to decode the linguistic nuances of curriculum design discourse. In doing so, we uncovered common practices and emerging trends in the field; a concept echoed in Jurafsky and Martin's Speech and Language Processing (2009). This methodological fusion enriched our analysis, providing a more elaborate perspective on how curriculum design theories and practices are linguistically constructed and interconnected.

We thus identified 153 practices distributed across 22 curriculum design methods. Additionally, we noted the existence of the following ten items that are universally included in curriculum designs and are considered common in curriculum design theory: Body of Knowledge, Expert/Peer Experience, Prior Knowledge/Interests of Students, Context/Industry/Marketing Needs, Aims/Objectives/Learning Outcomes, Structure/Content, Teaching Strategies/Learning Experiences, Assessment, Resources, and Feedback, as depicted in Figure 3.

Authors of the method	Method structures	Common items in curriculum design theory									
		Background-based approach				Component-based approach					
		1	2	3	4	5	6	7	8	9	10
#1, Kilpatrick (1918)	1. Purposing			x							
	2. Planning			x			x				
	3. Executing			x	x			x			
	4. Interpreting and Judging										x
#2, Bobbitt (1924)	1. Identifying a domain	x			x	x					
	1.1. Finding the experts		x		x						
	1.2. Analyzing the expert behavior		x								
	1.3. Characterizing the student profile and their role			x							
	2. Identifying the activities for such a domain		x		x						
	3. Proposing educational objectives for each activity					x					
	3.1. Objective-based steps					x					
	3.2. Preparing the material									x	
...											
#21, OIE-UNESCO (2017)	1. Evidence-gathering				x						
	2. Preparation					x	x				
	3. Development							x			
	4. Implementation							x		x	
	5. Monitoring and evaluation								x		x
#22, Ornstein & Hunkins (2018)	1. Theoretical foundation	x									
	2. Design					x	x				
	3. Development							x			
	4. Implementation									x	
	5. Evaluation								x		x

Figure 3: Excerpt of the 153 practices found in the analysis.

All these 153 practices are closely related and aim to conceptualise ten major concepts – the everyday items presented above – around which any effort in curriculum design revolves.

These 153 practices distributed among 22 curriculum design methods highlight the need to organise this knowledge to develop a terminological unification to synthesise various

curriculum design considerations. This realisation was the starting point for designing a new proposal called *ESSENTIA CURRICULUM*, which have the symbology depicted in Figure 4 to 7.

