

Essay

# Student-Centered Curriculum Design and Evaluation in Logistics Management

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**Abstract:** *Background:* In this essay, we address an important issue in the logistics education discourse relating to student-centered curriculum design and evaluation. *Methods:* We adopt an integrative approach based on conceptual development and guided by constructive alignment. *Results:* We apply and elaborate our conceptual framework using a case of a teaching plan in logistics management. We also propose an evaluation strategy for our teaching plan in the form of a template. *Conclusions:* Our essay contributes to the logistics education discourse by using learning theories and developing curriculum design and evaluation guidelines that can be replicated by other educators.

**Keywords:** logistics management; constructive alignment; curriculum design; curriculum evaluation

## 1. Introduction

A key responsibility of logistics educators is designing effective and authentic curricula and learning experiences for students [1]. As with any product/service development initiative, there is a chain of tasks and activities involved in the process of curriculum design and evaluation. What can significantly enhance the success of the final product is its alignment with students' educational needs, wants, and desires [1,2]. In essence, a student-centered design can assist the educator in making informed decisions on coordinating and integrating the chain of tasks and activities required for the successful development of logistics subjects. According to Hannafin et al. [3], student-centered learning promotes taking ownership of learning based on self-created learning opportunities and dynamic knowledge reconstruction.

Central to the above narrative is the notion of "constructive alignment", which can be extremely useful for logistics educators to synchronize elements such as intended learning outcomes (ILOs), teaching and learning activities (TLAs), and assessment tasks (ATs) within the curriculum design [4]. Biggs and Tang [5] define ILOs as "... statements, written from the students' perspective, indicating the level of understanding and performance they are expected to achieve as a result of engaging in the teaching and learning experience" (p. 100). As such, ILOs drive the strategic direction of a subject in terms of its TLAs and ATs. It is very important that ILOs are developed with careful attention to ensure that logistics students will obtain the required knowledge and skills after completing a particular unit of study [6].

Despite the growing interest among students and employers in issues related to logistics management, we lack an integrative understanding of what constitutes a student-centered, constructively aligned curriculum design for logistics education [7]. This has the potential to undermine the uptake of authentic learning and teaching despite the increasing industry demand for talent and the prevalence of 21st-century skills. Equally important is that we advance our understanding of how such authentic curriculum design can be practiced and its effectiveness evaluated by education and other stakeholders. This is an important shortcoming, in particular within the emerging literature that focuses on educational developments and, as such, warrants further contributions from the logistics



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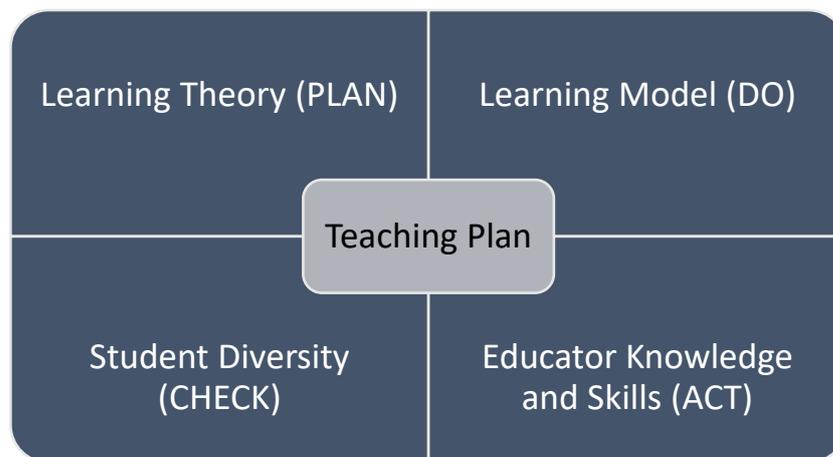
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education community. Such contributions allow for improving teaching and learning practices in logistics management and offer practical educational solutions, especially for junior faculty, to ensure student learning is not only effective but also authentic.

Consequently, the aim of our essay is twofold: first, we develop a conceptual framework employing the plan-do-check-act (PDCA) cycle as one of the widely known continuous improvement models. As such, we build on the literature to integrate learning theory (plan), learning model (do), student diversity (check), and educator knowledge and skills (act) as key factors informing student-centered, constructively aligned curriculum design. We develop and use a teaching plan for an undergraduate subject on logistics management to elaborate our conceptual framework. Second, we develop a template to evaluate the effectiveness of our teaching plan that focuses on key stakeholders, potential uses, methods/sources, criteria, and required resources/skills/timeframe. We also offer suggestions for empirical validation of our proposed template in future research. Our essay makes significant contributions to the logistics education theory and practice by developing curriculum design and evaluation guidelines that can be easily replicated by logistics educators.

## 2. Conceptual Development

Figure 1 illustrates our developed conceptual framework, grounded in a review of the pertinent literature (e.g., [8–14]). We argue that this framework assists in advancing our understanding of the key factors that influence the student-centered design of curriculum and learning experiences. We use this framework to justify development of the logistics management teaching plan followed by a discussion on an evaluation template that can be used to critique the same teaching plan.



**Figure 1.** Conceptual framework.

Our conceptual framework serves at least two interrelated purposes: first, it can explain the rationale for the curriculum design adopted by any educator, and second, it manifests key areas of concern when students are dissatisfied with their learning experience or have faced difficulties achieving the ILOs within a given curriculum design.

Further, the key premise of our conceptual framework can be summarized as follows: when *convergence* and *congruence* manifest across factors such as learning theory, learning model, student diversity, and educator knowledge/skills, the success of teaching and learning design will substantially improve. The latter corroborates the importance of alignment of the teaching plan with the factors shown in Figure 1 to establishing a better student learning experience.

From the quality management perspective, our conceptual framework resembles the plan-do-check-act (PDCA) cycle [15]. Learning theory establishes a broad strategy (Plan) and the learning model provides instructions for operation (Do). These instructions need to be aligned with the student cohort and diversity factors (Check) and eventually delivered

through an educator who has the right knowledge and skillset within the subject matter (Act). A discussion of each component of our conceptual framework (see Figure 1) follows.

### 2.1. Learning Theory

Theories play a pivotal role in explaining, describing, and predicting environmental, organizational, and human behaviors [10,11]. The rigorous, cumulative scientific discourse that underpins theory construction makes it capable of providing an instrumental framework of understanding and a guide for practice [10].

A number of learning theories have been discussed within the literature, such as behaviorism, cognitivism, constructivism, situated learning, connectivism, and complexity. We subscribe to the tenets of *constructivism*, which asserts that individuals create their own meanings through the information given to them, both through their individual assimilation and accommodation of the material [16] and through collaborative dialogue with their peers [17]. The latter can fuel the broad strategy (Plan) of the curriculum designer and, more specifically, his/her decisions in terms of selecting the appropriate learning model, integrating student diversity into the learning environment, and leveraging knowledge and skills to deliver impactful learning.

### 2.2. Learning Model

Learning models provide a systematic account of different curriculum design practices that can be adopted by educators (Do). These learning models are often a mixed reflection of the learning theories and the educators' experiences over the course of their careers. For example, objective models [18] offer a static view of design whereas interaction models [19] perceive design as a context-specific phenomenon with some level of fluidity that follows a temporal path towards its alignment with students' learning requirements. Other learning models, such as the naturalistic model [20], argue that curriculum design should be a function of the collective intelligence, where a consensus-based platform of ideas and shared beliefs can be established to draw overarching goals and pathways for a particular curriculum.

Integrating some of the key premises of the above-noted learning models, the *backward model* [1] offers a broad, student-centered approach to curriculum design. This model is similar to the objective model in that its prime attention is on the key goals, objectives, and learning outcomes (desired results) that students will need to obtain. It basically portrays the destination first and then seeks the most effective route to reach that destination. However, the backward model is also context-specific, as it embraces design emerging from the context in which the curriculum is constructed [2]. That is why, for example, in the backward model the ATs are designed after the determination of ILOs. The development of learning events does not occur until the last stage of backward model implementation.

### 2.3. Student Diversity

Diversity, as its name reflects, is a multidimensional concept. Understanding and appreciating diversity becomes even more complex when viewed in relation to higher-education students, as a number of dynamics, such as prior knowledge, learning conception, studying approaches, and established expectations, are at play [21]. While these types of dynamics are largely beyond institutional control [22], educators have the opportunity to integrate them into their chosen learning model (Check). This has the potential to increase the level of student satisfaction with their curriculum, as they can better relate to the contents.

### 2.4. Educator Knowledge and Skills

Without the right knowledge and skills (both research and teaching), even the best-designed teaching plans, well informed by learning theories and models and well aligned with student diversity, could easily fail. That is why an excellent teaching plan requires an excellent educator with the necessary knowledge, style, and character to enable impactful

teaching and student engagement. Therefore, an extremely important issue that affects the design and delivery of the teaching plan is ensuring that the educator has sufficient background and expertise in teaching the subject area and the capability to lead and manage diverse cohorts of students (Act).

### 3. Elaboration of the Conceptual Framework

We apply and elaborate our conceptual framework (see Figure 1), using the case of a teaching plan for the subject of logistics management, developed and implemented by the authors as part of an undergraduate course in the Bachelor of Supply Chain Management. Our teaching plan is informed by the constructivism theory and backward design model (see Table 1), with careful attention to the requirements of higher-education student cohorts and the relevant knowledge and skills of the educator. In order to identify desired results for the logistics management subject, four questions have been answered to support the implementation of the PDCA cycle. These are further explained in the following sections.

**Table 1.** Teaching Plan Stage 1—Identify desired results.

<b>What are the established goals?</b>
Students will understand the key logistics concepts and analyze the issues affecting the movement of goods, services, and people. They will also be able to articulate the reasoning behind logistics decisions and develop comprehensive logistics plans. Particular emphasis will be placed on freight movements, modal characteristics, logistics policy, pricing and costing, and the changes occurring in the industry in terms of, for example, security, globalization, use of technology, sustainability, and the emergence of third-party logistics firms.
<b>What essential questions will be considered?</b>
<ul style="list-style-type: none"> <li>• What is the role and importance of logistics for effective and efficient logistics and supply chain management?</li> <li>• How does logistics influence business processes and activities? How can logistics impact the national and global economy?</li> <li>• What is the role of legislation and regulation in the logistics management context? What are some examples of legislation and regulations? What are the key elements and considerations within national logistics policy?</li> <li>• What are the key characteristics of truck, rail, air, water, and pipeline modes of logistics? What are the factors that influence decisions around selecting proper modes of logistics?</li> <li>• What are the dynamics of logistics costing and pricing?</li> <li>• What are the key considerations for global logistics planning and execution?</li> <li>• How can issues such as third-party logistics, information technology, risk and security, and sustainability be managed in the context of logistics?</li> </ul>
<b>What understandings are desired?</b>
Students will understand that ... <ul style="list-style-type: none"> <li>• Logistics plays a significant role in effective supply chain management and is different from functions such as logistics.</li> <li>• Logistics can be viewed at both micro and macro levels. The micro view looks at logistics as a key element that assists supply chain management. The macro view establishes the link between logistics and the economic, political, and social aspects of a nation.</li> <li>• Regulation and legislation set the broader framework of operation for logistics management, which needs to be appreciated by managers.</li> <li>• Various modes of logistics have specific advantages, disadvantages, and challenges that need to be appreciated for informed intermodal logistics decisions.</li> <li>• Logistics networks, infrastructure, and equipment are key investment components for logistics planning and execution.</li> <li>• Costing and pricing matters follow a certain paradigm within the logistics domain, which influences decisions on transport investment.</li> <li>• Global logistics requires attention to a number of global supply chain issues, such as transaction, distribution, and communication channels.</li> <li>• Major decisions in modern logistics revolve around issues involving third-party logistics providers, information technology, risk and security, and sustainability management.</li> </ul>

Table 1. Cont.