ESSENTIA CURRICULUM has three areas of concern. The concept of ALPHA is related to the elements must be present in a curriculum effort; they can be measured, and they have states to be checked. Activity spaces are the concepts to encapsulate any activity related to curriculum design. Competences are the needed skills to develop the activities. Finally work products are the physical documents that are produced in a curriculum design project.
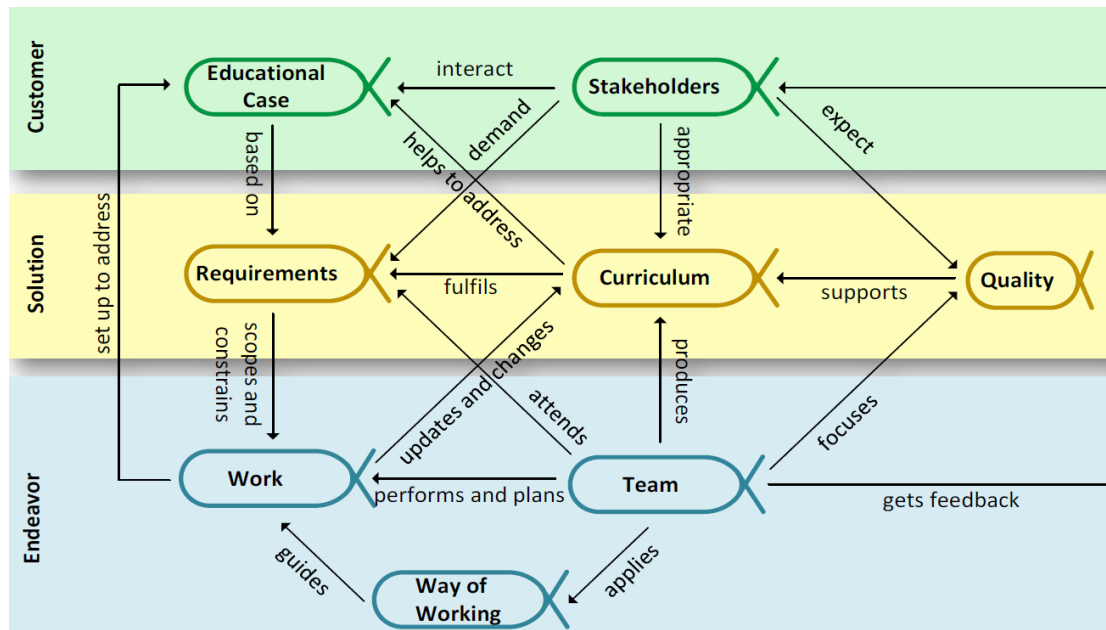
Figure 4: ALPHAs in ESSENTIA CURRICULUM
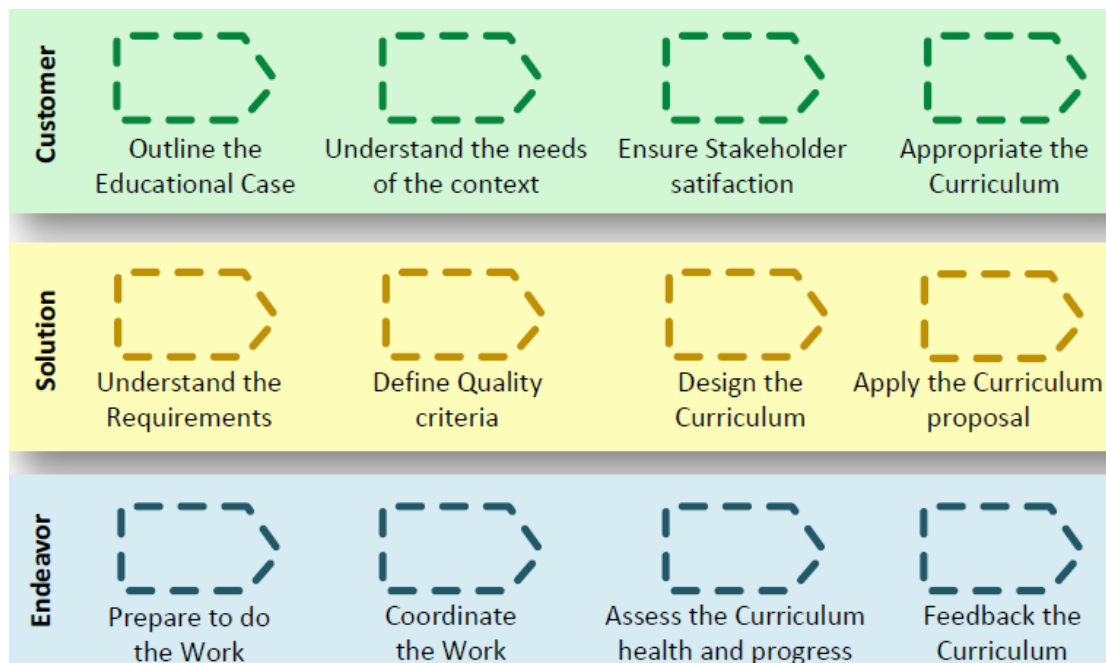
Figure 5: Activity Spaces in ESSENTIA CURRICULUM

Figure 6: Competences in ESSENTIA CURRICULUM
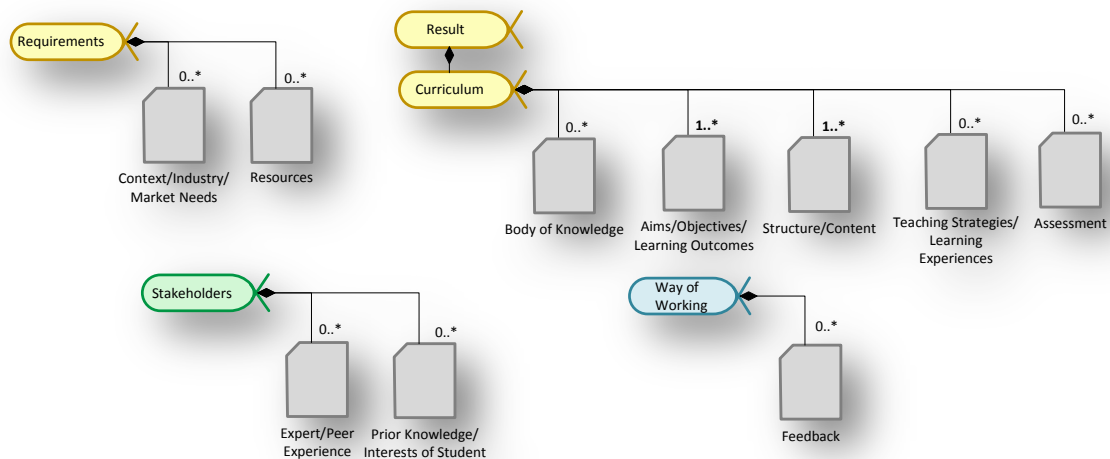
Figure 7: Work Products in ESSENTIA CURRICULUM