What key knowledge and skills will students acquire as a result of this subject?	
Students will know . . .	Students will be able to . . .
<ul style="list-style-type: none"> <li>• Key terms and parlance related to logistics management</li> <li>• The role of logistics management in supply chains</li> <li>• The influence of regulation and legislation in logistics management</li> <li>• The basis of decision making in modes of logistics, including intermodal logistics</li> <li>• The basis of decision making in logistics infrastructure and equipment</li> <li>• Costing and pricing regimes within logistics</li> <li>• Global logistics planning and execution issues, problems, and challenges</li> <li>• Key trends and issues in logistics management</li> </ul>	<ul style="list-style-type: none"> <li>• Develop a coherent and cost-effective logistics plan for a complex business operation.</li> <li>• Articulate the reasoning behind logistics decisions, giving a balanced justification for the basis of decisions.</li> <li>• Understand the complex business environment in which logistics decisions are made and analyze how logistics plans can be adapted in response to changes in the environment.</li> <li>• Work collaboratively in diverse teams.</li> </ul>

### 3.1. Evidence for Learning Theory (Plan)

This aspect of our conceptual framework is embedded throughout stages 2 and 3 of the teaching plan (see Tables 2 and 3). For example, performance task 1 would require both individual orientation, through reading the case study and addressing the allocated questions, and group (social) interaction, in which students need to discuss among themselves, finalize their responses, decide on the role of team leader, and the like. There is a discernible effort to create an opportunity for students to bring their own experiences into the discussion. With the educator facilitating, students will be able to meaningfully build on their existing knowledge of logistics management and newly learned concepts/theories through discussion with groupmates and the educator [11].

Table 2. Teaching Plan Stage 2—Determine acceptable evidence.

What evidence will show that students understand?
<b>Performance tasks</b>
<p>1. <i>Team case study analysis (weekly)</i>—10%</p> <p><i>Description</i> Students will work on weekly case study questions that aim to provide them with an opportunity to apply the corresponding week's concepts and theories to a case company's logistics management issues/problems. Each case study contains 2–4 questions. One of the reasons for doing this in teams is for students to start forming their performance task 2 teams, improve their understanding of each other's work attitudes and styles, and prepare to develop their team report. Students are advised to allocate the questions among themselves and ensure everybody is contributing (hence the individual-based element designed into this task). After discussion in the class, the answers should be emailed to the lecturer via the team leader.</p> <p><i>Monitoring</i> Students will be asked to use a group wiki to complete the relevant sections each week.</p> <p><i>Assessment</i> This will be assessed towards the end of the semester. Students will need to work on the cases from week 2 to week 12 (10 case studies).</p>
<p>2. <i>Team report (mid-semester)</i>—40%</p> <p><i>Description</i> This assignment requires students to apply their understandings of the role of logistics management in the broader supply chain context. There is a focus on freight logistics and its implications for effective supply chain management. Specifically, students will need to draw on their knowledge of logistics management and the associated concepts/theories covered in weeks 1–8 to analyze a chosen company within the Australian Textile, Clothing, and Footwear supply chain.</p> <p><i>Monitoring</i> Starting from week 3, the instructor will ask students every week about their progress with the team report and whether they have questions, comments, or concerns. A discussion forum dedicated to this assignment, for students to post questions, will operate until the end of week 8.</p> <p><i>Assessment</i> This will be assessed in view of the following components:</p> <ul style="list-style-type: none"> <li>• Evidence of an understanding of logistics management issues within logistics and the supply chain</li> <li>• Depth of analysis carried out, including effective use of references</li> <li>• Linking of the analysis to concepts/theories</li> <li>• Collaboration in process and product—based on self- and peer evaluation (there will be separate self- and peer evaluation forms, which students will need to complete and attach as the last page of their personal submission of the team report)</li> <li>• Presentation according to accepted conventions, readability, and communication.</li> </ul>

Table 2. Cont.