Findings and Discussion

In the first semester of 2023, 10 participants of the self-assessment process in the Systems Engineering Programme developed a workshop with *ESSENTIA CURRICULUM*, the participants performed the validation of *ESSENTIA CURRICULUM* based on an institutional document. "Curriculum Processes," in a textbook by Góyes and Uscátegui (2000), has guided curriculum design for over two decades at the University of Nariño. The University, which holds high-quality institutional accreditation, has 11 faculties, 107 academic programmes with qualified registration, and 35 academic programmes with high-quality accreditation. All accredited programmes at the University have followed this textbook's guidelines, which describe how to design a curriculum for the local context. This textbook is an excellent reference and authority on curriculum design with proven results.

Considering the terminological unification developed as an initial step in constructing *ESSENTIA CURRICULUM*, all practices represented in this approach must be well-named and well-formed, as proposed by Barón (2019). Every practice represented in *ESSENTIA CURRICULUM* must be named with an adjective, a nominalised verb, and a noun from the unified glossary. Following the specified order, this practice is called the collaborative construction of the curriculum process. Coloured words have a special meaning based on the *ESSENTIA CURRICULUM* rules. This practice encompasses all the aspects in the textbook that have been an institutional reference for the curricular designs of the high-quality accredited academic programmes of the University of Nariño.

The workshop included the representation of curriculum processes based on *ESSENTIA CURRICULUM* in its content. Some elements were initially identified in the text and reinterpreted. With these essential elements and following the syntax of *ESSENTIA CURRICULUM* as a graphic language, it was possible to represent a practice related to curriculum processes based on the textbook within the development of a collective workshop with the ten participants. At the end of the workshop, the following representations were made, as depicted in Figure 8 and 9.
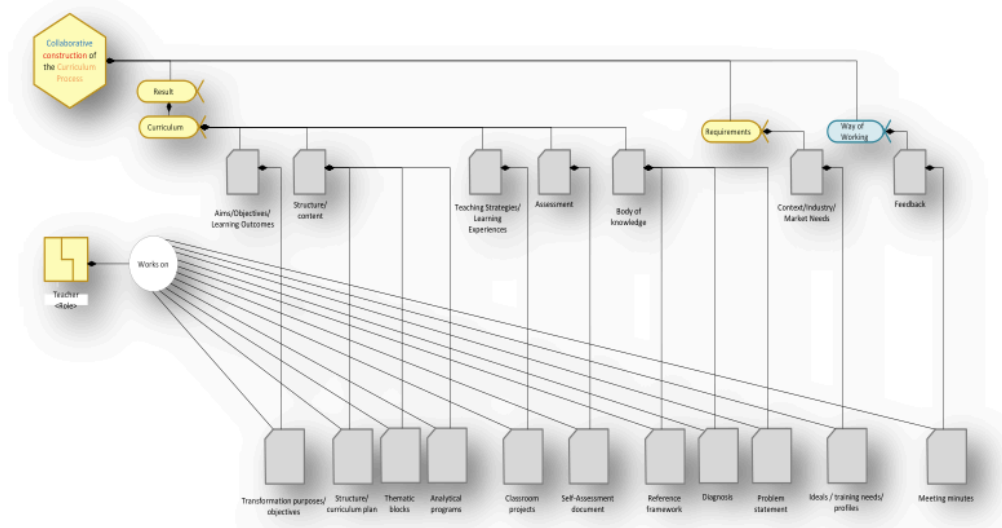
Figure 8: Practice representation in ESSENTIA CURRICULUM (part 1)
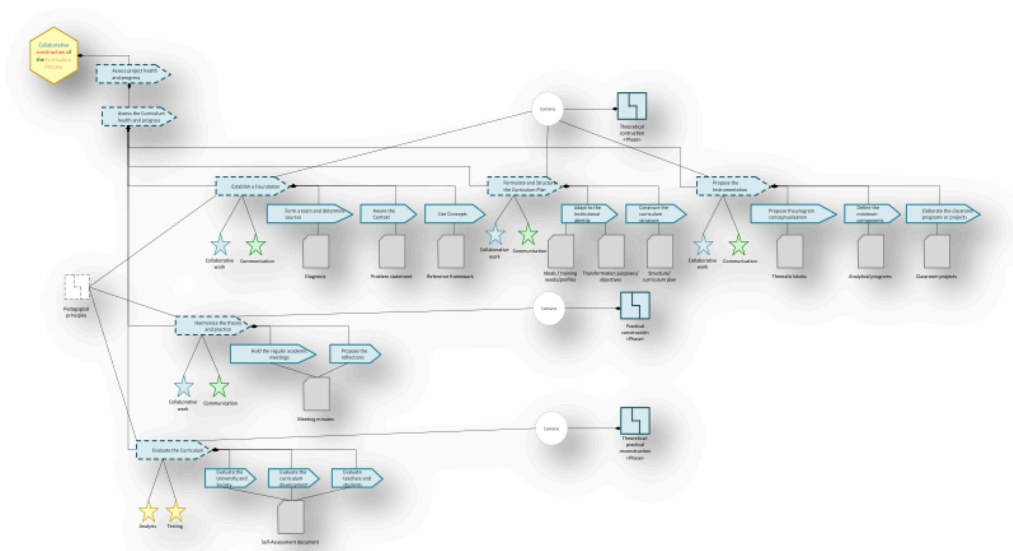
Figure 9: Practice representation in ESSENTIA CURRICULUM (part 2)