3. Final exam—50%
<i>Description</i> The examination will be three hours long and consist of multiple-choice, short-answer, quantitative, and case study questions. It will cover all weeks except the final week.
<i>Monitoring</i> Exam preparation should be seen as an ongoing process throughout the semester. The performance of individual students across the other performance tasks will be taken into consideration to identify those students who require further support. Those who have failed in the previous performance tasks will be emailed to arrange a review meeting with the instructor to discuss their case and develop a plan for performance improvement. Ongoing classroom/discussion forum questions and answers will provide an opportunity for the instructor to gain a better understanding of the students' level of understanding and learning of the topics. Particularly, the review week (final week in the semester) will be used as the last opportunity for students to ask questions and seek clarifications.
<i>Assessment</i> The exam will be designed to assess students' understanding of the logistics management concepts/theories and their application in a number of different ways. Multiple-choice questions will assess theoretical understanding and familiarity with the textbook and other subject resources. Short-answer questions will assess the ability to discuss, explain, and articulate logistics management issues and familiarity with the research and practitioner articles assigned to each week's topic. The quantitative section will assess the analytical abilities of the students and their understanding of the quantification of some of the qualitative concepts they have learned in the subject. Finally, the case study will assess the ability to apply the concepts/theories learned throughout the semester as powerful tools to explain and synthesize case company logistics issues/problems. Through the case study, students will have the opportunity to demonstrate their level of articulation and argument development, using the right terminology, and overall comprehension of logistics and its position within businesses and supply chains.
<i>Other evidence</i> Apart from the objective assessments described in the performance tasks section, a number of subjective mechanisms will be used by the instructor to assist him/her with assessing each student's level of engagement, understanding, and participation throughout the semester. These mechanisms are as follows: <ul style="list-style-type: none"> <li>• Questioning (prompting/probing)</li> <li>• Observation of, for example, level of involvement and participation in debates, discussions, games, and other learning events in the class and discussion forums.</li> </ul> Student class attendance and discussion forum activity will also constitute an informal assessment procedure which will provide the instructor with an impression of the level of engagement and hence connectivity of students to the subject and understanding of its key concepts.
<i>Student self-assessment and reflection</i> The following mechanisms will be used to integrate student self-assessment and reflection into this subject: <ul style="list-style-type: none"> <li>• Account of knowledge and understanding This technique is based on getting students to write as much as they can about the subject in the very first session of the subject. There will be a few questions and 15 min' time for students to address those questions and send an account of their knowledge and understanding to the instructor. The instructor will keep these and return them to the students at the end of the semester to discuss with the students whether they notice improvement in their knowledge and understanding after going through the weekly topics over the semester.</li> <li>• Self- and peer evaluation forms as part of the second performance task The self- and peer evaluation forms, where students will reflect on their overall teamwork experience and the knowledge/understanding they gained through completing the assignment, will be part of the team report.</li> <li>• Informal questioning procedure at the end of the semester This informal procedure entails asking as many students as possible about their personal feelings on their knowledge development. This procedure can be used in conjunction with the "account of knowledge and understanding" mechanism.</li> </ul>

Table 3. Teaching Plan Stage 3—Plan learning experiences.

W.H.E.R.E.T.O (shown across the first six weeks of the subject): <i>Where and why; Hook and hold; Explore, experience, enable, equip; Reflect, rethink, revise; Evaluate work and progress; Tailor and personalize the work; Organize for optimal effectiveness</i>
<i>Week 1</i> <ul style="list-style-type: none"> <li>• Welcome students; review their expectations and state what this unit can offer them (based on weekly topics and learning outcomes).—W</li> <li>• Assist students in beginning to make connections and discuss the performance tasks of the subject; for example, let them know that a team report is required for performance task 1, which involves the use of a group wiki as a way of communicating and contributing ideas.—W</li> <li>• Facilitate understanding of supply chains, logistics, and transportation; particularly focus on the role and importance of logistics and its potential impact on the other functions/activities within and between organizations.—H</li> </ul>
<i>Week 2</i> <ul style="list-style-type: none"> <li>• Establish discussion on the nature of logistics demand and how it influences individual companies in the economy. <i>Note:</i> It may be helpful to ask students to consider companies they have worked for or have detailed knowledge of.—W and E</li> <li>• Ask students to debate, based on their knowledge and industry experience, the following statement: Logistics is the most important economic factor for economic development.—E and R</li> <li>• Have student groups read Case X1 from their textbook and suggest at least two strategies to improve the case company's competitive situation.—R and E</li> <li>• Play the Video Y1. Ask students to discuss the potential transport-related implications of the project discussed in the video for the operation of both manufacturing and service companies in Victoria.—E and T</li> </ul>
<i>Week 3</i> <ul style="list-style-type: none"> <li>• Ask students to find and share two or three examples of major transport-related state and federal legislation and regulations (across aviation, road, maritime, and rail modes) based on the state or territory they are located in.—W and E</li> <li>• Establish discussion on the pros and cons of Australia's National Transport Plan in terms of its policy framework and governance. <i>Note:</i> Students can draw on their knowledge and/or industry experience.—E, E, and T</li> <li>• Have student groups read Case X2 and address the following:—R and E</li> </ul> <ol style="list-style-type: none"> <li>In each of the three scenarios presented in the case, opponents and proponents have divergent views of government regulations. One view is on the public benefit, the other is on the cost to private industry. Which view resonates with you and why?</li> <li>In each of the scenarios, identify the benefits and costs for both viewpoints.</li> <li>Should the government intervene in setting regulations to increase security and help the environment? Or should private industry take on this role? Discuss.</li> </ol>

Table 3. Cont.