As a complement to the experience of *ESSENTIA CURRICULUM* in the academic setting, the participants completed a survey with quantitative and qualitative items, the results of which are depicted in Figures 10 and 11. The experience began with an introductory session on this innovative approach, setting the stage for an in-depth examination of the 'curriculum process' method proposed by Góyes and Uscátegui (2000). This foundational understanding paved the way for an immersive workshop where participants, collaborating in pairs, examined the representation of practices for the method under study.
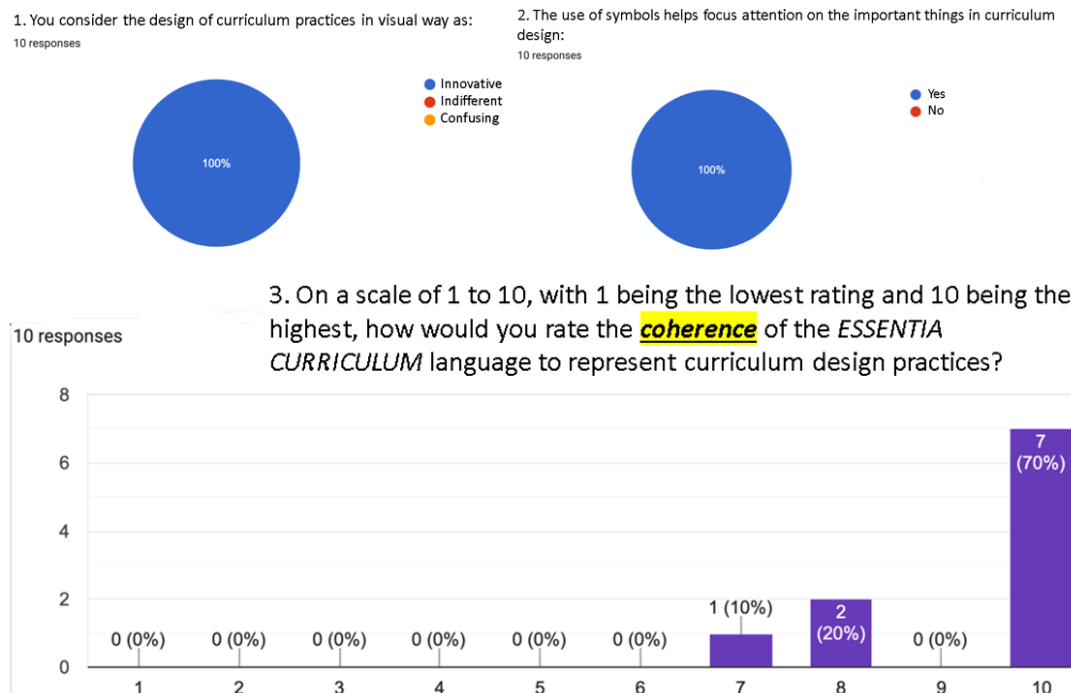
Figure 10: Quantitative results of the experience.

Figure 11: Qualitative results of the experience.

This hands-on workshop was an academic exercise and a collaborative venture that harnessed the cohort's collective intelligence. As the pairs collaborated, they shared insights and feedback, employing the principles of *ESSENTIA CURRICULUM* to navigate the intricacies of the curriculum process method. This culminated in a series of presentations, where each pair contributed to a unified representation of practice. The collaborative, iterative process ensured that the final representation was comprehensive and enriched with the diverse perspectives of all participants.

The benefits of such collaborative activities extend beyond the academic outcomes of any single project, fostering a sense of community and shared purpose among people while encouraging the exchange of ideas, promoting critical thinking, and enabling them to appreciate the value of diverse viewpoints. All these features were achieved using just one graphic language called *ESSENTIA CURRICULUM*. Through collective problem-solving and negotiation, students develop communication and consensus-building skills vital for academic and professional success. Additionally, the group construction of knowledge, facilitated by activities like the *ESSENTIA CURRICULUM* workshop, exemplifies the social constructivist paradigm, where learning is seen as a socially situated activity and knowledge is built through interaction with others.

Finally, incorporating collaborative methodologies in curriculum design enhances the learning experience and mirrors real-world scenarios requiring interdisciplinary teamwork and cooperation. As demonstrated in the Systems Engineering Programme, this approach leads to developing a more robust and versatile curriculum representation and equips students with the interpersonal and cognitive skills necessary for leadership in educational innovation.

Conclusions and Future Directions

Drawing upon a century of curriculum design theories and a global survey of 226 professors, our research underscores a critical gap in the systematic documentation of curriculum design processes. It highlights the challenges posed by diverse terminologies and representation methods. The findings reveal a tendency among educators to rely on subjective criteria, leading to a significant loss of valuable knowledge that could otherwise enrich academia's collective understanding of curriculum development.

The introduction of *ESSENTIA CURRICULUM* represents a transformative step in addressing these challenges. By uncovering a common ground through the synthesis of extensive theoretical insights and the practical experiences of professors worldwide, *ESSENTIA CURRICULUM* emerges as a unifying language that simplifies and enhances the discourse of curriculum design. Its adaptability across various contexts marks a significant advancement in curriculum design practices.

Its validation within the workshop at the University of Nariño, as part of its self-assessment process of the Systems Engineering Programme, is a testament to its utility and effectiveness. The positive outcomes observed therein validate the practical application of *ESSENTIA CURRICULUM* and open avenues for its future enhancement and adaptation. Its potential to facilitate more transparent communication, more efficient design processes, and enhanced pedagogical outcomes is substantial.

As the field of curriculum design continues to evolve, *ESSENTIA CURRICULUM* emerges as a guiding force for future research and development. It is poised to bridge the divide between theory and practice, offering a robust framework that can be tailored to the unique needs of diverse educational landscapes. The implications for academia are profound, promising a new era of streamlined curriculum design processes characterised by greater coherence, improved knowledge sharing, and enriched educational experiences.

ESSENTIA CURRICULUM is more than a tool; it catalyses change. It embodies the collective wisdom of a century's curriculum design expertise while embracing the nuances of contemporary educational challenges. Our research invites educators and curriculum

designers to embrace this new language, fostering a collaborative environment where knowledge is preserved, shared, and used to its fullest potential.

Finally, *ESSENTIA CURRICULUM* is supported by syntax rules and semantic coupling, highlighting its potential use in future developments of some computational tools that allow integrating elements of artificial intelligence for deployment. In this sense, there is the potential to leverage natural language processing to automatically create each work product, such as syllabus, teaching and learning strategies, and learning outcomes.

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