<p>Week 4</p> <ul style="list-style-type: none"> <li>Establish discussion on how fuel and labor have impacted motor carrier cost structures and altered motor carrier operations. <i>Note:</i> Ask students to mention any relevant industry experience they may have in relation to this issue.—E and E</li> <li>Explain what factors have contributed to the decline in the volume of higher-value freight by railroad. Seek students' opinions on what changes, if any, they would recommend for railroads to attract back more higher-value freight from motor carriers.—H</li> <li>Explain and discuss the pros and cons of using air transportation and how these relate to the choice between air carriage and other modes for freight and passengers.—H</li> <li>Have student groups read Case X3 and address the following:—W, R, and E <ul style="list-style-type: none"> <li>(a) What suggestions would you give Jim to help Airspace lower its operating costs?</li> <li>(b) How would you help Airspace implement those plans?</li> <li>(c) What constraints can you identify that would prevent Airspace from implementing your suggestions?</li> <li>(d) How would you suggest Jim respond to Delta's request for more flights at a lower cost?</li> </ul> </li> <li>Have students read the National Land Freight Strategy discussion paper published by Infrastructure Australia (2011). Establish discussion on the implications of the action plans proposed as part of this discussion paper in relation to students' knowledge and/or industry experience.—E and R</li> </ul>
<p>Week 5</p> <ul style="list-style-type: none"> <li>Have students read the report <i>Investing in Transport—Overview and Summary of Findings</i> (Department of Transport, Planning and Local Infrastructure, 2014). Focusing on Recommendations 1, 5, and 12; establish discussion on the implications of these recommendations for the local business logistics network using network parlance (nodes and links).—E, R, and T</li> <li>Have students read the journal paper "The Role of Transport Flexibility in Logistics Provision", by Naim et al. (2006). Ask students to consider and explain how transport flexibility could impact logistics and supply chain management in an organization in terms of the pros and cons.</li> </ul>
<p>Week 6</p> <ul style="list-style-type: none"> <li>Practice the transportation problem and algorithm with students.—R and E</li> <li>Have students read Chapter 2 of the <i>National Freight Network Strategy Background Paper</i> (Allen Consulting Group, 2010). Ask students to use the whiteboard to write down the two most interesting pieces of information about Australia's intermodal terminals that they have learned from reading this report. Then, establish discussion around the responses.—W, E, and R</li> </ul>
<p>Week 7</p> <ul style="list-style-type: none"> <li>Establish a role-playing game where students need to use their knowledge of pure competition and monopoly from a pricing perspective. Discuss which type of competition (pure versus monopoly) they would prefer if they were a <i>shipper</i>, and why. How about if they were a <i>carrier</i> organization?</li> <li>Explain the most important aspect in the relationship between value-of-service pricing and cost-of-service pricing.</li> <li>Establish a discussion on major forces that affect carrier-pricing strategies, with specific reference to the Australian transport market.</li> <li>Ask students to visit the Transport and Logistics Industry News website. Instruct them to find a news article, dated anytime from 2013 to present, with implications for transport costing and pricing.</li> </ul>
<p>Week 8</p> <ul style="list-style-type: none"> <li>Explain why logistics planning is an important aspect of global freight movement and what types of planning must be done.</li> <li>Establish discussion on the risks and perils present in global logistics. Explain how exporters and importers can manage these risks.</li> <li>Have student groups read Case X4 from their textbook and address the following: <ul style="list-style-type: none"> <li>(a) Which mode of transportation should ME use to move Blasters to their new markets? What benefits will this bring?</li> <li>(b) Identify and describe other global logistics issues that Jagr may be overlooking.</li> </ul> </li> </ul>
<p>Week 9</p> <ul style="list-style-type: none"> <li>Establish discussion on the reasons why some companies choose to use the services of 3PLs and why other companies do not.</li> <li>Establish a role-playing game where students act as if they have been given the task of outsourcing their company's logistics operations. Ask them to discuss what types of capabilities they would seek in a 3PL service provider.</li> <li>Have student groups read Case X5 from their textbook and address the following: <ul style="list-style-type: none"> <li>(a) Discuss the pros and cons of using third-party logistics for Jetstream's after-market services.</li> <li>(b) What potential risks exist with outsourcing the after-market services to a 3PL?</li> <li>(c) What transportation and logistics activities should be considered for outsourcing in this situation?</li> <li>(d) Should Jetstream obtain these services on a tactical or strategic basis?</li> <li>(e) What type of 3PL service provider is best suited to meet Jetstream's after-market service goals? How should they go about finding a capable 3PL service provider?</li> </ul> </li> </ul>

Table 3. Cont.

Week 10	<ul style="list-style-type: none"> <li>Establish discussion on a type of technology and its corresponding application related to intelligent transportation systems. Ask students what implications they can identify for improved supply chain management. <i>Note:</i> The Video Y2 can be played to provide students with further insights.</li> <li>Have student groups read the news article “Intelligent Transport Systems (ITS) Australia in Deal for US Technology” (Pauka, 2014). Ask them to discuss, in 250 words, the potential applications of transport-related technology in logistics management, to be submitted to the discussion forum.</li> </ul>
Week 11	<ul style="list-style-type: none"> <li>Ask students to work on this question: Risk analysis is a critical component of risk management. When conducting this activity, what are the two components of risk that must be analyzed? Why are they important? You may wish to share your own experiences in risk analysis.</li> <li>Establish discussion on the roles business and industry can play in the creation of globally secure logistics networks.</li> <li>Have student groups read Case X6 and address the following:               <ol style="list-style-type: none"> <li>What issues should Magness evaluate in his assessment of logistics risks?</li> <li>Analyze each supplier option that Magness is considering. What specific risks does each supplier option present?</li> <li>Which supplier would you recommend that Magness choose to best balance company goals with supply chain risk?</li> <li>What types of security issues and requirements will confront TGU if they offshore manufacturing?</li> </ol> </li> </ul>
Week 12	<ul style="list-style-type: none"> <li>Ask students to share their thoughts on how shippers and carriers can mitigate their impact on the environment.</li> <li>Perform subject revision and answer student questions related to the Final Exam.</li> <li>Congratulate students on completing their learning journey in logistics management.</li> </ul>

### 3.2. Evidence for Learning Model (Do)

This aspect of our conceptual framework encompasses the overall structure of the teaching plan. A backward design model is used, based on three stages: desired results (Table 1), assessment evidence (Table 2), and learning plan (Table 3) [1]. This model is further developed in light of both social and cognitive constructivism.

### 3.3. Evidence for Student Diversity (Check)

Given that the subject of logistics management is offered to final-year undergraduate students, the teaching plan is developed bearing in mind the ideas of andragogy [23]. Accordingly, we were cognizant of the fact that adult learners’ education needs and wants require a paradigm shift in teaching and learning schemes in order to be more effective and sustainable [23]. Andragogy recognizes that transformation in people’s self-concept over the years has the potential to make them dependent and self-directing [23]. The information in Table 1 (stage 1—identify desired results) provides substantial evidence for such recognition. For example, reviewing the knowledge and skills that students will acquire through the subject, it can be observed that “high-level” abilities are catered to. Examples include:

- Develop a coherent and cost-effective logistics plan for a complex business operation.
- Articulate the reasoning behind logistics decisions, giving a balanced justification for the basis of decisions.

This is aligned with the requirements of the final-year undergraduate student cohort, who are close to graduation and need analytical abilities, such as logistics planning, as well as assessment and decision-making skills, such as understanding and articulation of the reasoning behind some of the logistics practices undertaken by organizations.

Further, students’ desire for developing their social and communication skills is addressed by a number of group-based performance tasks and learning events. Group work also assists students in practicing different roles in managing conflicts and exercising accountability, time management, commitment, and leadership skills.

### 3.4. Evidence for Educator Knowledge and Skills (Act)

The educator of the logistics management subject must have a Ph.D. degree in a cognate area (i.e., logistics and/or operations management) or at least a master’s degree accompanied by significant relevant industry experience. This ensures that the educator has the right knowledge and skills to successfully deliver the curriculum.

Next, we illustrate how our student-centered, constructively aligned teaching plan (see Tables 1–3) caters to the ILOs of the subject, which also serves to further validate our developed conceptual framework.

#### 4. Teaching Plan and Achieving ILOs

Our use of the backward learning model [1] in the design of the teaching plan provides a foundation for supporting students in achieving ILOs. This is further assisted by the recognition and use of the constructive alignment approach [9] in building performance tasks and learning experiences. Learning is constructed based on what activities the students perform, not what the educator does. Similarly, ATs are about how well students achieve the ILOs, not how well they report back what the educator has taught them [9].

For example, reviewing the learning events related to week 2 (see Table 3), one can observe that to achieve ILOs such as . . .

- Understand the key logistics concepts and analyze the issues affecting the movement of goods, services, and people (comprehension, from Bloom's [24] taxonomy)
- Describe the complex business environment in which logistics decisions are made (comprehension) and analyze how logistics plans can be adapted in response to changes in the environment (analysis).

. . . the following learning events are designed:

- Establish discussion on the nature of logistics demand and how it influences individual companies in the economy. *Note:* It may be helpful to ask students to consider companies they have worked for or have detailed knowledge of. (Student-centered and supporting both ILOs.)
- Ask students to debate, based on their knowledge and industry experience, the following statement: Logistics is the most important economic factor for economic development. (Student-centered and supporting the first ILO.)
- Have student groups read Case 1–2 "Clearfield Cheese Company Case" from their textbook (page 28) and suggest at least two strategies to improve the case company's competitive situation. (Student-centered and supporting both ILOs.)
- Play the video *Premier Unveils Reference Design for East West Link Project*. Ask students to discuss the potential transport-related implications of the project discussed in the video for the operation of both manufacturing and service companies in the state of Victoria. (Student-centered and supporting the second ILO.)

Furthermore, reviewing performance task 2 (see Table 2), one can observe that in order to assess ILOs such as . . .

- Develop a coherent and cost-effective logistics plan for a complex business operation.
- Articulate the reasoning behind logistics decisions, giving a balanced justification for the basis of decisions.

. . . the team report is designed to examine how well students can develop, articulate, and justify logistics issues and problems in a specific industry setting. This clearly demonstrates attention to assessing students' ability to apply and synthesize concepts/theories rather than simply requiring them to explain the contents back to the educator.

So far, we have elaborated our conceptual framework (and established that it is student-centered and follows constructive alignment) based on the teaching plan for the subject of logistics management. Next, we discuss how the effectiveness of this teaching plan can be assessed.

#### 5. Evaluation of the Teaching Plan

The effectiveness of a teaching plan can be assessed in a number of ways. This could entail qualitative, quantitative, formal, and informal mechanisms within both performance tasks and learning events. We develop a comprehensive teaching plan evaluation template following McAlpine and Harris [25]. Our template demonstrates that such evaluation requires identifying the key stakeholders, potential uses, methods/sources, criteria, and required resources/skills/timeframe, as described below.

### 5.1. Stakeholders of Evaluation

The stakeholders associated with our evaluation of the teaching plan are those individuals or institutions that have a vested interest in the subject and curriculum design since both the process and the outcome of any learning and teaching design will have a direct or indirect impact on them [26]. The most important stakeholders include:

- **Students:** Students are central to the process of curriculum design and are the most important category of stakeholder, as they will be directly affected by the quality, alignment, and authenticity of any learning design. Students' involvement in the design evaluation can be seen in terms of, for example, using their input as an important source of evidence.
- **Educators:** Educators play an instrumental role in the curriculum design process and are important stakeholders in the various stages of producing learning and teaching content. As the initiators of a design, educators rely on their expertise, knowledge, and skills; student learning needs; best practices; university strategies; and industry needs, among others, to design and develop relevant and authentic curriculums.
- **Managers:** This category includes stakeholders with managerial and leadership roles such as Head of Department, Line Manager, Course Coordinator/Convenor, and Subject Moderator. These stakeholders have different levels of interest in the unit and curriculum design evaluation depending on their specific role, and as a result may be directly or indirectly affected. For example, line managers are responsible for mentoring and monitoring academic staff performance and development, particularly during their probationary period.

Parents and businesses constitute other relevant and important stakeholders who might be involved in curriculum design activities in different ways and capacities. For example, while the role of parents is more prominent in early, primary, and secondary education [27], businesses play an instrumental role in the case of tertiary education. The latter become more conspicuous when the notion of 'job-ready graduates' starts to dominate the attention of both universities and businesses [28].

### 5.2. Potential Uses for the Evaluation

The evidence and data that will be collected for the teaching plan evaluation can be used for a number of other applications, such as continuous improvement, succession planning, probation and promotion, and academic publication. These are further discussed in terms of their formative and summative orientation.

### 5.3. Methods and Sources of Evaluation

Evaluation methods, whether in the form of examinations, appraisals, reviews, observations, ratings, or even peer critiques, are key to ensuring the effectiveness of learning and teaching [29]. The nature and diversity of evaluation methods may also enable students to better understand the way they learn from different styles, environments, and resources related to learning and teaching. Light and Cox [29] argue that evaluation needs to be well balanced and derived from complementary sources to ensure rigor, validity, and reliability.

Consequently, we propose a mixed evaluation methods design (see Table 4). This allows triangulation of methods (and data) to improve rigor in the research process [30]. Further validating the application of a mixed evaluation methods design is the fact that the teaching plan evaluation should also focus on ILOs, TLAs, and ATs. These components demand different evaluation methods to ensure the reliability and validity of measurement.

**Table 4.** Mixed evaluation methods design.

Components of Evaluation	Methods of Evaluation	Instruments for Evaluation	Data		
			Source	Type	Transformation
ILOs	General questionnaire	Survey	Students, educators, managers, businesses	Quant. and qual.	Yes (heat map)
	Documentary research	Online database search	Literature * (key elements that inform ILO development)	Qual. and quant.	Yes (fit envelope)
TLAs	Interactive teaching	Observation	Students, self	Qual.	No
	Portfolios and reflective commentaries	Unit portfolio application (Blackboard Learn)	Students	Qual.	No
ATs	Evaluation from assessment	Report, essay, project, exam	Students	Qual. and quant.	No
	Questionnaires for courses, parts of courses, or projects	Survey, marking rubrics	Students, educators	Quant. and qual.	No

\* Paradigms: type of knowledge (i.e., declarative or functioning); principles: outcome verb, content, and context; processes (taxonomies and general guidelines). *Note:* Quant. = quantitative; Qual. = qualitative.

As shown in Table 4, six different evaluation methods are chosen from a pool of evaluation methods proposed by Light and Cox [29] for the purpose of our teaching plan evaluation. The selection is based on how well the chosen methods can measure the components of evaluation. To reduce the impact of bias and measurement error, triangulation of method and data has been considered in the overall design. In this regard, a general questionnaire and documentary research [31] will be used to evaluate the ILOs as part of the teaching plan evaluation design. This combination ensures that the evaluation entails both primary (survey) and secondary (literature) data and takes the perspectives of various stakeholders as sources of data to produce a comprehensive understanding of the ILOs, including their wording and alignment with the course ILOs; general and specific skills; university strategy; and industry needs.

The approach for the selection of evaluation methods for TLAs has been based on the notion of “evaluation in action” ([29], p. 199), as this provides a better context to gauge students’ engagement with the activities. The sources of data will be both students and educator, as the educator will be focusing on students’ attention, non-attention, and expressions as well as their interpretation of how well certain activities have played out. To address the bias associated with educator-administered data collection, portfolios and reflective commentaries are proposed to elicit students’ experiences and reflections in relation to their engagement with the TLAs. In this regard, the Blackboard Learn (or any other learning management system) subject portfolio application can be used as an instrument for collecting qualitative data from students.

Lastly, with respect to the ATs, two complementary evaluation methods are proposed for courses, parts of courses, or projects: assessment and questionnaires. The former provides valuable data in terms of feedback and grades, which could be used by the educator to pinpoint gaps in the subject content or problems with student understanding of specific theories/concepts. This method reflects a proactive approach based on eliciting both students’ and educators’ insights on an assessment piece through surveys and marking rubrics in order to evaluate how well aligned they are with subject objectives and how well they can measure students’ progress towards achieving the relevant ILOs.

#### 5.4. Criteria for Evaluation

Three criteria can be used to make judgments about the teaching plan evaluation: constructive alignment, student satisfaction, and professional relevance. ILOs drive the strategic direction of a subject in terms of its TLAs and ATs. Therefore, it is very important that ILOs are developed with careful attention to ensure that students will acquire the required knowledge and skills through completing a particular subject [6]. In this regard, constructive alignment is an important criterion to ensure a curriculum evaluation design has a sound and rigorous theoretical and structural basis. As students are the most important stakeholder and the end consumer, it is crucial to use student satisfaction as a criterion for the judgment of a curriculum evaluation design. Ultimately, any subject design must suit students' learning needs and wants, and appreciate the diversity that they bring into the learning environment. The last criterion (i.e., professional relevance) is also significant in making judgments on how well a teaching plan prepares students for the relevant industry and profession, that is, its authenticity for the ultimate goal of developing work-ready graduates.

For further clarification, a practical application of constructive alignment as a criterion to judge the existing ILOs of the logistics management subject is demonstrated in Appendix A.

#### 5.5. Required Resources/Skills and Timeline for Implementation

Following Webb, Smith, and Worsfold [32], we have outlined the resources and skills needed to carry out our teaching plan evaluation which can be seen in Appendix B.

### 6. Conclusions

In this essay, our central aim was to assist logistics educators with designing student-centered, constructively aligned teaching plans that allow them to create authentic learning and teaching experiences for students. As such, we developed a conceptual framework based on the PDCA cycle, that integrates learning theory, learning model, student diversity, and educator knowledge/skills as core components of curriculum design. We applied and elaborated our framework by designing a teaching plan for the undergraduate logistics management subject. We also proposed a template which can be adopted by educators to evaluate the effectiveness of their teaching plans.

We believe that our essay contributes to advancing logistics education by providing a theoretically grounded teaching plan, accompanied by guidelines that can be used for its evaluation, to enhance students' learning experience and support them in achieving ILOs. Our frameworks and templates can be used beyond the logistics learning and teaching community, as they can be easily replicated in other disciplines. To our knowledge, we offer one of the first theoretically aligned and practically relevant discussions on curriculum design in logistics management which can be adopted by, for example, junior faculty working on their very first subject design project.

However, our work draws on conceptual development and anecdotal evidence lacking empirical validation. We hope that future research addresses this shortcoming, although we believe that our essay provides a solid foundation for future empirical studies on student-centered curriculum design and evaluation.

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## Appendix A. Practical Application of Constructive Alignment as a Criterion for Evaluating ILOs

The evaluation of ILOs can be undertaken by referring to the key elements that inform their construction and development. These elements are suggested to be associated with the paradigms (type of knowledge: declarative or functioning), principles (outcome verb, content, and context), and processes (taxonomies Such as Bloom's [24] taxonomy (later revised by Anderson et al. [33]) and general guidelines) used in creating an ILO ([5,6,34]. We use the above-mentioned elements (labeled as *horizontal evaluation*) as well as the course intended learning outcomes (CILOs; labeled as *vertical evaluation*) as the basis for a critical evaluation of the existing ILOs of the Logistics Management unit. A quantitative mechanism based on a three-point Likert scale (where 1 = weak, 2 = average, 3 = strong) is used to facilitate evaluation of the subjective, qualitative discussions and evidence.

As per Table 4, the method of evaluation for the following practical application is documentary research, the instrument for evaluation is online database search, the data source is literature, the data type is qualitative, and fit envelopes are used for data transformation.

***ILO1: Develop and articulate a coherent and cost-effective logistics plan for a complex business operation.***

### Vertical evaluation:

ILO1 contributes to four out of seven CILOs and four out of seven GILOs (generic intended learning outcomes) of the bachelor's degree [6]. Therefore, the state of contribution of ILO1 to CILOs and GILOs (as recommended by AQF) can be classified as *satisfactory*. It is assumed that if an ILO contributes to at least three CILOs and three GILOs, it can be considered as 'satisfactory', complying with AQF requirements of the course. 'Progressing' and 'unsatisfactory' are the two other classifications, which represent a contribution of the ILO to fewer than three CILOs or fewer than three GILOs, and fewer than three CILOs and fewer than three GILOs, respectively.

### Horizontal evaluation:

ILO1 is well written and clear in terms of the changes it intends to bring to the student's learning process. The outcome verbs (i.e., develop, articulate) are well aligned with the nature of the unit (year three, outcome unit) and transferable in terms of developing appropriate TLAs and measurable ATs. Further, ILO1 clearly identifies the content (i.e., coherent and cost-effective logistics plan) that the verb is meant to address and the context (i.e., for a complex business operation) in which this content will be deployed [5].

***ILO2: Articulate the reasoning behind logistics decisions, giving a balanced justification for the basis of decisions.***

### Vertical evaluation:

ILO2 contributes to two out of seven CILOs and three out of seven GILOs of the bachelor's degree [6]. Therefore, the state of contribution of ILO2 to CILOs and GILOs (as recommended by AQF) can be classified as *progressing*.

### Horizontal evaluation:

ILO2, while clear in terms of the change it aims to bring into the student's learning process, suffers from lack of specificity of the context (i.e., giving a balanced justification for the basis of decisions) of the learning activity. The outcome variable (i.e., articulate) is relatively well aligned with the nature of the unit (year three, outcome unit) and transferable in terms of developing appropriate TLAs and measurable ATs. Further, ILO2 clearly identifies the content (i.e., the reasoning behind logistics decisions) that the verb is meant to address; however, as noted, the context in which this content should be deployed requires some modifications to ensure the TLAs and ATs can successfully deliver this ILO [5].

### Appendix B. Resources/Skills and Timeline for Implementation of Teaching Plan Evaluation

Stage	Description	Resources/Skills Required	Timeline
Identify the subject of evaluation	Possible options are subject matter expertise, design skills, delivery skills, management skills, mentoring students	<ul style="list-style-type: none"> <li>• Anecdotal assessment of a unit/curriculum and brainstorming with a colleague/practitioner</li> <li>• Consulting the literature on teaching evaluation and scholarship</li> <li>• Consulting the university learning and teaching policies</li> <li>• Workload allocation</li> </ul>	To be determined
Define the components of evaluation	Identify the components of the subject that can be evaluated	<ul style="list-style-type: none"> <li>• Anecdotal experience</li> <li>• Consulting the literature on teaching evaluation and scholarship</li> <li>• Consulting the university learning and teaching policies</li> <li>• Workload allocation</li> </ul>	To be determined
Select evaluation methods	Define the alternative evaluation methods that can be used to collect data on components of evaluation	<ul style="list-style-type: none"> <li>• Consulting the literature on teaching evaluation and scholarship</li> <li>• Workload allocation</li> </ul>	To be determined
Locate information about the components of evaluation	Analyze options for instrument and sources for data	<ul style="list-style-type: none"> <li>• Consulting the literature on teaching evaluation and scholarship</li> <li>• Consulting the university ethics committee</li> <li>• Workload allocation</li> <li>• Faculty/department funding</li> <li>• Research assistant</li> </ul>	To be determined

Stage	Description	Resources/Skills Required	Timeline
Select resources to address the components of evaluation	Finalize decision on instruments and data sources and commencing data collection	<ul style="list-style-type: none"> <li>• Workload allocation</li> <li>• Research design training</li> <li>• Faculty/department funding</li> <li>• Research assistant</li> </ul>	To be determined
Undertake analysis of the data related to the components of evaluation	Clean and analyze various types of data collected through different instruments	<ul style="list-style-type: none"> <li>• Workload allocation</li> <li>• Data analysis training</li> <li>• Faculty/department funding</li> <li>• Research assistant</li> </ul>	To be determined
Write up the evaluation results	Interpret the results and develop a report that discusses the evaluation findings and recommendations	<ul style="list-style-type: none"> <li>• Workload allocation</li> <li>• Faculty/department funding</li> <li>• Research assistant</li> </ul>	To be determined
Implement the final recommendation	Incorporate the evaluation results and recommendations into redesign of the components of evaluation and ultimately improvements in the subject of evaluation	<ul style="list-style-type: none"> <li>• Workload allocation</li> <li>• Consulting the literature on teaching evaluation and scholarship</li> <li>• Consulting the university learning and teaching policies</li> </ul>	To be determined

Source: Adapted from Webb et al. [32].

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